MOBILIZATION-2015

7th National Seminar on

Sustainable Rural Livelihood:
Technological and Institutional Perspective

January 8-10, 2015

Society for Community Mobilization for Sustainable Development

Organized by
Division of Agricultural Extension Education
Sher-e-Kashmir
University of Agricultural Sciences & Technology of Jammu
Chatha, Jammu (J&K) 180009

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Message

I am happy to learn that the Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J), in collaboration with the Society of Community Mobilization for Sustainable Development, is shortly organizing the 7th National Seminar on "Sustainable Rural Livelihood: Technology and Institutional Perspectives".

The projected Seminar would provide a valuable opportunity for the scientists to share their knowledge and experiences and evolve pragmatic approaches for enabling the agriculture sector to achieve rapid and sustained growth. I hope that the Seminar would also consider formulating an action plan for the latest technologies being effectively utilized for achieving increased productivity in agriculture and allied sectors.

I compliment Prof. P.K. Sharma, Vice-Chancellor, SKUAST-J, and members of the Organizing Committee for arranging to discuss an important theme and wish the participants fruitful deliberations.

2nd January, 2015
Jammu.
Message

Current agri-rural development scenario is facing multi-pronged challenges and threats of global as well as domestic market related issues besides, production and post-harvest management related challenges. Agricultural system which, hitherto, was production based need to be evolved essentially on market based economy. The philosophy of ‘more producer means successful farmers’ is no longer valid. In the present context, farmers’ capacity need to be developed for value addition, produce presentation, quality standards and effective marketing at par with international market demand. Farmers essentially have to be agripreneurs in order to identify real business opportunities, draw maximum benefit from the available support system and build the global competitiveness for their produce. Therefore, the appropriate technological options in the field of agriculture, animal husbandry, horticulture, home science etc. are to be tapped and disseminated. This effort will be more synergistic, if farmers’ capacity for farm level microenterprise promotion is strengthened.

However, the need of initiatives from policy makers for revamping public-private partnership, strengthening market-led extension needs to be relooked into. Scaling up livelihood security and community-driven development paradigm is critical for social capital development. The national seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" to be organized from January 8-10, 2015 is a timely initiative in this direction.

I extend my sincere compliments and also congratulate the organizers for their professional initiative and wish this seminar a grand success.

(Radha Mohan Singh)
Message

Significance of agriculture and allied field had many dimensions for rural prosperity. Not only it has major share in rural economy, but also offers the gainful employment opportunity and income sustainability to the large number of rural people. Rural community may have self-employment by adopting alternative rural resource systems. Recent initiative for employment generation in rural areas has showed the path that unorganized sector has immense potential for employment and income generation.

Creation of employment opportunities through entrepreneurial intervention is essential, because unemployment being the major issue confronting rural youth today. Hence, efforts for micro-enterprise promotion among rural youth, farm women and farmers need sincere attention. The other issues like management of natural resources, agro-forestry, social forestry, productivity enhancement in rainfed agriculture and inclusive growth are equally important.

It is heartening to know that the Society for Community Mobilization for Sustainable Development in collaboration with S K University of Agricultural Sciences and Technology of Jammu (J&K) is organizing 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015.

I hope that the present seminar will help in evolving a comprehensive road map for ensuring employment and income security among rural populace through application and adoption of new technological options for rural development.

I wish the seminar a grand success.

(Dr. SANJEEV KUMAR BALYAN)
It is a matter of pleasure to know that the Society for Community Mobilization for Sustainable Development is organizing 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015 in collaboration with SK University of Agricultural Sciences and Technology of Jammu (J&K).

Sustainable rural prosperity is a government priority which demands sincere attention from all the potential stakeholders. Hence, capturing their experiences and evolving the model for further replication is not ruled out. Convergence of technologies and institutions to achieve the intended objectives is also being deliberated and realized at various platforms. The broad dimensions include agri-rural development and the issues like appropriate technological options matching with farming situation characteristics. However, effective delivery and dissemination to the target clientele, promotion of farmers' innovations for income sustainability, challenges related to agro-forestry, natural resource management, women empowerment, gender mainstreaming, promotion of self-help groups, enhancing efficiency in rainfed agriculture, organic farming demand particular attention of rural development professionals.

In the given scenario, when Indian agriculture has witnessed both success stories and future challenges, it is apt to hold such National Seminar on the above topic which is very timely and I am sure that the emanated recommendations will be instrumental to the research and extension administrators, policy planners, development agencies, NGOs and other partners of rural development in general and agricultural development in particular.

I wish the Seminar a grand success.

(S. Ayyappan)
I am pleased to know that 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective " is being organized by the Society for Community Mobilization for Sustainable Development in collaboration with S K University of Agricultural Sciences and Technology of Jammu (J&K) from January 8-10, 2015.

Indian agriculture has transformed itself from sustenance agriculture to agribusiness. It simply implies that there is a need to evolve the paradigm from 'management of agricultural extension' to 'innovation management'. Therefore, sustainability of agri-rural development initiatives has taken the front seat. As a result, sustainable rural income security is being accorded the top priority by the concerned stakeholders. The multi-pronged challenges in the areas of agriculture, horticulture, livestock, etc; gender mainstreaming, enterprise promotion in agriculture, etc ought to be addressed. The key issues like technology delivery mechanism, agricultural knowledge management by using ICT, cost-sharing in extension, contract farming, etc. are the new emerging vistas demanding immediate attention for debate and deliberations. It is expected that the ideas deliberated during the seminar will offer various alternatives for the development of rural masses for improving their quality of life.

I am sure that the seminar will also help the development administrators and researchers to acquaint with the opportunities, challenges and threats of international and national competition in agriculture and allied sector to devise an appropriate intervention strategy.

It is also a matter of great pleasure that MOBILIZATION is bringing out a Souvenir at this occasion.

I wish the National Seminar a splendid success

Dr. Gurbachan Singh
Chairman
National Academy of Agricultural Sciences

Vice President National Academy of Agricultural Sciences
Former Chairperson PPV&FRA
Chairman NBA
Vice Chancellor GBPUAT, Pantnagar-263 145

P.L. Gautam

Message

It is indeed a matter of great pleasure to share that MOBILIZATION Society, in collaboration with S K University of Agricultural Sciences and Technology of Jammu (J&K)) is organizing the 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective” from January 8-10, 2015.

As at present agriculture and allied sectors in India, shall continue to play a crucial role in sustaining rural economy future as well. It will be helpful to maintain the livelihood and employment security for our rural populace. Enhancing farm productivity and ensuring income security have emerged as the major challenges. Therefore, making them aware of their rights and opportunities and facilitating them for self employment in rural areas have become. We must strive for stimulating and enabling the potential agripreneurs to initiate agriculture and livestock related ventures and efficiently manage and sustain them. The important questions like how farmers’ innovation could be appreciated and integrated into mainstream agricultural research, how farmers’ awareness could be enhanced about protection of their innovations and how, more specifically, their rights could be protected demand sincere attention and debate.

I am sure the seminar will offer a common platform for researchers, policy makers, entrepreneurs and farmers to interact and share their experiences and to formulate the future road-map for harnessing global competitiveness of agricultural produce. The outcome of seminar will evolve the strategies to help the rural community to mitigate the challenges and threats of international and national competition in agriculture and allied sectors.

I extend my warm greetings and wish the seminar a great success.

(P.L. Gautam)

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Tel.: +91-11-25846051-52; Fax: +91-11-25846054; E-mail: nass@vsnl.com; Website: www.naasindia.org
**Message**

It is a matter of great pride for Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu that this university in collaboration with the Society for Community Mobilization for Sustainable Development is hosting the 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015.

It is essential to ensure household food and nutritional security to the rural in order to sustain agricultural economy in the country. For that it is important to facilitate them to initiate enterprise as a profitable venture. Strengthening farmers' organizations and making farmers' interest groups, societies, etc. is another key area for rural social capital building. It is an opportunity for researchers, agricultural professionals, public sector partners, rural institutions, mass media and financial institutions to converge technological and skill oriented interventions for rural prosperity through agriculture, livestock and allied fields. It is high time to generate awareness among all the stakeholders and empower them for sharpening our agriculture sector to surmount the upcoming global challenges.

I am sure that the seminar will offer a common platform to deliberate and share their experiences to design strategies for entrepreneurship development among rural masses. I am grateful to all those who have supported this professional endeavour in various capacities.

I wish the seminar a grand success.

-sd-

(P.K. SHARMA)
Message

I am immensely happy to know that the Society for Community Mobilization for Sustainable Development in collaboration with S K University of Agricultural Sciences and Technology of Jammu (J&K) is organizing 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015.

Agriculture and livestock are the primary source of rural livelihood security. Declining resource base and unstable income are the major challenges before the farming community. Unemployment on the other hand is the major issue, which demands strategic attention of planners, development administrators and government at higher level. Development of rural areas can be instrumental for holistic development. Besides, other critical issues like entrepreneurship development, credit and financial management, market-led agricultural production etc. are some of the core issues that ought to be addressed.

The concept of lab to land in respect of crop and livestock technologies will continue to remain dynamic for capacity development of Indian farmers. I look forward for the recommendations of the seminar and wish the organization of this seminar a grand success.

(A.K. Singh)
Message

Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J) is organizing 7th National Seminar on **Sustainable Rural Livelihood: Technology and Institutional Perspectives**, on 8-10 January, 2015 at Chatha, Jammu.

Agriculture sector in the state has been witnessing radical changes over the years with introduction of new schemes for development of sustainable agriculture to augment employment opportunities, improve income levels of farmers and promote value added growth of agro-based business.

J&K State needs to firmly establish infrastructure to increase agriculture production and productivity. Strong emphasis by various funding agencies and pooling of resources by Central/State Governments with convergence in implementation at village/block/district/State levels by line Departments/SAUs/farmers producer organizations is required with greater scientific understanding of sustainable agriculture in the State in view of with policy shift from Rice-Wheat maize cycle to cash crops like vegetables, saffron, basmati and pulses with higher returns. Essential elements for both sustainability and productivity that already exist need to be rediscovered through the indigenous knowledge of farming systems/communities and pooling of diverse natural resources with better water harvesting, INM, IPM and post harvest technologies with linkages to markets.

I hope the participating scientists would make an endeavour to draw a road map and make suitable recommendations which can go a long way in socio-economic upliftment of farming community of the state.

I wish the seminar a great success.

(Dr. Asgar Hassan Samoon)
It is a matter of great pleasure to know that Society for Community Mobilization for Sustainable Development (MOBILIZATION), in collaboration with Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (J&K) is organizing the 7th National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015.

Agriculture still is the backbone of Indian economy. But in recent times, Agricultural sector is facing many challenges. Spiraling demand of food, declining agricultural productivity due to natural resources degradation, scarce water resources and changing climatic conditions impact agricultural productivity and ultimately result in reduction of farm profitability.

Sustainable agriculture becomes a priority which has also been emphasized in recent times by Government of India. There is need for convergence of multi-sectoral paradigm to achieve sustainable development of agricultural sector for enhanced livelihood opportunities for rural population. All stakeholders joining hands for developing agricultural sector is paramount for delivering effective solutions on a long term basis.

This seminar is being organized on the most relevant theme in present context. I am sure that the deliberations will bring out relevant recommendations, which will be instrumental to the researchers, extensionists, policy planners, development agencies, NGOs and other organizations playing vital role in rural development.

I congratulate the organizers for selecting this theme for the seminar and I wish it a grand success.

(Ravinder Kaur)
Message

I am happy to learn that Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu in collaboration with the Society for Community Mobilization for Sustainable Development is organizing the VII National Seminar on "Sustainable Rural Livelihood: Technological & Institutional Perspective" at its main Campus Chatha from January 08-10, 2015. About 250 delegates are expected to participate in the Seminar from India and abroad to share their experiences.

I wish the organizers all the best.

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National Bank for Agriculture and Rural Development

Shankar A. Pande
Chief General Manager

Message

Sustainable Rural Livelihood is important for developing the Indian economy. On-farm and off-farm activities provide livelihood to about fifty-two percent of the Indian population. Therefore, for developing the rural economy the work force involved in farm activities need the support of the government for their economic well being.

It gives me immense pleasure that Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu in collaboration with “Society for Community Mobilization for Sustainable Development” is organizing VIth National Seminar on “Sustainable Rural Livelihood: Technological & Institutional Perspective” at its main campus Chatha, Jammu, from January 08-10, 2015. I believe that this national seminar will offer a platform for all stakeholders associated with agriculture and rural development to deliberate in formulating the roadmap for sustainable rural development. I hope the seminar shall also come up with its recommendations for meeting the challenges of agriculture and the problems encountered by the small holding farmers. NABARD is honored to be partner in organizing the national seminar.

I wish the national seminar a great success.

(Shankar A Pande)
Chief General Manager
NABARD
Jammu
Message

Agriculture, Livestock and allied sectoral development are the major support systems to the rural economy which provide livelihood, nutritional and income security to the farmers. The agricultural system hitherto was production based which is to be developed essentially on the line of market driven economy. Empowering farmers through entrepreneurship for holistic benefits from available support systems and to build their global competitiveness has become imminent. It requires multi sectoral intervention in the rural areas. At the same time potential of the farmers to start agricultural and livestock enterprises and successfully manage them needs to be enhanced. This seminar will definitely evolve the roadmap to help the rural community to overcome the threats of international and national challenges in agriculture and livestock sectors.

I am very happy that S K University of Agricultural Sciences and Technology of Jammu (J&K) is sharing the responsibility with MOBILIZATION Society to organize National Seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015. I am sure that presentations and deliberations will sensitize the people from different sectors of development and will enable the professionals to formulate the future strategies for building global competitiveness of agricultural produce. I look forward to the meaningful recommendations for policy planners and development administrators to be emanated through this seminar.

I wish the national seminar a grand success.

(K.S. RISAM)
Message

Society for Community Mobilization for Sustainable Development (MOBILIZATION) is a non-profit professional organization for mobilizing the community towards sustainable rural development. It has showed a tremendous potential in imparting training and capacity building among various sections of the society particularly youth and women. The society, during these ensuing years has successfully mobilized several researchers, academicians, planners, grass root mobilizers and students and created conducive intellectual atmosphere for introspective deliberations and conducted seminars to address the burning problems of the day.

I am particularly happy to share that this time the Society in collaboration with Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (J&K) is organizing a National seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" from January 8-10, 2015.

I am confident that seminar will be helpful in evolving the appropriate strategy for micro-enterprise promotion in agriculture through convergence of technologies, use of ICT. farmer innovation. market driven technological interventions etc. I am sure that the seminar will provide a common platform for researchers, policymakers, entrepreneurs and farmers to interact and share the experience and will enable us to formulate the future strategies for sustainable agri-rural development. It will also help to develop a road map for developing rural capacity, market driven farming system models and ensuring sustainable livelihood security to our nation.

This is also a matter of great pleasure that at this occasion MOBILIZATION is bringing out a Souvenir. I wish the National Seminar a grand success.

J.P. SHARMA
Message

Agriculture is the main livelihood activity with distinctive climatic conditions and peculiar problems throughout India. It is estimated that nearly 54 million hectare of land of the country is covered by hill and mountainous regions which is populated by nearly 34 million people. Agriculture remains the main stay of rural people as other activities have generally less scope in view of the geographical and climatic conditions. Despite several favourable conditions suitable for agriculture like fertile soil, natural irrigation, moderate temperature, organic matter availability, there are innumerable problems being faced by the farmers in the agriculture. J&K state has substantial land falling in the hilly areas and potential and problems of agriculture are no different than rest of the country’s regions. Farmers of our state require technological interventions during cultivation and post harvest stages for better productivity and better economic return. Attention is also require for quality crops, cost-effective mechanization, quality produce, which can enter the metro markets as agro products from hilly areas. Mixed farming is another area of attraction for which hilly areas are ideally suitable.

It gives me immense pleasure to know that Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), Jammu is organizing 7th National Seminar on Sustainable Rural livelihood: Technology and Institutional perspectives, on 8-10 January, 2015 at Jammu. I foresee best result to come from the scientist initiatives being undertaken in SKUAST Jammu and other state and national level development and institutions in this regard focusing sustainable hill agriculture which is going to shape the economic scenario of our state well.

I wish the organizers of the 7th National Seminar on Sustainable Rural livelihood: Technology and Institutional perspectives a grand success in this endeavor.

-sd-

(Jag Paul Sharma)
Message

I am delighted to learn that Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu is organizing the 7th National Seminar on “Sustainable Rural Livelihood: Technological & Institutional Perspective”, at its Main Campus Chatha, Jammu, from January 8-10, 2015.

Sustainable Rural Livelihood is significant for developing the rural economy of a nation. On-farm and off-farm activities provide livelihood opportunities to about fifty-two percent of the Indian population. It is therefore imperative that for developing the rural economy, the work force involved in farming sector is provided support and hand holding by various government and non-government agencies. The theme chosen for the National Seminar is expected to focus on technological and institutional priorities for sustainable rural livelihood and it shall go a long way in providing the agricultural scientists, extension professionals and policy planners a road map to develop long term strategic plans for achieving the goal of sustainable rural livelihood. From the rural entrepreneurship stand point, the exposure of a select few prospective entrepreneurial beneficiaries with grassroots connect, to the basket of rural farming livelihood opportunities, would be the highlight of the Seminar.

J&K State Council for Science &Technology is privileged with an opportunity to be a partner in organizing the National Seminar.

Shafat Sultan
Additional Director
From the Desk of Organizing Secretary

Agriculture, livestock and allied sectors continue to play a key role for the rural livelihood security through micro-enterprise promotion for poverty alleviation to larger section of the society. However, the present Agri-development scenario is at crossroads with several challenges and multiple threats of global competition even for our domestic market. The issues like micro-enterprise promotion, sustainable natural resource management, women empowerment, etc. are still partially addressed. The agricultural system hitherto was mainly production oriented but modern agricultural sector ought to be based on market based economy. Hence, the scope of contract farming, market led extension and use of ICT in extension cannot be ruled out. In view of present marketing scenario, it is imperative that farmers need to be mobilized for collective action to have more bargaining power and impact in policy formulations. Hence, strengthening farmers' organizations, SHGs, FIGs is need of the hour.

The theme of the national seminar on "Sustainable Rural Livelihood: Technological and Institutional Perspective" is very relevant and timely in the context of rural prosperity. As the seminar will cover all the important areas such as sustainable development options, empowering the farmers for global competitiveness, information and communication technologies, public private partnership and marketing, I hope the scientists, experts, entrepreneurs, extension personnel, industry partners and NGOs attending this seminar shall deliberate on the above issues and come up with recommendations to mitigate the problems faced by farmers. I think it is the high time to address the issues of rural development in meaningful manner.

I extend my sincere wishes for successful organization of the seminar.

(Rakesh Nanda)
Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu (J&K)

“An institution for sustainable agriculture for food and nutritional security”
7th National Seminar of MOBILIZATION on “Sustainable Rural Livelihood: Technological and Institutional Perspective”
8-10 January, 2015
Sher-e-Kashmir
University of Agricultural Sciences & Technology of Jammu
Main Campus, Chatha, Jammu- 180009 (J&K)

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**VII National Seminar on Sustainable Rural Livelihood: Technological & Institutional Perspective**

**MOBILIZATION-2015**

**JANUARY 8-10, 2015**

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8-10 January, 2015
Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu
Main Campus, Chatha, Jammu-180009 (J&K)

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Session 3
Market Driven Farming Systems, Institutional Convergence for Promotion of Agribusiness, Rural-Tourism and Social Sustainability

3.1 Market Driven Farming Systems and their Role towards Livelihood Security of Rural Communities

M.S. Gill

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Keynote Paper
Keynote Paper

Sustainable Rural Livelihood: Technological and Institutional Perspective

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Indian Agricultural Research Institute, New Delhi

1. Introduction

Indian agriculture has the onus of providing household food and nutritional security to its billion plus population. India ranks second worldwide in farm output. Agriculture and allied sectors like forestry, logging and fishing accounted for 13.7% of the GDP and despite a steady decline of its share in the GDP, is still the largest economic sector and plays a significant role in the overall socioeconomic development of India by providing employment to 51% of the total workforce in India (Wikipedia, 2014). However, international comparisons reveal the average yield in India is generally 30% to 50% of the highest average yield in the world (Datt and Sundharam, 2009). The country recorded impressive achievements in agriculture during five decades since the onset of green revolution in late sixties. The nation that was frequently plagued by famines and chronic food shortage before green revolution, today faces surplus. From a food grain production around 55 million tons at the time of independence, we now boost of production of 263 million tons of food. This enabled the country to overcome widespread hunger and starvation; achieve self-sufficiency in food; reduce poverty and bring economic transformation in millions of rural families. But the production system adopted during the Green Revolution era has subjected the natural resources to immense pressure. The situation, however, started turning adverse for the sector around mid-nineties, with slowdown in growth rate of output, which then resulted in stagnation or even decline in farmer’s income leading to agrarian distress, which is spreading and turning more and more serious. The declining trend of per capita land availability and shrinking operational holding sizes, however, pose serious challenges to the sustainability and profitability of our farming systems. Natural resource base of agriculture, which provides for sustainable production, are shrinking and degrading, adversely affecting production capacity of the ecosystem and less contribution of consumers in farmer’s income. There is also a decline in total factor productivity due to decrease in public investment on agriculture sector. However, demand for agriculture is rising rapidly with increase in population and per capita income and growing demand from industry sector. Hence the sustainable development of Indian agriculture is considered to be a necessary condition for “inclusive growth”. Furthermore, our growing analytical understanding of entrenched inequality suggests that key populations- smallholder farmers and women broadly- are at the nexus of agriculture, nutrition, and health, and thus, critical drivers of inclusive growth.

In the process of agricultural development, the adoption of modern technologies have had many positive effects and reduced many risks in farming, but there have also been significant costs. There is, thus, an urgent need to identify severity of problem confronting agriculture sector to restore its vitality and put it back on higher growth trajectory. A changeover is needed towards an optimal and renewable use of biological resources and towards viable primary production and processing systems. These systems will need to produce more food, fibre and other bio-based products with curtailed inputs; environmental impact and greenhouse gas emissions, and with enhanced ecosystem services, zero waste and adequate societal value to meet the food demand and food security (European union 2014). Ensuring food security goes beyond securing a sufficient supply. It also requires social and economic access to safe and nutritious food. Food consumption has an impact on human health and the environment. The
challenge is how to meet consumers’ needs and preferences while minimising the related impact on health and the environment. After decades of limited success indifferent conceptual and development programmes, new ideas about development are emerging. Sustainable livelihoods approaches represent one way of doing this. Sustainable rural livelihood and agriculture in extension perspective is an innovative way to learn from the experts and innovative farmers about cutting-edge techniques and innovative programs and to connect with others who are just as passionate about rebuilding a healthy, local food shed from seed to plate.

Sustainable rural livelihood development aims at improving rural people’s livelihoods in an impartial and justifiable manner, both socially and environmentally, through better access to assets (natural, physical, human, technological and social capital), services and control over productive capital (Gangopadhyay et al., 2008). A rural livelihood is “the capabilities, assets and activities that rural people require for a means of living” (FAO, 2003). It is considered sustainable “when it can cope with and recover from stresses, shocks, and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base”. Sustainable Agriculture may be defined as any management system which protects the environment by holding soil erosion to tolerable limits, by keeping pollutants out of surface and groundwater, and by employing pest control strategies that are not harmful to natural systems, farmers, their neighbours and consumers. Poverty reduction, economic growth, nutritional and food security can be sustained only if natural resources are managed on sustainable basis. Most definitions agree that, to be sustainable, agriculture must be ecologically thorough, economically worthwhile and socially accountable. There is a need to add one more dimension to it, by extending its importance in producer’s income. This postulates a multidimensional approach and a systemic exploration conceiving not only single factors but also complex functions and processes with various interactions between elements and sub systems, as well as mutual dependencies.

Even though such strong theoretical back ground is present, there are many questions need to be answered by “Sustainable Rural Livelihood Development” concept like “How can we make farming more lucrative and more justifiable in our generation? How can India direct more of its economic growth towards rural development and eradicating widespread poverty and malnutrition? How can the double poverty trap of small farms with poor income be overcome? How can agriculture become an attractive entrepreneurial undertaking, reducing drudgery, reducing unemployment, and getting people- women and youth in particular-decent and fulfilling work? How can we ensure that investments are motivated by facts and priority needs rather than political interests? What could be new, more effective models for agricultural extension? What should be the future investment models for agricultural research and development? In order to answer these questions, sustainable rural livelihood and agriculture should not be seen as a set of practices to be fixed in time and space, but must consist of its ability to pass muddle through changes. Given the huge diversity of agriculture in India and of the starting points for change-there can be no one-size-fits-all solutions. We should follow the most suitable pathways and timelines for addressing our specific challenges through tailored sustainable rural livelihood and agricultural solutions, policies, monitoring and other implementation mechanisms. Solutions should be of workable options that can be tailored to raising system productivity or diversity, efficiency, resilience, value and profitability of farming.

2. Technological perspective towards sustainable rural livelihood

For years, scientific and technological advancements have benefited farmers in the industrialized world by driving agriculture production. However, smallholder farmers who are responsible for 90 per cent of the food in the developing world have yet to see similar gains (IFAD, 2011). These farmers, the majority of whom are women, lack access to many of the tools needed to be successful, such as modern irrigation practices, crop management products, fertilizers, postharvest loss solutions, improved seeds, mobile technology, as well as access to
information and extension services. In Indian agriculture the enormous pressure to produce more food from less land with shrinking natural resources is a tough task for the farmers. Not only this but also the other challenges like unavailability of quality seed, increased fertilizer consumption, irrigation problems, etc. are present in technological perspectives of sustainable agriculture. For broad-based and inclusive development of the agriculture sector, there are three strategy options: (i) extensive farming - bringing more area under farming; (ii) intensive agriculture-increasing use of inputs such as land, labour, fertilizers, irrigation, etc., and (iii) technological change. However, the first two approaches are agro-economically and ecologically unsustainable in the long run. The only sustainable strategy for growth in agriculture is continuous technological change, which shifts the production function upwards. Sustainable agricultural science and technology mainly refers to highly productive, high quality, efficient and resource-saving (water, energy and fodder) techniques and expertise for agricultural production. Technology, in the classical sense, includes the development and use of nutrients, pest control products, crop cultivars, and farm equipment; but it also includes the vision of genetically modified crops providing greater nutritional efficiency (more calories per yield, or more yield), manipulation of natural pest control agents, and use of farm management techniques that focus on whole-farm productivity over time, not just annual production per hectare. To a large extent, the rate of technology development and the degree of innovation in future technologies will greatly influence the stability, and certainly the productivity, of agriculture (Hutchins and Gehring, 1993). In order to implement this approach, the following strategies should be focused.

2.1 Revamping agricultural research

Promoting new location specific technologies and reforming agricultural research is one of the most important needs for agricultural growth. Restructuring of the existing research and development institutions to make them demand driven and more responsive to the needs of users like farmers and industry, and active involvement of small farmers, particularly in post-harvest activities including storage, food processing, and marketing may address the problems of post-harvest losses. Empowering today’s youth is greatest responsibility of agricultural education. Providing a platform to create professional and business oriented farming systems for youth will be very important for sustainable development and continuation of agriculture in coming generations also. Further the role of highly educated and skilled youth will be quite useful in managing the knowledge intensive farming systems. Capacity building of youth population through advanced trainings will further empower them to go for creating input-output supply chains for primary and secondary agriculture. The only possibility of retaining youth in agriculture is through developing micro-business models in farming as it offers scope for regular sustained income (ICAR, 2013). ARYA (Attracting and Retaining Youth in Agriculture), and Student READY are the two innovative educational programmes by The Indian Council of Agricultural Research (ICAR) to provide training to farm youth on innovative and sustainable agricultural practices to help make agriculture a profitable venture. This would involve a series of activities, including exploring opportunities in secondary agricultural operations such as value addition of crops, hiring, and servicing of mechanized farm implements and also incorporating entrepreneur ability (ICAR, 2012).

2.2 Output revolution

Way to achieve the maximum yield and production changed year over year. It began with the decision to adopt superior yielding, disease resistant wheat varieties in combination with better farming knowledge (in early 50’s and 60’s) to improve productivity followed by evolution of a production pattern in line with the demand pattern leading to a shift in emphasis to other agricultural commodities like oilseed, fruit and vegetables (in 80’s) and now reaching to the sustainable technologies for inclusive growth. Output revolution as yield and productivity improvement will be possible only if greater attention is paid to improving the efficiency of input use, particularly quality seeds, nutrients and water. To bridge the gaps between actual and
potential yields, there is a need to understand the potential yields prevailing at the currently available levels of technology in different regions and farming systems. The lasting benefits of improved seeds and improved farming technologies now largely depend on whether India develops infrastructure such as irrigation network, flood control systems, reliable electricity production capacity, all season rural and urban highways, cold storage to prevent food spoilage, modern retail, and competitive buyers of produce from the Indian farmer.

2.3 Improving Water Resources and Irrigation/Drainage Management

Agriculture is India’s largest user of water. As urban and other demands multiply, less water is likely to be available for irrigation. Climate change and the hydrological variability of water’s distribution and occurrence are natural driving forces that, when combined with the pressures from economic growth and major population change, make the sustainable development of our water resources a challenge. However, increasing competition for water between industry, domestic use and agriculture has highlighted the need to plan and manage water on a river basin and multi-sectorial basis. We have reached a reasonable level of knowledge towards recognizing impacts on water quality and quantity from pollution and excessive groundwater and surface water withdrawals. The focus must now be on reducing these impacts. Ways to radically enhance the productivity of irrigation by making judicious use of water (“per drop more crop”) need to be found. Worldwide farmers are using innovative practices to utilize water more efficiently and in lesser quantities to produce more nutritious foods. Prevention strategies and new technologies that augment existing natural water resources, reduce demand, and achieve higher efficiency are part of the response to meet today’s increasing demands on our available water resources. Piped conveyance, better on-farm management of water, and use of more efficient delivery mechanisms such as drip irrigation are among the actions that could be taken.

2.4 Facilitating agricultural diversification to higher-value commodities

Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The sector encompasses a wide range of crops namely fruit crops, vegetables crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices, and plantation crops. New introductions such as mushroom, bamboo, and bee keeping (for improving the crop productivity) have further expanded the scope of diversification in agriculture (Planning Commission, 2013). Encouraging farmers to diversify for higher value commodities will be a significant factor for higher agricultural growth, particularly in rain-fed areas. Moreover, considerable potential exists for expanding agro-processing and building competitive value chains from producers to urban centres and export markets in India. If carried out appropriately, diversification can be used as a tool to augment farm income, generate employment, alleviate poverty and conserve precious soil and water resources (Bhattacharyya, 2008). It also provides ample opportunities for sustaining large number of agro-industries which generate substantial employment opportunities. While diversification inventiveness should be left to farmers and entrepreneurs, the Government can, first and foremost, slacken constraints to marketing, transport, export and processing.

2.5 Ensuring zero hunger and zero wastage through value addition of crop produces

Against backdrop of rising food demand, 12.5 per cent of the world’s population (868 million people) are chronically under-nourished, equating to one in eight people worldwide fall outside of the food security regime (Naylor 2011, FAO 2013). Farm output has been setting new records in recent years in India. But a high proportion of the food that India produces never reaches consumers and near about food worth $8.3 billion, or nearly 40% of the total value of annual production, is wasted. Nearly 30 per cent of the wastage is by this way only. India is also contributing to this by wasting food in social gathering and functions (Sharma et al. 2013). There are several reasons why so much food is lost, including the absence of modern food distribution
chains, too few cold-storage centres and refrigerated trucks, poor transportation facilities, erratic electricity supply, and the lack of incentives to invest in the sector (Biswas, 2014). The livelihoods of most smallholder farmers are often restrained by poor access to markets and limited entrepreneurial skills for adding value to the products. Due to the busy and tight schedule of work, food preference of the people also changed to a greater extent than in past time. Now a day’s people are more quality conscious and prefer to eat ready to mix/ ready to cook type of products. When incomes rise, consumers tend to buy a wider variety of unique food products that are highly processed and highly advertised and are less price elastic than the traditional foods they replace. Consumers also increasingly rely on brand or company reputations as quality guides. Whoever is able to capture the changing market for food demand is going to be money maker in coming days. Producers’ greatest opportunities may lie in activities that add value to their products and move their point of first sale downstream toward consumers. Adding value to bulk raw commodities is one way for producers to keep a larger share of the margins associated with further processing and market development. Technologies have the power to turn farming as a real business, now farmers need to take initiative in every process, with the utilization of available support system. This saves the farmer money and it cuts out mediators who tend to buy low from farmers and sell high to end consumers.

2.6 Creating Skill India

Growing the pool of skilled people is a key priority. This entirely depends upon access to quality education. Here comes the role of extension institutions like KVK, State Agricultural Universities etc. In India majority of the education system and institutions are giving knowledge and information but not any skill. The education system present in India is creating the job seekers not the job creators. There is an urgent need to reform the education system in India with more emphasis on the farmer friendly vocational education for creating skill India.

2.7 Climate resilient agriculture through mitigation technologies

Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of the huge population dependent on agriculture, excessive pressure on natural resources and poor coping mechanisms. The warming trend in India over the past 100 years has indicated on increase of 0.60°C. Planned adaptation is essential to increase the resilience of agricultural production to climate change. Several improved agricultural practices evolved over time for diverse agro-ecological regions in India have potential to enhance climate change adaptation, if deployed prudently. Some practices that help adapt to climate change in Indian agriculture are soil organic carbon build up, in-situ moisture conservation, residue incorporation instead of burning, water harvesting and recycling for supplemental irrigation, growing drought and flood tolerant varieties, water saving technologies, location specific agronomic and nutrient management, improved livestock feed and feeding methods (ICAR, 2008). Some important Climate Ready crop verities developed by IARI are Puas Gautami, Pusa Amulya and Pusa Basant in wheat and Pusa Basmati 1509, Jaldi Dhan-13, Pusa Sugandh-2 and Pusa Basmath 1121 in rice (Hema et al., 2014).

The recent revolutions in production technologies like biotechnology and genetics, and in information and communication technologies, radically change the conceptual framework of managing agricultural production systems. Through these tools and much greater investment in agriculture, we can move toward more sustainably curbing global hunger and malnutrition around the world. This will lead to dramatic increase in productivity yields, conservation of food by substantially reducing post-harvest losses and improvement in nutritional content of the food. To keep up the thrust of growth, a cautious economic and utility evaluation of inputs like seeds, fertilizers, irrigation sources etc. are of substantial importance.
3. **Alternative institutional approaches to achieve sustainable rural livelihood**

Integrating the concept of sustainability into the institutional strategy and design of research and education programmes of agricultural and rural development is proving difficult because sustainability requires dealing with interactions between technology, society, and environment and therefore with multiple stakeholders. Institutional perspective for sustainable rural livelihood offers space for convergence and partnerships with a variety of stakeholders, by building an enabling environment for farmers to access their rights and entitlements, government schemes and innovations. Some of the innovative extension approaches addressing profitability and sustainability of production system are discussed here with.

3.1 **IARI- post office linkage extension model**

IARI- post office linkage extension model, initiated as an action research project is an innovative and alternative extension model for agricultural technology dissemination to reach the unreached in far flung areas. It can be explained as the synthesis of communication, adoption and pluralistic models of agricultural extension. It also pinpoints how the main extension systems of the country have rearranged its structure and function for making their communication effective with farmer with the help of rural post offices of the country (Yojana, 2014). Since 90 per cent of the post offices in the country are rural post offices and the branch post masters of these rural post offices are mostly resident of the same area and they also undertake farming. The branch post masters also can help to disseminate the quality seeds among farmers and helps in the technology transfer by participating in building a demonstration plot in the village. The project was implemented in the Sitapur district of Uttar Pradesh, on pilot basis. In this project, the seeds of high yielding varieties of the Institute were distributed to the farmers through village Postmen and the farmers of remote areas were highly benefited as they got good seed at their doorstep. Starting from 2009 to till 2013 a total of 1921 farmers from 181 remote villages under 18 post offices in five states of India namely Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Jammu and Kashmir were reached by this prestigious project(Dubey et al. 2014). Eight major improved wheat varieties, nine popular rice varieties (both basmati and non-basmati) and other popular high yielding varieties like Pusa Jaikisan, Pusa Bold of Mustard, Pusa 383, Pusa 443 of Bajra, Pusa Naveen of Bottlegourd, Pusa Viswas of Pumpkin, were disseminated. Based on the increased demand of farmers for technologies other than seeds, it has been started to disseminate the BGA and Pusa Hydrogel among the needy farmers. This project resulted in increase of 11-31 per cent of yield due to the replacement of conventional varieties with IARI varieties with an increased rate of 80 per cent from mere 5 per cent in project operational areas. Vast increase in adoption rate of IARI varieties was also noticed through horizontal spread among the neighbouring villages. Capacity building of post masters and beneficiary farmers was also identified as one of the major achievement of IARI-Post office linkage model.

3.2 **Collective farming and marketing**

The biggest challenges for Indian agriculture are the decreasing size of land holdings and reducing share of consumer in farmer’s income due to large number of middle men, which can potentially make the profession impracticable in future. Our acreage has remained at 140 million hectares since 40 years but the number of farmers has increased from 7 crore to 14 crore due to population explosion. We are adding one crore farmers every five years. With smaller land at disposal, there is a decrease in farmer’s capacity to invest in land. With average land holding halved, the cost of getting inputs and time consumed has doubled. With the number of people tilling the same land doubled, the bank’s cost of financing has doubled and providing extension services has become difficult. If these are not tackled now, it will be difficult to maintain agriculture as a feasible profession (The economic times, 2013). Collectivization of producers, especially small and marginal farmers, into producer organisations has emerged as one of the most effective pathways to address the many of the above mentioned challenges of agriculture through mobilization and increasing the bargaining power of the farmers. The year 2014 is being
observed as the “Year of Farmer Producer Organisations (FPO)” by the Government of India which shows the importance of this approach on sustainable development of Indian agriculture. The growth of agriculture especially horticulture in Maharashtra and Karnataka is contributed by large number of Farmer Producer Organizations like Maha Grapes, Maha Mango, MahaAnaretc., Lahore potato growers association, Farm's Produce Promotion Society (FAPRO) in Hoshiarpur are other leading examples. In this challenging scenario of sustainable rural livelihood for smallholders, producer organizations are essential to achieve competitiveness and ultimately improve their welfare.

3.3 Improving public and private sector linkages

Over the past 60 years, Indian agriculture has recorded an average growth rate of 2.7% per year, making it the slowest growing sector. That we have not yet succeeded in consistently touching 4% growth as targeted in the recent Five-Year Plans indicates the challenges we face in agriculture. Provision of public services and infrastructure has traditionally been the exclusive domain of the government. However, with increasing population pressures, urbanisation and other developmental trends, government’s ability to adequately address the public needs through traditional means has been severely constrained. The level of public investment is crucial for long term sustainable growth of the sector. But unfortunately there was a decline in the public investment in agriculture. From the total investment since 2004-05, majority of the investment in agriculture was made by private sector. The total investment by public sector has declined from Rs 21.27 crore in 2004-05 to Rs 15.11 crore in 2010-11. Unlike, the public investment, the private investment is following a rising trend, as it increased from Rs 78.73 crore in 2004-05 to Rs 84.89 crore in 2010-11 (CSO, 2012). This lead to an urgent need to work together to bring innovations via partnerships between the private and public sector, farmers and government to meet India’s agriculture needs through new technology and intervention models (GOI, 2010). Public Private Partnerships (PPPs) have been recognized as one of the most effective mechanisms to ignite the economic development of India. Private sector has the potential to play an effective role in this by participating in the process of infrastructure creation and bringing about economies of scale in technology development, production and agricultural marketing in the country. Since agriculture is a risky business, there is a need to understand the perception of farmers about the private sector involvement and the private sector about the issues in agriculture, so that appropriate public policies could be framed to help both the farmers and the private players overcome their difficulties and attract them to invest in the sector.

3.4 Scaling up of farmer led innovations

Agricultural development is innovation driven, hence innovations that ultimately makes the difference is what farmers decide to do. During the course of earning livelihood from farming, numerous innovations, which brought good returns, recognition and made farming a sustainable practice, have been generated by the farmers. The outcome of this process is farmer innovations, for example, farming techniques or ways of organising work that are new for that particular locality. Farmer led innovation in agriculture is the process through which individuals or groups within a given locality discover or develop and apply improved ways of managing the available resources, building on and expanding the boundaries of their indigenous knowledge. According to Prolinnova (2004) and the World Bank (2004), local (farmer) innovation refers to the dynamics of indigenous knowledge i.e., knowledge that grows within a social group, incorporating learning from own experience over generations, but also external knowledge internalized within the local ways of thinking and doing. The lift irrigation system, the pitcher irrigation and khad in cultivation in Thar Desert are some examples of such innovations. Over the years, farmers also selected several varieties that had higher productivity and better quality. Farmers have also developed new and low cost technologies to preserve, process and package various farm products both for increased shelf life and better market opportunities. Despite these, such farmer-led innovations have received little attention and recognition, which they deserve. Also the propriety rights on
the innovations made by the farmers have often been ignored. In order to promote development of farmers led skills as well as protect their rights, it is necessary that extension system recognize and further promote these innovations. It is also desirable to blend the existing traditional wisdom with the modern scientific knowledge for ensuring sustainable agriculture. The concept of farmer innovation is applied to agriculture technology processes that aim to improve rural livelihoods for sustainable development while ensuring inter-institutional and farmer learning.

3.5 Convergence and synergies among activities of different agencies

Trends like market development, democratization and communication revolution drive farmers to obtain agricultural information through a wider range of means and from a wider range of sources. For farmers various communication channels exist like public, private, input dealers and corporate people. Among the above said agencies, public extension services is just one source of information, often purely focusing on production issues (Spielman et al., 2011). Actual need for the present day sustainable rural livelihood and agriculture is a Beyond Production Extension approach, with a synergetic and pluralistic action of all services providers. Pluralistic extension recognizes the inherent diversity of farmers and farming systems and the need to address challenges in rural development with different services and approaches starting from planting to final stage of money earning. It is characterized by the co-existence of multiple public, private, and mixed extension systems and approaches; multiple providers and types of services; diverse funding streams; and multiple sources of information- all of which benefit from some degree of coordination and regulation that facilitates interaction and learning. Ideally, the outcome of pluralistic extension services is that different client groups in different contexts are satisfied with their access to services that they have demanded.

3.6 Agri tourism- An innovative income enhancing approach to rural livelihood

More than a profession or a business, agriculture is India’s culture. Hence, adding additional income generating activities to existing agriculture would certainly increase contribution of agriculture in the national GDP. Agri-tourism is one such activity for employment generation, poverty alleviation and sustainable human development in rural areas. Present concept of travel and tourism is limited to urban and rich class which constitute only small portion of the population. However, the concept of Agri-tourism takes travel and tourism to the larger population, widening the scope of tourism due to its cost effectiveness. The urban population always has curiosity about sources of food, plants, animals, raw materials like wood, handicrafts, languages, culture, tradition, dresses and lifestyle. Agri-tourism which revolves around the farmers, villages and agriculture has the capacity to satisfy the curiosity of this segment of population. Agri-tourism provides scope for re-discouring the rural life which is rich in diversity. Agri-tourism could create awareness about rural life and knowledge about agriculture science among urban school children. It provides opportunity for hands on experience for urban college students in Agriculture. It is a means for providing training to future farmers. It would be effectively used as educational and training tool to train agriculture and line department officers.

4. Way ahead for Agricultural Extension Sustainable Rural livelihood

- There is a rising need to develop competency among extension professionals to make use of the innovative approaches and best practices of extension and also to operate in pluralistic extension system through win-win arrangement with other partners like private agencies, input firms, civil organizations, corporate, etc. Competency building among the extension person can be achieved by providing proper and time based training on analytical understanding and facilitating assimilation of innovative approaches and models of extension.

- Extension system needed to be change in different ways like establishing single window delivery system and creating ‘one-stop shops’ to provide all relevant information need to farming community.
Farmers’ innovation has always been happening but quite slowly and has seldom been recognized by communities itself and the scientist also. It so, because of the key actors in innovation process are not working closely with each other. The innovation process at farmers could be speeded up giving opportunity to bring in their ideas and skills. The capacities and potential contributions the farmers must be valued. Recognizing the innovativeness of farmers creates fertile ground for their collaboration with other actors in innovation systems.

The farmer-led innovations could be encouraged in several ways as creating access to resources for innovative farmers, accommodating the idea of farmer innovations in agricultural research system, offering alternatives to compare with current practices or local innovations, and facilitating mutual learning. There is a need to sensitize the farmers and extensional workers with the various methods for dissemination and institutionalization for up-scaling of farmer-led innovations.

Agriculture in a climate change context requires a multi-sectoral and multi-agency approach. Government policies, and the various departments and development agencies need to synchronise their efforts towards achieving sustainable agriculture productivity and food and nutrition security, particularly for the small and marginal farmer. Institutional interventions must promote collective action and build resilience among communities for mitigating ill effects of climate change.

Reduction of waste of agriculture produce at all stages from farm to plate is essential, especially during the post-harvest stage. Decentralising the storage facilities and improving storage possibilities along with localised value addition to perishable goods is essential.

Agri-tourism is a livelihoods strategy that brings together two traditionally distinct sectors to create new opportunities, which have implications for advisory service providers. It is a diversification strategy, in which both household economic survival and the conservation of agricultural land become equally important. In order to widespread the importance of agri-tourism among the potential farmers there is a need for specialised and dedicated extension or advisory services. They may provide information and data bank regarding potential areas along with training. Agri-tourism will require new skills in farm family self-assessment, entrepreneurship and business planning, marketing, promotion, visitor risk assessment and a range of other skills linked to the tourism industry.

Efforts are also needed to create strong research-extension-farm linkages. For this purpose, there must be promotion of farmers’ organization groups. Thus, a complementary state cooperative strategy may play a key role to improve agricultural production and productivity.

The rural non-farm economic sector comprises of wide ranging activities which are directly or indirectly associated to and supporting to various agricultural and non-agricultural related economic activities, excluding activities related to the agricultural production, performed in rural areas need to be more emphasised. The activities related to animal husbandry, fishing and hunting, forestry and logging form the part of agriculture sector, are commonly included in non-farm sector.

5. Conclusion

The process of sustainable rural livelihood development does not and must not happen overnight. The redesigning of complex production systems requires a series of small, very well planned and realistic steps. Researchers need to work hand in hand with communities to test tools and approaches that help combat these dual threats to food and farming. The story of a ‘second Green Revolution’ can only become reality if sustainable and inclusive agricultural development is promoted.
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Session 1

Futuristic Agricultural Extension Models and Approaches
Agricultural Extension Education: Evolution and Future Perspectives

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1. Prologue

Agricultural extension work as identified by Johns and Garforth (2009) has a venerable history though, largely unrecorded. Albeit, it has been largely recognized as the significant social innovation which is an important force in agricultural change and has undergone the process of creation and recreation, adaptation and thus had been developed over the decades and centuries. As evident in several records, the evolution of agricultural extension related works extends over nearly four thousand years, although its modern forms are largely a product of the past two centuries. Today, the organizations, institutions and personnel facilitating the agricultural extension process encompass a diverse range of socially conformed and legitimate activities which seek to enlarge and improve the abilities of farm people to decide and adapt more appropriately and make full use of the often new practices and technologies. The paper attempts to look into the past and perspectives of extension and extension education round the globe including India, the modern initiatives for agricultural extension have been discussed, the core issues and circumstances compelling for seeking the alternatives for future extension endeavours have been probed through the synthesis of available literature and documented evidences of researchers and scholars across the globe and India.

2. The terms “extension” and “extension education”

The use of the word “extension” derives from an educational development in England during the second half of the nineteenth century. Around 1850, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve the educational needs, near to their homes, of the rapidly growing populations in the industrial, urban area. It was not until 1867 that a first practical attempt was made in what was designated “university extension,” but the activity developed quickly to become a well-established movement before the end of the century. Initially, most of the lectures given were on literary and social topics, but by the 1890s agricultural subjects were being covered by peripatetic lecturers in rural areas (Jones, 1994). The growth and success of this work in Britain influenced the initiation of similar activity elsewhere, especially in the United States. There, in many states, comparable out-of-college lectures were becoming established by the 1890s (True, 1900, 1928). During the first two decades of this century, the extramural work of the land-grant colleges, concerned with serving the needs of farm families, was to expand dramatically and become formally organized; but the use of the term “extension” continued and has persisted as the designation for the work.

The overt use of the notion of “extending” relevant and useful information to the adult population at large, however, predates the university extension movement. Earlier in the nineteenth century, a British politician, Lord Henry Brougham, an influential advocate of formal education for the poor and of mass adult education, founded the Society for the Diffusion of Useful Knowledge in 1826. Its objective was “impacting useful information to all classes of the community, particularly to such as are unable to avail themselves of experienced teachers, or may prefer learning by themselves.” The society sought to do this largely through producing low-priced publications and establishing local committees throughout the country “for extending the object of the Society” (Society for the Diffusion of Useful Knowledge, 1827). During its twenty
years’ existence, agricultural topics were well covered in the society’s publications. Similar, albeit short-lived, societies were also established before 1840 in several other European countries, India, China, Malaysia, and the United States (in Virginia) (Grobel, 1933; Smith, 1972).

3. Farm advisory services: the distant origins

The dissemination of farm related information and advices to the actual practitioners has a long history prior to the emergence of modern forms of agricultural extension in the nineteenth century. The first ever documented example was in Mesopotamia (roughly, present-day Iraq) around 1800 B.C. Archaeologists have unearthed clay tablets of that time on which were inscribed advice on watering crops and getting rid of rats - important for mitigating any potential loss of taxation revenue from farmers (Ahmed, 1982, as quoted in BneSaad, 1990). Some hieroglyphs on Egyptian columns also gave advice on avoiding crop damage and loss of life from the Nile’s floods. An important advance was the beginning of agricultural writings. Though few have survived, the earliest were written during the ancient Greek and Phoenician civilizations, but some of them were adapted by Roman writers. From the second century B.C. to the fourth century A.D., several important Latin texts were written, frequently drawing on practical farming experience, which aimed to help Roman landowners to maintain and improve then-estates and their revenues (White, 1970, 1977). Around the same period in imperial China, early forms of advancing and disseminating agricultural information also began during Han Dynasty (25-220 A.D.), Sung and Yuan Dynasties (960-1368), Ming (1368-1644) and Chi’ling (1644-1912) Dynasties as reported by Perkins (1969), Elvin, (1973), Bray (1984) and Delman (1991).

4. Inception of modern era of extension

The earliest known renaissance agricultural text was written in Latin by Pietro de Crescenzi in 1304 and was translated into Italian and French. This became the first book on agriculture to be printed in the mid-fifteenth century. Others soon followed, often based on the old Latin texts or on the collected wisdom of farmers and their families. A well-known example, a compendium of helpful advice in simple verse and a bestseller in Tudor England, was Thomas Tusser’s A hundredth good pointes of husbandrie, published in 1557 and expanded in 1573 to five hundred good points with as many on “goodehousewiferie” (Tusser, 1580). Less popular, but of greater significance, were Francis Bacon’s writings early in the next century based on his observations and scientific experiments on his estate north of London - the beginnings of the application of science and scientific method to agriculture (Russell, 1966).

Two main forces underlay the movement mid-eighteenth century throughout the Europe. First, many landowners were eager to learn of ways to improve their estates and the production capabilities of their tenants so as to increase the value of their estates and their rental incomes. Secondly, progress was being made towards modern science and its application to agriculture, especially in agricultural chemistry and plant physiology (Russell, 1966). It was considered almost a duty by their elite membership to make their initiatives and activities known to “the generality” of farmers through publishing their proceedings and reporting their meetings in newspapers (Hudson, 1972). Although such agricultural societies initially spread slowly - the first had been formed at Rezzato near Milan in 1548 (Coletti, 1900) - they had become common throughout much of Europe by 1800, and a small number had been established by that year in the young United States and eastern Canada.

The first examples of itinerant agricultural lecturers-cum-instructors were in parts of New England and New York in the 1820s (True, 1928) and in France, where a first migratory agricultural teacher was appointed in the Gironde in 1837, followed by nine more in various areas of the country in succeeding years (Boulet n.d.). During the 1840s, further sporadic developments also occurred in the United States, particularly in New York, Ohio, and Maryland (True, 1928), while in Württemberg, in southwest Germany, a pasture specialist (Wiesenbaumeister) together with a staff of eighteen technicians was employed by the state agricultural society to advise farmers, landowners, and town administrations on land drainage, irrigation, and improved pasture
management (CLVS, 1845). In Europe, agricultural science was evolving rapidly by the 1840s, with notable strides being made in Germany by Justus von Liebig at Giessen, and with the establishment of agricultural experiments at Rothamsted in England in 1843 by John Bennet Lawes and Henry Gilbert.

4.1 Evolution of systematic agricultural extension services

The first agricultural extension service of a modern kind came into existence as the result of a crisis and the initiative of the occupant of a high office of authority. The crisis was the outbreak of potato blight in Europe in 1845. In Ireland its effects were particularly severe because the predominantly peasant population relied on potatoes in their diet, and “the potato famine” persisted until 1851. The potato famine led to the system that was adopted in the kingdom of Bavaria in 1896, it was as an integral part of the state civil service; the extension workers were grandly titled Royal Agricultural Teachers (KöniglicheLandwirtschafts-lehrer) (Maier-Bode, 1910).

By the close of the nineteenth century, agricultural extension systems modelled to a considerable extent on the German Wanderlehrer had spread: to Denmark from 1870 onwards; to the Netherlands, where a few extension workers (wandelleraren) had been appointed by agricultural societies in the late 1840s and 1850s, but had then disappeared before being revived as a government system in the 1890s; to Italy, where the first itinerant agricultural teacher (cattedraambulante di agricoltura) was appointed in 1886 at Rovigo, near the estuary of the River Po, with many others following in the next decade and funded largely by public donations, the church, and the banks; to Switzerland; too much of the Austro-Hungarian Empire; and to Russia; France in 1879.

The growth of agricultural education and extension work in continental Europe was to have a strong impact on the emergence of comparable activity in the United Kingdom. An official commission on technical education in the early 1880s included a detailed review of the European developments (Jenkins, 1884).

Two major developments after 1850 were of more significance to the evolution of agricultural extension in the United States. First was the Morrill Act of 1862, signed by President Lincoln during the Civil War, which was seminal in the creation of state colleges “of agriculture and the mechanic arts” in the northern United States; its land-grant provisions enabled the states to establish and fund their colleges. Second was the beginning at about the same time of the farmers’ institute movement. These institutes organized one-or two-day (and later longer) meetings, which became popular after 1860, arranged by and for farmers. By the end of the last century, a system of agricultural extension work had become well established in a large part of North America. In the United States, the colleges and their leading professors, including several notable proponents of more practical extension work, progressively took over the initiation and organization of the activity. This culminated in 1914 with the passage of the Smith-Lever Act, establishing the Cooperative Extension Service - a tripartite cooperation of federal, state, and local county governments, with the state college as the extension agency - “in order to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same.”

Agricultural extension work had also started before 1900 in Japan. Following the Meiji Restoration in 1868, new administrative structures and various modernizing policies were adopted. Two agricultural colleges were established in the mid-1870s, staffed by Western (mainly European) teachers. At these colleges and government farms, experimental work was conducted and new practices were tested and developed.

A central department of agriculture was established in India after the 1866 Orissa famine, and the government of India soon after resolved to establish departments in each province. However, it was 1905 before a central government directive ordered every province to appoint a full time director of agriculture who should organize agricultural research and demonstration
farms with staff who could advise farmers (Mook, 1982). The first British colony to appoint a director of agriculture was Zanzibar in 1896. Of more significance, however, was the creation in 1898 of the Imperial Department of Agriculture for the West Indies, with headquarters in Barbados. Before 1914, such departments of agriculture had been created in several African and Southeast Asian territories, as well as in several Caribbean islands (Masefield, 1950). In Sri Lanka, a few agricultural instructors had been appointed about 1880 to work alongside government agents. When in 1904 the Ceylon Agricultural Society was formed to promote experimental work, it also began an agricultural extension service with the objective of reaching native cultivators (Arasasingham, 1981). Along with school gardens (Willis, 1922), the extension workers were considered an effective way of demonstrating improved cultivation practices to villagers. Similar developments also occurred in the Caribbean.

In most tropical African territories, the European interaction with native agriculture was minimal before 1914. The “scramble for Africa” had been mainly in the late nineteenth century, and the young departments of agriculture, where they existed, were largely involved in administrative duties. Before 1914, however, agricultural instruction was given in most government-assisted schools and at four agricultural stations in Ghana (the Gold Coast) (Lucas, 1913). In addition, missionaries often undertook agricultural education, with demonstration and improvement activities, alongside their religious work. The church farms (fermes-chapelles) begun in 1895 by Jesuits in the then Belgian Congo (de Failly, 1970) were copied by missionaries of other persuasions in many other areas.

5. Agricultural extension systems in India: public sector initiatives

Extension services in India have traditionally been funded and delivered by government. Organised attempts in this direction started after the country became independent in 1947. Pre-Independence efforts had been largely local attempts, driven mainly by the humanitarian essays of a few individuals and organisations. These were area-specific and had limited impact. Independent India acknowledged the relevance of extension quite early, a decade earlier than organized attempts to strengthen agricultural research were initiated in the country. External aid for agricultural development emphasized extension in the 1950s. Community Development Approach was put into action and two important programmes, the Community Development (CD) and the National Extension Service (NES) were clear examples of the Govt. of India’s commitment to provide a number of services in such areas as agriculture, health, animal husbandry, etc. to all sections of society. With little progress on the agricultural front, the need to pay special attention to agriculture was realised, and since the 1960s many new programmes that aim to raise agricultural production have been initiated. Till the 1960s, agricultural extension was purely a function performed under the guidance of the State Departments of Agriculture (DoA). Extension was undertaken through Integrated Approach. A number of development programmes like IADP, IAAP etc., were launched. ICAR also initiated some programmes as the Lab-to-Land Programme and the Operational Research Programme that were merged with the KVKs in the 1990s. State Agricultural Universities (SAUs) initiated training programmes (for officials and farmers), demonstrations and exhibitions, and these were strengthened with the establishment of the Directorate of Extension in each SAU for University based Extension Education Approach. Organisations created for the promotion of specific commodities (Commodity based Extension Approach) and specific are as (Command Area Development Authorities) also initiated extension activities. Extension was treated essentially as a public good, and with only the public sector involved with technology development and transfer, the focus was on spreading the reach of extension to all parts of the country through more extension staff and a large number of programmes (Birner et al., 2007). The 1980s saw most of the States embracing the World Bank-funded Training and Visit (T&V) system. It improved the funding and manpower intensity of extension and introduced a unified command system of extension. The T&V system that largely ignored the agro-climatic and socio-economic diversity of the country produced mixed results. A review of evaluation studies of the T&V system revealed its impressive
gains (in terms of productivity) in irrigated areas and its failure to make impact in the majority of the rainfed areas. The need for a proper analysis of institutional and socioeconomic factors in rainfed areas, and the importance of social science skills in making relevant interventions was also highlighted by Farrington et al., 1998. Since the 1980s, more and more NGOs, agro-input industries, and agro-processors have also become involved in agricultural extension activities. Now farmers’ associations and producers’ cooperatives are also involved in extension services for selected crops and commodities. A large number of extension services are being provided by input agencies, especially fertilizer companies. With increase in rural literacy, the newspapers are devoting more space to reports related to the use of agricultural technology. With external support drying up, many States found T&V unaffordable, and the 1990s saw them experimenting with the provisions of extension services. These experiments included decentralisation (extension planning and control under elected bodies at the district/block level), contracting NGOs for some extension activities, the adoption of group approaches (instead of the earlier individual approach), the use of para-extension workers (as substitutes for DoA field extension workers, and the setting up of multi-disciplinary SAU teams at the district level. Another trend has been the formation of specific organisations (which are less bureaucratic, more flexible, and have wider expertise) to implement special programmes related to agricultural development. This has been a reflection of the increasing inability of line departments to deliver results because of their strictly enforced hierarchies, inappropriate reward structures, lack of accountability, and limited expertise.

5.1 Agricultural extension in India- the next step

The arrangements for agricultural extension in India have grown, over the last five decades, in terms of activities, organizational types and available manpower. Public sector extension, represented mainly by the State Department of Agriculture (DoA), continues to be the most important source of information for the majority of farmers. Activities of other extension agencies, be it Non-Governmental Organizations (NGOs), input agencies, mass media, research institutions or farmers associations, though increasing, are still restricted to certain regions, crops and enterprises. The performance of public sector extension is under scrutiny for quite some time and questions are being raised on its capability to deliver goods in the rapidly changing environment. The major changes in agriculture, that have a bearing on the priorities and performance of agricultural extension are identified by Silaiman and Van den ban (2000) are as follows:

**Shrinking resource base:** The land and water resource base for an average farm holding has declined considerably during the last five decades (Selvarajan and Joshi, 2000. Socio-economic Policies in Natural Resource Management, Souvenir, International Conference on Managing Natural Resource for Sustainable Agricultural Production in the 21st Century, New Delhi.). Most of the future agricultural growth will have to come via yield enhancement, (that means more intensive but more appropriate and scientific use of natural resources) and from rainfed areas, wherein most of the technologies are knowledge based and need community action. Forming and sustaining farmers’ groups will be crucial in achieving future agricultural growth.

**Changes in demand and consumption pattern:** Per capita cereal consumption for food declined somewhat over the past three decades, while the consumption of fruits, vegetables, meat, fish, eggs and dairy products increased (Kumar, 1998) Food Demand and Supply Projections for India, Agricultural Economics, Policy Paper 98-01, Indian Agricultural Research Institute, New Delhi). The demand for livestock products has been increasing rapidly during the last two decades. Increasing per capita income and changing lifestyles are expected to further increase the demand for milk, fruits and vegetables. Rapid growth in livestock demand would push demand for cereals for livestock feed. Assuming a modest growth in per capita income of 2 percent, the total cereal demand in 2020 is projected at 257.3 million tons, a modest 70% increase over 1993 demand (Bhalla et al., 1999) Prospects for India’s Cereal Supply and Demand to 2020, Food, Agriculture

**Changing farming systems:** The area under food grains as percentage of gross cropped area has been declining in the Nineties, whereas the percentage share of non-food grains has been generally increasing during the same period. Area under horticultural crops (fruits, vegetables and tuber, spices and plantation crops) increased from 12.3 m.ha in 1991-92 to 15.0 m.ha in 1996-97. Farmers require a different type of support (training, problem-solving consultancy, marketing advice etc) for growing many of these crops, than simply information on technology, as was the case earlier.

**Declining public investments in agriculture:** Public investments in agriculture, (investments in irrigation, rural roads, rural electrification, storage, marketing, agricultural research and education, land development, co-operation etc) in real terms since mid-seventies have been declining consistently in all the states (Ramesh Chand, 1999) Emerging trends and Regional Variations in Agricultural Investments and their implications for Growth and Equity. Draft Project Report, NCAP, New Delhi). Farmers have to join together to put pressure on governments to invest more and have to pool together their resources to develop and maintain the necessary infrastructure. Extension may have to support farmers in this endeavour. The increasing pressure on research funds to find technological solutions to more diverse problems necessitates serious efforts in research prioritization and targetted technology development. Extension need to assist and direct researchers in problem focussing and evaluating technological options.

**International developments:** Liberalization of agricultural trade, consequent to the WTO agreements has resulted in new opportunities and threats to Indian agriculture. India is likely to gain in some crops, but consistent efforts for improving quality (to meet international standards) and increasing cost effectiveness (increasing productivity, achieving cost reduction) in these crops/products are essential to achieve these. Liberalization of agricultural imports, which would gain further momentum in the months to come, would subject our producers to competition from outside. There is an urgent need to increase the competitiveness of Indian agro-products.

6. **The future**

Some of the most promising recent developments in extension methodology have occurred where the key agenda is environmental or is concerned with equity, for example in the need for the joint management of forests by professionals and local forest users and in integrated pest management. A consistent theme running through the innovative approaches being used, such as participatory rural appraisal (Chambers, 1993), is a fundamental change in what are the respective roles of extension agent and clients. The agent is no longer seen as the expert who has all the useful information and technical solutions; the clients’ own knowledge and ingenuity, individually and collectively, are recognized as a major resource; solutions to local problems are to be developed in partnership between agent and clients. Since the scale at which extension support is required is thus often larger than the individual farm, extension workers need new skills of negotiation, conflict resolution, and the nurturing of emerging community organizations (Garforth, 1993; Smith, 1994).

The future is also likely to witness a reversal of recent trends towards bureaucratization within hierarchical extension services and a reduction in their levels of public funding. Moreover, a rapid increase can be expected in the use of information technology in support of extension. The forces for change in these areas (see Rivera & Gustafson, 1991) will come from four main directions.

**Economic and Policy Climate:** With the collapse during the past decade of socialist forms of economic organization, the (dominant) role of the public sector in national economies has become questionable, with a strengthening trend to reduce levels of public spending. Thus government extension services and those which are largely publicly financed are, and will
continue to be, under pressure to become more efficient, to reduce their expenditure and staff, and to pass on (some of) the costs of provision to their clients who directly benefit financially. This is particularly the case in countries where the farm population forms a small minority and agricultural production is in surplus. The case is weaker, but not absent, in less developed countries where farming households form a high proportion of the total population and where increasing food production is still important. Thus charging clients for services is likely to become more widespread, while governments will find it attractive to contract out the operation of services to the private or the voluntary sector.

**Social Context in Rural Areas:** In the future, rural populations will undoubtedly be progressively better educated, while their exposure to the mass media will continue to reduce their isolation and detachment from information, ideas, and an awareness of their situation within a national and international context. However, this exposure will not reduce the need for extension. Rather, given the changing demands on agricultural producers from population growth, increasing urbanization, legislative changes, and market requirements, the more knowledgeable farming population will require different kinds of extension services. Social and economic trends within rural areas will therefore necessitate more highly trained, specialized, and technically competent workers, who also know where to obtain relevant information and problem solutions and various provision and organizational forms (Moris, 1991; Hayward, 1990) to replace monolithic government extension agencies. These agencies will need to recognize and serve different types of clients defined not in terms of “adopter categories” but of access to markets, degree of commercialization, and relative dependence on agriculture for family income and welfare.

**Systems Knowledge:** A recognition of the locale-specific nature of farming systems and the agricultural information systems which support them is an important source of the pressure towards the debureaucratization and devolution of extension services. This recognition also implies that extension workers and farmers be jointly involved in the verification and adaptation of new technology, and thus that the extension workers respect farmers as experimenters, developers, and adapters of technology and devote more energy on communication within their local areas. The devolution of extension services to become local organizations is a reasonable corollary of this. Developments in mass media technology, already apparent over a decade ago (Garforth, 1986), will continue to support this localization of extension effort.

**Information Technology:** The continuing rapid development of telecommunications and computer-based information technology (IT) is probably the biggest factor for change in extension, one which will facilitate and reinforce other changes. There are many possibilities for the potential applications of the technology in agricultural extension (FAO, 1993; Zijp, 1994). IT will bring new information services to rural areas over which farmers, as users, will have much greater control than over current information channels. Even if every farmer does not have a computer terminal, these could become readily available at local information resource centres, with computers carrying expert systems to help farmers to make decisions. However, it will not make extension workers redundant. Rather, they will be able to concentrate on tasks and services where human interaction is essential: in helping farmers individually and in small groups to diagnose problems, to interpret data, and to apply their meaning (Leeuwis, 1993).

The future will call for more able, more independent, more client-oriented extension workers. The emphasis will be on the quality of interaction between agent and client rather than on the movement of “messages” through a hierarchical system.

Flexibility and adaptability will be seen as virtues rather than aberrations. Paradoxically, these trends will bring us full circle to the early manifestations of modem extension in Europe. The itinerant agricultural teachers, unencumbered by large bureaucracies and tall hierarchies, will find their modem counterparts in the computer-carrying extension workers who are at ease helping farmers to identify the information they need in order to realize the potential of their farming
operates. Looking back, we can regard the period from 1970 to 1995 as a necessary but expensive stage in the evolution of extension systems, after which extension agents were able to settle down to their main task - bringing together the expertise of farmers and the best available scientific knowledge to develop farms and local agricultural economies. An extension organisation is a knowledge intensive organisation, which is involved in the production and dissemination of knowledge. Hence the success of this organisation depends to a large extent on knowledge “management.

**Future Extension Education Initiatives:** In the current scenario of changing agri-rural environment the role of extension education and technology delivery system is also changing. Broad based extension approaches are the need of the day. Harnessing advances in frontiers of science in selected priority areas with larger spin-off benefits by focusing on basic and strategic research also assumes significance. We need to search for alternatives to the present public agricultural extension system in the country. A paradigm shift from single discipline orientation to multi-disciplinary approach is critical for research in the discipline. Privatization, planning, monitoring, evaluation and assessment as core components of research management process should be encouraged. Due importance should be given to the discipline of Extension Education and intermittent changes in the curriculum need to be incorporated to enhance its applicability in NARS. The following emerging approaches as enunciated by Singh et al., 2009) include Extension Education Research, Production to Marketing, Collegiate participation of farmers, Web enabled technology dissemination, Developing Cases as Tool for Technology Dissemination, Agriculture as a profitable venture, Scaling up of group mobilization and Micro Enterprises Promotion.

### 7. Epilogue

Through their sheer numbers and outreach the public extension system would continue to play a prominent role in technology dissemination. The large section of small and marginal farmers and landless labourers would need to be serviced by the public extension systems. The other actors involved in the extension/ transfer of technologies such as NGOs, Farmers Organizations, Private Sector (both corporate & informal), para-workers etc. would actively complement/ supplement the efforts of the public extension agency and wherever possible replace it. Extension mechanisms will have to be driven by farmers’ needs, be location specific and address diversification demands. Technologies required to address total farming systems are knowledge intensive. Public extension system will need to be redefined with focus on knowledge-based technologies to upgrade and improve the skills of the farmers. Several of the institutional innovations that have come up in response to the weaknesses in public research and extension system, have given enough indications of the emergence of an agricultural innovation system in India. This has resulted in the blurring of the clearly demarcated institutional boundaries between research, extension, farmers, farmers groups, NGOs and private enterprises. Extension has to play a very important role of facilitating the nodes to generate access and transfer knowledge between different entities in the innovation system. It also has to create competent institutional modes to improve the overall performance of the innovation system. Inability to play this important role would marginalize extension further. As agricultural extension transforms itself into a more diversified farming systems approach from its present simplistic accent on yield enhancement by increasing some limited inputs, farmers will be required to adopt a wider range of inputs and practices and develop skills in their more efficient use. The task of extension will become more challenging in the wake of post WTO era, which demands a system of market led extension with specific focus on diversification, post harvest management and export orientation. This will present a more complex role, but simultaneously requiring a flexible approach allowing specific information to be customized for different farmer-groups. A strategy of institutional innovations in extension will be evolved which optimizes the strengths of the public-private sectors to service the needs of the farming community.
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Futuristic Agricultural Extension: Issues and Priorities

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1. Introduction

The extension system in the country has been facing ever increasing challenges and has been found demanding on several front. The diversity in farming situations being high, streamlining the extension system is a quite challenging task. However, various efforts and experimentations have been made to enhance the reach of the system to the farmers through a number of projects and programmes.

The early extension approaches were based upon the assumption of ‘farmers’ ignorance’ as the most important factor of non-adoptions of agricultural technologies. The extension policies in the 50s and 60s remained confined to teaching and educating the farmers. In 1970s and 80s, farm level constraints were given due consideration for explaining non-adoption. The major policies were mainly related to that of a system restricted to input supply for removal of such farm level constraints. The basic philosophy of these extension approaches was transfer of technology. By the early 1990’s it was understood that the extension system should begin to broad base its programmes. It should consider the farmers as not only the mere receptor but a partner in technology generation and its diffusion process. Of late, farming systems approach drew attention of the researchers, administrators and policy maker in 1990.

The present day agriculture is defined by stability, sustainability, diversification and commercialization. As long as the term commercialization of farming business is given due emphasis, there is definitely a greater need for following more participatory approaches in problem diagnosis, designing technological interventions, implementation, monitoring and evaluation for greater feedback to the system. The extension agent is no longer an expert who possesses all the useful information and technical solutions for farmers, rather may be considered as one among the facilitating partners in an agricultural information and technology management system.

The agricultural methods, processes, approaches and models of information and technology dissemination should therefore, lay due emphasis upon localized assessment and solution to problems in a partnership mode between farmers, scientists and extension agents, thoroughly utilizing the indigenous technical knowledge of the farmers and laboratory research expertise of the scientists. There is a growing need for pondering over internalization of technologies rather than their mere adoption. It can only be made possible when the technology has immense potential to address locally faced problems and challenges. The need for translating the laboratory based researches in the actual field situation is indispensable in the coming days for reducing the gap between technology generation and their transfer to the farmers’ fields.

2. The Past of Extension Services in India: At a Glance

India has a very rich past of Agricultural Extension Services which dates back to eighteenth century and were initiated by some philanthropists. Extension services in the pre-independence era mainly consisted of rural development programmes like Ganhian experiment in rural reconstruction (1920), Sriniketan Project (1921), Marthandum Project (1921), Gurgaon Project (1927), Rural Reconstruction Movement (1932), Nilokheri Project (1947) etc. Among the post independence initiatives, Etawah Pilot Project and Sarvodaya Programme (1948), Community Development Programme (1952), National Extension Service (1953), Intensive Agriculture Development Programme (1960), Intensive Agriculture Area Programme (1964), High Yielding
Variety Programme (1966) and Training and Visit System (1974) were noteworthy. The Indian Council of Agricultural Research (ICAR) since the mid sixties have spearheaded into the extension service delivery mechanism in the country through frontline extension programmes- National Demonstration (ND) (1964), Krishi Vigyan Kendra (1974), Operational Research Project (1975) and Lab to Land Programme (1979).

Based upon the recommendations of Education Commission (1964-65) and Mohan Singh Mehta Committee (1974), Krishi Vigyan Kendras (KVKs), mandated to impart vocational training in agriculture and allied enterprises to the farming community, came into existence, the first one being established at erstwhile Pondicherry. The operational research project (ORP) aimed at identifying technological as well as socio economic constraints, formulating and implementing suitable technology modules in an area, watershed or for a target group in an operational area in light of the identified problems. The ICAR launched Lab to Land Programme during its golden jubilee celebration. The prime purpose of the programme was to transfer low cost agricultural and allied technologies effectively to the farmers’ fields. As a part of technology mission on oilseeds and pulses, the Council started frontline demonstration in 1990-91. An innovative approach towards technology assessment and refinement through Institution – Village Linkage Programme (1995) was pilot tested and it was further integrated with the National Agricultural Technology Project (1998-2004). Gradually, the council established Agricultural Technology Information Centers (ATICs) in ICAR institutes and SAUs to work as a ‘single window’ delivery and support system linking the various units of research institutes with intermediary users and farmers to facilitate them in decision making and problem solving. Since 2006-07, the National Agricultural Innovation Project (NAIP), implemented by the council in consortium mode is under operation.

3. Pluralistic Extension and Agricultural Knowledge Management

In the present day, farmers’ priorities are to connect with agri-business production system and other numerous partners. Knowledge empowerment in this particular regard is therefore, becoming more and more important along with capital investment. It is felt that there is more diverse need for information in part of the farmers not only for facilitating them in making greater profit in farm business through increased production, but also for quality certification, grading, packaging, storage and transportation for both domestic as well as export markets. Agricultural knowledge management in this particular regard is gaining more and more importance and becoming the focal point of discussion. Data generated through research and field experiments need to be adequately processed and shared among different stakeholders and the role of grass root level extension organizations in general and KVKs in particular in this respect is very crucial. The research institutes need to function in an enhanced convergence mode with the KVKs and other fundamental rural development agencies for evolving as a superior agricultural knowledge management and transmission system.

Extension approaches with focus on group, market, public private partnership and ICT initiatives can be considered as the basic components of an effective agricultural knowledge management and transmission system. Partnership is the best way to harness optimum resource use efficiency vis-à-vis reaching to the farmers with information, advisory and other input delivery services.

An extension model comprising of the public agricultural extension system, private sector, NGOs, input dealers and fundamental village level organization with judicious definition of individual roles and activities will be necessitated for better exploitation of the pluralistic mode of extension. In this regard, a programme launched at MANAGE, Hyderabad draws due attention. DEASI, Diploma in Agriculture for Input Service/ Input Dealers with courses on improved package of practices, seed act, pesticide act, fertilizer act, business ethics, state and central government programmes etc. is quite need based and timely. In fact NGOs, private agri-business companies, progressive farmers, farmers’ organizations, TV channels, private owned financial organizations
and funding agencies are playing different roles in the process of agricultural knowledge management and technology transfer in different ways, an integration of all these channels will be increasingly required in the coming days.

4. Translational Research-Extension

With the gradually changing context of technology application in farmers' fields, a number of new concepts and models of participatory research and extension are being evolved. Agro-ecosystem analysis, Farming System Research and Extension and Participatory Technology Development are few of those. In Indian context, the KVKs being the grass root level organizations having direct contact to the farmers and direct reach to the farmers' fields, effectively executing the process of technology application in micro eco situations to understand the location specificity and applicability of the technologies in field situation by them had been felt quite effective. As the KVKs continued to gain strength, their mandate also changed from vocational training to testing and demonstration of technologies in 1990s to technology assessment and refinement in Xth Five Year Plan and finally to ‘Knowledge and Resource Centre' of agricultural technologies in 2009. The conventional mode of Transfer of Technology (TOT) only through personal contact and skill oriented vocational training is no longer the predominant mode of extension in KVKs. Translating the technologies in the farmer’s field itself through conducting small scale trials and thereby assessing location specificity of the technologies for their promotion, therefore aiding to collective adoption has become one of the most important activities of the KVKs. The necessity for translational research-extension in our country is felt higher given the immense proportion of small and marginal farmers and huge diversity in soil and climatic conditions. It is felt very important to address the issue of inadequate manpower and resources in operating the public agricultural extension system. The ever shifting focus from production to profit oriented farm business bears the sign of a quick and timely change of modalities used by this grass root level extension agency. It is imperative to ensure a strong connectivity between the national agricultural research system with the farmers in a way the technologies are well translated by the KVKs according to the need of localized contexts.

5. Futuristic Extension Strategies

Promoting multidisciplinary research with a farming system orientation toward small farmers and women and focusing on harsh ecologies or difficult terrains; use a consortium mode involving the private sector and all other research partners for different commodities are the future priorities. Technology management capacity for patenting and out-scaling innovations, skilled manpower for transferring benefit of technology to small and marginal farmers to be strengthened. Research should be undertaken on secondary agriculture in and around rural areas covering storage, primary processing, value addition, low-cost packaging, grading and standardization etc. to make small farming more profitable. Extension professionals should strengthen human resource development of extension agents, field workers, small and marginal farmers on technology use and implementation. It is also needed to strengthen soft skills of agricultural researchers in research policy, long-term planning, visioning, socioeconomics, use of ICTs, intellectual property rights, participatory research, research documentation, communication, and impact assessment of technology etc. Convergence among research institutions, KVKs, Universities, farmers and other relevant stakeholders are to be promoted.

Krishi Vigyan Kendras (KVKs) in the NARS and Agricultural Technology Management Agencies (ATMAs) in the public extension system have become the only available and dependable functional extension agencies at the district level and below. Ensuring functional convergence of KVKs with ATMAs and other development departments with clear-cut work and resources are necessary to strengthen technology dissemination at the district and lower levels. Technologies are to be tested at KVK/research farm/farmers’ field etc. involving farmers to prove its usefulness before large scale dissemination. Adopting a sequential approach in technology dissemination and identifying the relevant factors at each of technology transfer is the need of the hour.

Sustainable Rural Livelihood: Technological & Institutional Perspective
Extensive use of modern information and communication technologies (ICTs) like mobile telephones is important to address the transfer of knowledge to the millions of farmers and other end users ICTs are the only effective and cheaper means to reach the vast un reached end user communities. Krishi Vigyan Knowledge network and voice KVK are some of the ICT initiatives of ICAR currently being implemented. There is a need to broad base these initiatives and develop country wide database on all the crops applicable to different agro-climatic situations. Investment in demonstration, campaign, meeting, field visits etc need be emphasized for better translation of knowledge from lab to farmers.

Strong research to suggest new methods and methodologies in public extension is needed. Innovative extension methods and methodologies are to be developed to cope with the challenge to reach the vast and highly diverse un reached masses. More site- and location-specific, and need specific extension research and basic research need to be conducted keeping in multiple stress of that location in mind. The closer involvement of growers in knowledge exchange and research activities needs to be facilitated. Introducing academic incentive concept by rewarding participatory research that is better aligned with practical needs may motivate the researchers for undertaking more translational research. Strengthen interaction among key actors is a sine-qua-non in translational; research. Farmer FIRST is another initiative in the offering in order to enhance farmers scientist interface, enriching knowledge, integrating technology, ensuring feedback, developing partnership and content management.

6. Conclusion

Several of the institutional innovations that have come up in response to the weaknesses in public research and extension system, have given enough indications of the emergence of an agricultural innovation system in India. This has resulted in the blurring of the clearly demarcated institutional boundaries between research, extension, farmers, farmers groups, NGOs and private enterprises. Extension has to play a very important role of facilitating the nodes to generate access and transfer knowledge between different entities in the innovation system. It also has to create competent institutional modes to improve the overall performance of the innovation system. Inability to play this important role would marginalize extension further.

References


Agriculture Sector: A Source of Livelihood

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Agriculture is pivotal sector for ensuring food and nutritional security, sustainable development, and elimination of poverty. Small and marginal farming communities are incompetent to sustain their families. Therefore, they engage in multiple sets of activities to augment their income and manage their cash flows. At macro-level, the agriculture works as key sector for livelihood. Agriculture and animal husbandry are major sources of livelihood for small sized farmers but for marginal and labours have to go with available options for their livelihood security. The small sized farmers were more diversified in farming and non-farming activities than marginal farmers. Further, the small sized farmers were more diversified towards food + cash/ plantation crops + livestock/ poultry combination, and marginal farmers with cash/ plantation crops alone. Especially, project based approach, value oriented training to women Self Help Groups (SHGs) and Front Line Demonstrations (FLDs) found competent for livelihood security. During off seasons, rural to urban and urban to urban migration develops positive influences on migrants that resulted more investment in agriculture. In toto, it can be said that agriculture is the best livelihood source for farming communities.

Keyword: Livelihood, Livelihood options, Livelihood security, Livelihood diversification, Livelihood migration
The information needs of the farmers on new crops, pesticides, farm machines and farming techniques keep on increasing over the years. In order to make accurate decisions farm managers, extension workers and farmers need speedy access to advice on agricultural problems which could be timely, reliable and consistent. The rapid development of computers and internet technologies has enabled the way for web enabled expert system development. Information and communication technology (ICT) has the potential to empower the knowledge in agricultural research as well as to disseminate it to the farmers. Development of an expert system on agricultural crops will help growers in faster dissemination of expert advice for different locations at the same time and will guide them to take decision into different aspects of crop management. The ICAR and SAUs have initiated various ICT programmes for agriculture sector in the country. Among several such initiatives, Agri-Daksh of Indian Agricultural Statistic Research Institute (IASRI), New Delhi and e-SAP developed at UAS, Raichur are important expert systems assisting farmers in their decision making. Agri-Daksh is a tool for building online expert system for various crops, which has been developed at division of computer applications. It has modules on knowledge creation, acquisition, problem identification, knowledge retrieval, ask questions to expert and administration. Agri-Daksh enables domain experts to build online experts system in their crops with minimal intervention of knowledge engineers and programmers. e-SAP will make the work of the extension worker easy, enhance their efficiency and at the same time provide the farmers with solutions right in his field in time. e-SAP enables rapid and effective dissemination of technologies to farm lands, and delivery of farm data in various forms. The expert system do not replace people, but serve as intelligent assistant, improve the quality and productivity of decision-making in farmers field. The extension machinery of both public and private sector organizations need to use these Expert systems effectively in delivering services to farmers.

**Keywords:** Expert system, Agri-Daksh, e-SAP, Information and communication technology
1.03

Agri-Tourism: Scope and Opportunities- A Case Study of Parashar Agri-Tourism Center

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Global economic restructuring has created a climate in which many local economies have to adjust, in order to maintain or enhance their socio-economic viability. As Butler et al. (1998) note economic and social forces operating at the global level are determining both the nature and form of the rural landscape and how we value and use it. These changes, coupled with new ideas and approaches to leisure and recreation time are encouraging tourism development in rural areas at an ever increasing pace. Tourism is now well recognized as an engine of growth in the various economies in the world. Several countries have transformed their economies by developing their tourism potential. Tourism has great capacity to generate large-scale employment and additional income sources to the skilled and unskilled. Today the concept of traditional tourism has been changed. Some new areas of the tourism have been emerged like Agri-Tourism. Promotion of tourism would bring many direct and indirect benefits to the people. To promote domestic tourism, thrust areas identified by the government of India are development of infrastructure, product development and diversification, development of eco-adventure sports, cultural presentations, providing inexpensive accommodation etc. The government also has realized the importance of Agri-Tourism. The Planning Commission of India had constituted a Working Group for the formulation of Tenth Five Year Plan on Tourism. It has accorded high priority to tourism as an instrument of employment generation and poverty alleviation in rural and backward areas by developing the potential of agro tourism to supplement farm incomes, and heritage tourism to promote village development.

Keywords: Agri-tourism, Planning commission, Diversification
Biocontrol Agents as a Viable Option for Futuristic Sustainable Rural Livelihood

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Trichoderma harzianum and Pseudomonas fluorescens are playing important role as biocontrol agents as well as plant growth promoting activities in disease management. These bioagents require very little investment and gives good yield and suits better for different types of cropping systems. These are the rhizosphere microorganisms isolated from couple of field and horticultural crops, which can be applied to seed, plant surface or soil, colonizes the rhizosphere and stimulate plant growth through the synthesis of growth promoting substances have been determined in pigeonpea, cotton, tomato, ashwagandha and coleus crops. Biocontrol potentiality of these afore mentioned microorganisms was tested in vitro under dual culture against wide range of pathogens viz., Fusarium, Rhizoctonia, Sclerotium, Alternaria, Ralstonia and root-knot nematode (Meloidogyne incognita). The biocontrol mechanisms of these efficient bioagents were also elucidated through antibiosis, parasitism, competition, production of siderophore and HCN. An attempt was made in North Eastern Karnataka to formulate these potential as well as commonly efficacious biocontrol agents against major plant pathogens, talc formulation and distributing to the forming community for the management of several diseases in different crops (wilt of pigeonpea and chickpea, root rot of pulses and cotton, collar rot of groundnut and sunflower etc.,), through seed treatment @ 4g per kg seeds, soil application through FYM enrichment @ 2.5 kg per q. FYM based formulations. Most of the farmers of this region are using these bioagents as one of the important component in integrated disease management strategies which will avoid ourselves becoming more dependent on chemical pesticides by creating good environment which can provide better health among human and animals.

Keywords: Biocontrol agents, Trichoderma harzianum, Pseudomonas fluorescens, Adoption of biocontrol agents
Challenges to Agricultural Extension Services in the Present Situation

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The present day agriculture is defined by key concept of stability, sustainability, diversification and commercialization. In the last decade, the agricultural situation in India has undergone a tremendous change in the light of liberalization and establishment of world trade organization (WTO). India’s singing of general agreement on trade and tariff (GATT) in 1994 and joining of WTO has put our agriculture in to a frame work of global market. Low productivity of crops added to less remunerative market prices of agricultural commodities are the major causes of worry. Thus, agriculture is found to be not very profitable although a large majority is depending on it. In the changing situation, farmers needed to transform themselves from producer-seller in the domestic market to producer cum seller in a wider market sense to realize good returns on their investments, risks and efforts. In order to achieve this goal, farmers need to know the answers to the questions like what to produce, when to produce, how much to produce, when and where to sell, at what price and what form to sell their produce. Framers have received most of the production technologies from the extension system. The extension system need to be oriented with knowledge and skills related to the market. Agricultural extension finds itself in the midst of significant changes and uncertainty. Thus, the changing role of extension professionals in the context of WTO critically analyzed in this paper.

Keywords: Globalization, Liberalization, Extension professionals, Trade, WTO


Crop Insurance Scheme in Pune District of Maharashtra-Farmers’ Perception

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The main objective of Crop Insurance Scheme is to provide insurance cover and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, insect pests & diseases. Hence, it is necessary to know insurance products adopted and constraints of respondents and communicate feedback and suggestion of farmers to the government, policy makers and insurance companies. Therefore, the study entitled “Farmers’ perception towards crop insurance scheme in Pune district” was undertaken. The study was conducted with 120 respondents from Bhor, Khed, Junnar and Ambegaon tehsils of Pune district of Maharashtra State. Majority (59.16%) of the respondents had low level of perception, while 30.84% of them had medium level of perception and only 10 percent of the respondents had high level of perception towards Crop Insurance Scheme. Majority (89.16%) of respondents of Pune district suggested that individual assessment of the beneficiaries should be followed in the scheme and 79.16% respondents suggested that appointment of survey officer by each financial institution definitely fetch good response toward Crop Insurance Scheme. While 60.83% respondents suggested that, mass awareness should be followed for better feedback and 55.83% respondents suggested that, bringing transparency in the scheme by means of avoiding corruption would also result in good response of the farmers toward Crop Insurance Scheme. In each village 48.33% respondents there is need for financial institutions, followed by 47.50% suggesting that security level should be raised up to 90%. Few respondents (37.50%) were also opposing the compensation and suggest subsidies should be provided to the beneficiaries to overcome their losses. The major constraint faced by the respondents of Pune district was individual assessment is not followed in the scheme (74.16%) while 72.50 per cent members faced constraint of low security level, followed by more than half (63.33%) of the respondents faced constraints that deprived availability of the information regarding scheme. Poor functioning of the financial institutions was reported by 62.50% respondents and 55.00% respondents were not satisfied with the compensation offered in the scheme. Corruption is one of the major constraints reported by the respondents (52.50%). Respondents (47.50%) also argued that, more time consumed in getting compensation. The coefficient of correlation ‘r’ has been employed to analyze the factors affecting adoption of Crop Insurance Scheme among the respondents. The study revealed that most farmers (65%) were aware of risk mitigation measures of the government. But, less than half of the farmers were aware about the crop insurance schemes. This implies that there is need to disseminate information about insurance schemes across the target groups. The study has clearly brought out the urgency of developing more innovative products, having minimum human interventions.

Keywords: Crop insurance scheme, Farmers’ perceptions, Constraints
Designing and Validating Alternate Extension Model through Partnership with Village Post Offices

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Public-sector extension, continues to be the main source of information to a majority of the farmers in our country. Indian Agricultural Research Institute (IARI) recently developed IARI-Post Office Linkage Extension Model using village post masters as change agents for information sharing and technology dissemination to the farmers. The model was tested on pilot basis which emphasized mainly ensuring availability of quality seeds of various IARI crop varieties to the farmers of the operational area through a vast network of the post offices and the post masters spread out in the rural areas of the country. Under this scheme, village level post masters and farmers were trained in improved farm practices with the help of local Krishi Vigyan Kendras (KVKs). These postmaster/farmers laid out demonstrations of improved IARI varieties on their farms, which became the place of learning for other farmers and the seed produced from such demonstration farms were further made available to other farmers. This way, the coverage of improved varieties substantially increased through ‘farmer-to-farmer’ seed sharing. The model was first tested in district Sitapur of Uttar Pradesh involving seven village post offices and subsequently it was successfully validated in Buxar (Bihar), Sheopur (Madhya Pradesh), Sirohi (Rajasthan) and Jammu (Jammu & Kashmir) districts covering 20 village post offices. With enabled access to high quality seed and enhanced knowledge of crop husbandry through this approach, the crop yield in the project locations increased by 11 to 30 per cent. The model has been found very effective in timely dissemination of improved seeds to the unachieved farmers. The model was effective not only in dissemination of low volume seeds of mustard, bajra, vegetables and flowers but also high volume seeds of paddy and wheat. Data on diffusion effect of the model showed extended coverage of improved varieties through ‘farmer-to-farmer’ seed sharing. Findings of the above study indicate the scope for developing post offices as the means of agricultural technology transfer in India.

Keywords: Alternative extension model, Farmer-to-farmer, Post offices
1.08

Digital Green and its Catalytic Role in Agriculture Extension

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Agriculture accounts between 50-60% of the workforce in India and also dedicates the second largest workforce to agriculture extension, employing more than 1,00,000 people to share knowledge on best agricultural practices. Several barriers have hindered adoption of best practices in India, from illiteracy levels in rural communities, to lack of access to cost-effective technology and the limited mobility of extension agents. In 2006, US born Rikin Gandhi set up an organisation (Digital green) that would significantly break down these barriers for the first time (www.digitalgreen.org). Digital Green is a research project that seeks to disseminate targeted agricultural information to small and marginal farmers in using digital video. It pursued opportunities to use ICT devices to build capacity and increase outreach to poor farmers, and is at least 10 times more effective per dollar spent than the traditional extension. It is participatory process for content production, locally generated digital video data base, human-mediated instruction for dissemination and training and regimented sequencing to initiate a new community. Unlike some systems that expect information or communication technology alone to deliver useful knowledge to marginal farmers, Digital Green works with existing, people based extension systems and seeks to amplify their effectiveness. While video provides a point of focus, it is people and social dynamics that ultimately make Digital Green work. Local social networks are tapped to connect farmers with experts, the thrill of appearing “on TV” motivates farmers and homophile is exploited to minimize the distance between teacher and learner. Videos are recorded in local languages and dialects, making them easy to understand, and local farmers are the ‘actors’. The reconnection with local communities is the defining feature of this extension model; as the farmers that watch the videos feel inspired by fellow farmers in similar circumstances. With a growing repository of standardized content on agriculture practices, it is slated to have one of the most comprehensive databases, which can enrich the agricultural knowledge and research space. With the growing mobile technology industry, it is now conducting trials and research to best include this technology for better information delivery and data capture. It is concluded that the digital green playing a vital or dynamic role in agriculture extension for better understanding of agriculture practices by the all farmers, also increased rate of adoption than the traditional method and its going to be effective day by day.

Keywords: ICT, Agriculture practices, Digital green, Video
1.09

Existing Status of Rural Families in View of Gender Disparity in Rural Area of Bikaner District

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Gender inequality refers to the socially constructed differences between men and women. Gender inequalities include unequal rights, responsibilities, and opportunities for Indian women and translate to poor health status, educational attainment, and economic status compared to men. Most notably, is the lack of opportunity for many girls to be born due to sex-selective abortions and shorter lifespan due to neglect as evidenced in India’s highly skewed child sex ratio (under age 6) of 919 girls per 1,000 boys. The female child has been treated inferior to male child, and this is deeply engraved in her mind. A study was undertaken in Bikaner district of Rajasthan. There are six Panchayat samities in Bikaner district out of which, two Panchayat Samities namely Kolayat and Shree Dungargarh were selected randomly for the study. From each Panchayat Samities, two villages, thus a total of 120 respondents were selected on the basis of comprehensive list of respondents in the age group of 15 to 45 years. The data were collected by interview method using structural interview schedule. Results indicated that as birth order increased, the number of female children decreased, first preference was given to male child. School dropout rate was more in female children (61.80%) as compared to male child. The reasons of school dropout of children were found to be lack of interest (59.65%), lack of school near village (19.30%) among male children, whereas among female children lack of resources (41.46%) and early marriage (35.77%) were main reasons of school dropout. About 41 percent female children wanted to become teachers. Cooking was mainly performed by adult female with overall mean scores 2.14, and ranked first which was followed by female child. First preference was given to adult male for serving of costly and special food. Domestic role and responsibilities were performed by majority of adult female. Major decisions in families were taken by adult male (2.59 mean score) followed by male child (1.38 mean score), adult female (1.35 mean score) and jointly (1.20). Female child participation in decision making was negligible in rural area. Livestock and management related activities continue to be predominately rural women’s responsibility and domain.

Keywords: Rural families, Gender disparity
1.10

Extension Strategy for Sustainable Agricultural Development

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Agricultural extension service is intended to bridge the gap between farmers and agricultural research scientists through transmission of latest technical know-how. Besides this, the agriculture extension services also focus on enhancing farmers’ knowledge about crop management techniques to increase productivity. In India, public sector extension, represented mainly by the state departments of agriculture, continues to be the most important source of information for the majority of farmers. Activities of other extension agencies, be it state agricultural universities, non-governmental organizations, input agencies, mass media, research institutions or farmers associations are still restricted to certain regions, crops and enterprises. The performance of public sector extension is under scrutiny for quite some time and questions are being raised on its capability to deliver goods in the rapidly changing environment. The shifting emphasis of Indian agriculture towards diversification, commercialization, sustainability and efficiency has made it necessary for the state extension organizations to critically examine their extension approaches. Department of agriculture in several states made changes in some of their approaches towards the late 1980s as the Training and Visit system of extension was coming to an end. There has to be strengthening of integration of KVKs with ATMA for effective technology transfer.

Keywords: Extension strategy, Sustainable agriculture
1.11 Extent of Research-Extension-Farmer Linkages in Punjab

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The concept of linkage implies the communication and working relationship established between two or more organizations pursuing commonly shared objectives in order to have a regular contact and improved agricultural productivity. Linkage mechanism refers to a concrete procedure, regular event, arrangement, device or channel which bridges the gap between the researchers, extensionists and farmers and allows communication between them. Research and technology transfer institutions, managers, units, or personnel may link with each other for six broadly defined functions namely planning and review; collaborative activities; exchange of resources; dissemination of knowledge and information; evaluation and feedback and coordination. In agriculture sector; research, extension and farmers are three systems which are linked by information flow and feedback. Linking roles has been closely related to the dissemination and utilization of knowledge. This paper analyses the research-extension-farmer linkage system in the agriculture sector of Punjab state in India. An investigation was carried out at the Punjab Agricultural University (PAU) headquarters in Ludhiana district and in the three other districts namely Faridkot, Sangrur and Hoshiarpur of the state. Survey technique was used to know the perception of 150 researchers and extensionists of PAU and State Department of Agriculture, Punjab towards their kind and extent of linkages amongst each other as well as with the farmers. Data was also recorded regarding their participation in various linkage mechanism areas with each other as well as with the farmers. The researchers and extensionists perceived low to medium linkages amongst each other and medium to high linkages with the farmers while less than half of the researchers and extensionists perceived that they had low extent of participation in linkage mechanisms with each other (43.3%) and medium extent of participation with farmers (45.3%). The authors proposed that participatory technology generation and participatory conduct, monitoring and evaluation of research and extension activities should be used to enhance the research-extension-farmer linkages. Formation of Village Knowledge Centres and farmers organizations will also help to foster these linkages in the state.

Keywords: Linkages, Participatory technology generation, Village knowledge centres
Farmer Participatory Integrated Farming System for Sustainable Income

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In the recent past agriculture is experiencing a lot of challenges, especially from natural calamities such as flood and drought. In addition, the area under agriculture is also reducing due to various non-farm activities such as road construction, industrial development and other infrastructure developments. Further farmers concentrate mainly on agriculture and because of vagaries of weather and other pressure from non-farm activities, the productivity and income from the farm is dwindling. To sustain the income and productivity the farmer has to integrate subsidiary enterprises with crop production. These enterprises not only supplement the income of the farmer but also help in enhancing the family labour employment. Therefore, a study cum demonstration on farming system was conducted in the year 2010 and 2011 in the farmer field of Uttam Dadugol of Kalasanakoppa village, Kalagatagi taluk of Dharwad district through participatory approach. Based on the need and available resources of the farm, allied enterprises such as dairy, vermicompost unit and backyard poultry was introduced in the farm for getting sustainable income during the demonstration period. The productivity of the field crops increased by 14 percent over benchmark year. For diversifying the activities and cropping system, vegetable (brinjal, clusterbean, bittergourd, ridgegourd, onion and okra) cultivation was introduced on the farm. Addition of allied enterprise such as dairy, vermicompost production unit and backyard poultry helped in increasing the net returns. The net returns (Rs.31850/annum) of benchmark year increased to Rs.50492/annum during 2011. This realized an increase of 54% and indicated that, the higher returns could be obtained by judicious mix of allied enterprises of agriculture.

Keywords: IFS, Former participatory IFS, Demonstration of IFS
1.13

Farmers’ Accessibility and Preferences towards Extension Service Providers: Private & Public

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The development and a interest in the problem of food security was first generated when the World Food Conference, convened by Food & Agriculture Organization (FAO) in 1974, drew the attention to the need and ways for ensuring food security to the hungry millions of the world. In recent years, the need for involving private sector in sharing, augmenting and supplementing public sector extension efforts is being increasingly recognized in India. As farmers need very timely and quality services to compete at global level so both private and public agencies did their best to benefit the farmers. The present study was undertaken in the districts of Ambala, Kurukshetra, Karnal, Hisar and Fatehabad of Haryana state to find out the farmer’s accessibility and preferences towards public and private extension services. Manageable sizes of 200 farmers were selected and a sample of 40 private extension agencies was taken randomly. The study revealed that farmers had greater accessibility in private extension for input supply (mean 10.90) and infrastructure facilities (mean 9.67), while for consultancy & diagnosis services (mean 10.51), information (mean 11.53) and technical services (mean 8.90) public extension was found more accessible in both the zones. Similarly, farmers prefer the consultancy & diagnosis services (mean 4.36), information (mean 5.63) and technical services (mean 3.82) in public extension, while for input supply (mean 5.84) and infrastructure (mean 4.08) they preferred more private extension services. Sixty five per cent of the farmers found private extension services highly feasible followed by 25 and 10 per cent with medium and low level of feasibility, respectively. Lacks of infrastructure facilities (rank I), communication gap (rank II) and lack of coordination (rank III) were some of the commonly faced problems by private extension agencies. The study concluded that private and public extension services must work together for the overall development of the farming community.

Keywords: Accessibility, Preference, Private extension service, and Public extension service providers.
1.14

Farmers’ Perception towards Extension Services of Private Organization

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Diverse agricultural extension funding and delivery arrangements have been undertaken since the mid-1980s by governments worldwide in the name of “privatization.” Privatization is used in the broadest sense - of introducing or increasing private sector participation, which does not necessarily imply a transfer of designated state-owned assets to the private sector. In fact, various cost-recoveries, commercialization, and other so-called privatization alternatives have been adopted to improve agricultural extension. The privatize extension is carried on extension services for providing the various inputs, such seeds, fertilizers, pesticides, farm machineries, post harvest tools etc. These private extension services are carried out by the private organization with the motive to sell their products as well as also impart their role in agricultural development. Various private organization operative in the districts of Udhampur (Jammu & Kashmir) for carrying out extension services along with the government organization. The study revealed that the majority of farmers (72%) still had faith on government department extension services such as Department of Agriculture, SKUAST-Jammu, Department of Horticulture and other development departments. Only, 30 percent of the farmers had accessed to private extension services for purchasing the inputs of agriculture. Among the various private extension services, the animal husbandry services ranked first, followed by the agriculture and horticultural service ranked third while the extension service of fisheries ranked last i.e IXth among the services utilized by the farmers.

Keywords: Privatization, Extension services, Farmers, Input supply
Fisheries Co-operative Society in Enhancing Livelihood Security of Rural Fisherman Population

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A study on the performance of the socio-economic status of the fisheries co-operative society of Kalaghatagi taluka in Dharwad district was conducted in 2011. A total sample of respondents was 100 families, and head of the family was considered as respondent for the collection of data in addition to the head of the fisherman co-operative society. Pre-tested interview schedule was used for the collection of information from fisherman community. The results of the study revealed that the male population constituted around 61.70 percent, indicating the dominance of males in the fisheries sector. Among the total fishermen’s only 15.50 percent were found to be literate about 49 percent of the population fell under the age group of less than 20 years and the total earning population constituted around 66.60 percent. The dominance of male population was evident in all the categories giving an indication that fishing and related activities are the domain of males. On further examination, it was found that smoking, betel nut chewing and consumption of liquor were the common habits of adult fisherman community. As the major occupation was fishing, majority of the population were engaged in fishing activity and 59.54 percent were under the income group of < Rs. 30000. The study indicated that the livelihood security of the fisherman community could be improved by creating awareness on recent advancements in fish farming technologies and improved storage and marketing methods through training and demonstration as more than 300 ha water spread area is under the society’s clutch.

Keywords: Livelihood security, Socio-economics, Fisherman community, Co-operative society
Innovations in Marketing of Fruits in Assam: A Study of North Eastern Regional Agricultural Marketing Corporation Limited (NERAMAC)

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There is gradually growing commercialization of agriculture and increased requirement of rigid adherence to strict quality grades and standards. Small farmers in India, especially in backward regions like in North Eastern India, are facing both an opportunity for access to valuable markets and also the risk of uncertainty that they will be excluded from them. Due to high and fluctuating consumer prices, only a small share of the consumer rupee reaching the producer farmers. There has been a concern in the recent years regarding the efficiency of marketing of fruits and vegetables. The present study was conducted to analyze the innovations in marketing of fruits by North Eastern Regional Agricultural Marketing Corporation Limited in two districts of Assam namely Dhubri and Karimganj. The total of 80 NERAMAC beneficiaries, 40 non-beneficiaries and the entire available field functionaries of NERAMAC in the study area were interviewed with the help of structured and semi structured interview schedules. The backward and forward linkages provided by NERAMAC for the fruit crop cultivation and marketing, the factors influencing the market decision of beneficiaries and non-beneficiaries and the perceived constraints in marketing of fruits were studied. The beneficiary farmers were exposed highly to mass media, showed higher extension agency contacts, higher risk orientation, higher achievement motivation and market orientation than non-beneficiary farmers. NERAMAC was found efficient in supplying inputs to farmers which are better in terms of accessibility, quality and timeliness. As a measure of economic gain, transaction output cost due to sale of harvested produce and the mean transactional input cost per hectare was significantly less for beneficiaries compared to non-beneficiaries. Logit analysis showed that the land holding, monetary profit and market support were the major predictors of marketing decision making process. Improper management and coordination of work among the members was major organizational constraints whereas poor cooperation at grass root level organizations and lack of farmers awareness were foremost among functional constraints reported by the clientele and stakeholders of NERAMAC. Less intensity of advisory services and storage of harvested produce were ranked as the major constraints by beneficiaries leading to reduced efficiency of marketing of fruits. Whereas fluctuating market price and finding appropriate price of produces are perceived as major constraints by non-beneficiaries. On the basis of the findings it may be concluded that a focus should be given for enhancement of coordination and leadership development among members with good organizational climate.

Keywords: NERAMAC, Marketing of fruits, Logit analysis
1.17

Integrated Farming System- A Model Approach for Sustainability and Rural Livelihood

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Agriculture is the backbone of India. In the recent past due to vagaries of weather and price fluctuations of the produce, the yield and income of the farmers are dwindling. Hence, farmers are investing less in agriculture which resulted in the low productivity of the field crops. In addition, the area under cultivation may further dwindle and more than 20 percent of the current cultivable area will be converted for other than agriculture purposes by 2030. Integrated farming system assumes a greater importance for sound management of farm resources to enhance the farm productivity and reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. Demonstration were conducted on farm of Sri.Yallappa Drakoji at Kalasanakoppa village of Kalaghatagi taluk, Dharwad district, Karanataka with an objective of encouraging the judicious mix of various allied enterprises of agriculture to enhance the productivity, sustainable income of the farm to enhance the quality life of the farmers. During the demonstration period (2010 and 2011), the study was conducted involving cropping, backyard poultry (10+1 Giriraja birds), vermicomposting (2 pits of 10’x3’x1’) preparation, vegetable cultivation as integrated system. The study results indicated that, the productivity of food grain rose from 25q/ha to 28.4q/ha which was 14 percent higher over benchmark year. Similarly the productivity of soybean and cotton increased by 29 and 21 percent respectively over benchmark year. The cultivation of horticulture crops especially vegetables such as brinjal, okra, clusterbean, ridgegourd and bittergourd was introduced on the farm to enhance the income. Because of the introduction of dairy, vermicompost and backyard poultry the net returns of the farm increased to Rs.64,050 during 2011 over benchmark net returns of Rs.38,295. The increase in the net returns works out to be 67 percent indicating the benefits of inclusion of agricultural allied enterprises for obtaining a sustainable yield and income.

Keywords: Integrated farming system, Demonstration, Productivity
1.18

Integrated Farming System for Sustainable Rural Livelihood in Hilly, Tribal and Backward Poonch District of J&K State

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Poonch is one of the remotest and border district of Jammu and Kashmir state, situated at Indo-Pak Line of Control. Majority of the fields in this district are situated across the hilly slopes. The difficult terrain, scattered and small land holdings, traditional mode of production, low use of modern inputs, extreme vulnerability to natural events, poor infrastructures and lack of market incentives are the primary constraints affecting the performance of agriculture in this hilly district. These constraints demand a treatment little different from the standard followed in the mainland plain areas. To overcome the problem of this hill district, Krishi Vigyan Kendra-Poonch is trying to promote Integrated Farming System Model for an area of 0.5 ha to adopt a holistic approach for optimal utilization of small patches of cultivable land. The proposed land use for Integrated Farming System on 0.5 hectare comprises of field crops (2000 m²), horticultural crops (1500 m²), fish-cum-poultry production (800 m²), mushroom cultivation (200 m²), vermicompost (100 m²), and 400 m² land is allotted under animal shed and other common uses. This IFS model aims at augmenting rural income with optimal utilization of available resources and it is suitable to small holdings, homesteads and resource poor farmers.

Keywords: Integrated farming system, Rural livelihood, Hilly areas, Scattered and small land holdings
**1.19**

**IPM Approach for Healthy Intensification of Rice Crop**

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**Abstract:** Rice is the staple food of at least half of the world’s population and is grown in approximately 148 million ha of land globally. Nearly 90 percent of this area falls in the Asian region. Achieving high rice yields is constrained by the losses caused by insect pests. With reduced land availability and increased demand for food production, rice cultivation is being intensified through higher fertilizer inputs and cropping. Such intensifications may in turn increase pest intensities and demand for more pesticides. Pesticide application by most of the rice farmers in Asia is influenced by misperceptions and over estimations of damages. Thus, great majority of Integrated Pest Management (IPM) programs in the tropics require an “integrated” approach. Integrated pest management (IPM) is a broad ecological approach for pest management which employs all available skills, techniques and practices such as cultural, genetic, mechanical and biological methods including application of chemical pesticides as a last resort in a harmonious and compatible manner with a view to suppress pest population below economic injury level, based on regular crop pest surveillance and monitoring. It is a dynamic approach and process which varies from area to area, time to time, crop to crop and pest to pest etc., and aims at minimizing crop losses with due consideration to human and animal health besides safety to environment. Now IPM approach has been globally accepted for achieving sustainability in agriculture and has been enshrined as the important principal of plant protection in the overall crop protection programme under the national agricultural policy of the government of India since 1980. The present study deals with importance of IPM approach in healthy intensification of rice crop in different villages of Haryana district.

**Keywords:** Rice, Integrated pest management practices, Pesticides
1.20

Issues and Strategies in Pulse Production in NFSM Areas of Rajasthan

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Food and good nutrition are basic human needs and this is recognized in the first millennium development Goal-the eradication of extreme poverty and hunger by 2015. The World Food Programme (WFP) for instance includes 60 grams of pulses in its typical food basket, alongside cereals, oils, sugar and salt. The United Nation declared 2016 to be an International Year of Pulses (IYOP) and the goal is to position pulses as a primary source of protein and other essential nutrients. The average global yield for pulses in 2010 was estimated at 819 kg/ha. India’s yields were even lower, at 600 kg/ha while Canada and the US had yields more than three times that of India, at around 1800 kg/ha. To improve the production and productivity of pulses Government of India is operating A3P under National Food Security Mission (NFSM). The present study examines the adoption pattern of improved technologies and constraints in in two adopted districts of A3P component of NFSM of Rajasthan state (high potential high gap state) namely Churu and Nagaur. The farmers expressed that variety, nutrient and plant protection centric approach helped in expanding the area and production. The NFSM interventions increased the soil testing, use of thio urea, increased number of sprinklers, INM practices and introduction of IPM practices in adopted areas. The major constraints reported included the poor availability of critical Inputs, like seeds, bio-fertilizers, bio-pesticides, secondary and micronutrients in productivity zone. The issue of non-availability of quality irrigation water for life saving irrigation and more profitability in the competing crops like Cumin, Fennel and Fenugeek (Trigonella foenum-graecum) was also reported to be major hindering factor in increasing area under chickpea in areas with availability of water in Nagaur District of Rajasthan whereas in Churu district wheat, mustard were prioritized crops for good quality land with assured irrigation and chickpea was allotted perceived inferior land. Although pulses have a direct positive impact on soil quality by feeding soil microbes, which benefits soil health and also the water footprint produced due to production of unit quantity of pulses is very low in comparison to other proteins yet they suffer from several constraints which need to be looked into in order to reduce the import burden and meet the minimum dietary requirements.

Keywords: NFSM, Pulses, Productivity
Kissan Credit Card - A Vital Support for Resource Poor Farmers

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Easy access to sources of finance is believed to be an important tool for poverty alleviation and inclusive growth. Kissan Credit Card Scheme (KCC) started by the Government of India, Reserve Bank of India (RBI), National Bank for Agriculture and Rural Development (NABARD) in 1998-99, aims at providing adequate and timely support from the banking system to the farmers for their short-term credit needs for cultivation of crops. This mainly helps resource poor farmers for purchase of inputs etc., during the cropping season at appropriate time for obtaining the optimum yield. KCC ensure the assured availability of credit at any time enabling reduced interest burden for the farmer. KCC is functioning by different names in different leading banks of the country such as PNB Krishi card, Kissan Samadhan Card, Kissan Gold Credit Card etc. In J&K Kissan Credit Card Scheme came into existence in 2002-03. From the analysis of secondary data of J&K it has been found that in the initial year the target was 30766 Kissan Credit Cards with the amount 3527.07 lakhs and total achievement in sanctioning Kissan Credit Cards was 4393 with the disbursement of Rs 1718.29 lakhs which consists of 47 percentage of financial achievement. Later on up to the year 2011-12 there has been found decreasing trend in the target achievements but in the year 2011-12 only 10 percent of the total target was achieved from the year 2012-13 onwards, improvement was noticed in Kissan credit card scheme and on the basis of door to door survey conducted by department of Agriculture production, the total target was 1017152 KCC and out of which 744470 KCC with the amount of 446117.27 lakhs is achieved which constitutes 73 percent of the total set target. Major contributors in the field of KCC are J&K Bank (52%) followed by JKGB (14%) and SBI (9%). Kissan Credit Card scheme if properly implemented can prove to be a vital financial support to the farming community for meeting the necessary inputs at the appropriate time, to get rid from the clutches of non-institutional credit sources and to improve the socio-economic condition of the resource poor farmers.

Keywords: Kissan Credit Card, Resource poor farmer, Credit source
Market Oriented Farm Management Extension- Strategy to Overcome Farm Problems

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The changes in farming caused by the changes in the world’s economy have wide implications for extension workers. The farmers increasingly find themselves making fundamental decisions about the nature of their farming activities. For many farmers-especially small-scale, farming has been about producing food for their families with the world around them changing and it requires them to have cash, these farmers are faced with the need to become more entrepreneurial and market oriented and run their farms as businesses. To make this transition, they need more than technical solutions to production questions. They need information about markets, farm management and finance and need to develop their capacity as entrepreneurs. They need the knowledge and skills to manage competitive and profitable farming, including managing input, managing production and managing marketing. All of these changes for farmers imply changes for extension workers. To support ‘entrepreneurial farmers’ extension workers need to acquire this knowledge and skills. The farm management extension can have a significant impact on helping farmers walk the pathway from traditional production-driven farming to market and profit-driven farming. It involves helping farmers learn how to analyze, interpret and define their farming businesses in terms of the changes taking place around them. And it helps farmers identify and implement appropriate managerial action for themselves. Extension workers and small-scale farmers need to be familiar with and knowledgeable about the changes that are occurring in farming and the opportunities and risks that the new farming environment offers. These farmers have to begin to farm as a business if they are to prosper in the future.

Keywords: Market oriented, Farm management, Extension strategy
Mobile Phone Use Patterns of Employees of Farm Science Centers (KVKs)

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To understand the cell phone use patterns of KVK employees an online survey was conducted on randomly selected employees of KVKs of Zonal Project Directorate, Zone-VI, Jodhpur, Rajasthan and Zonal Project Directorate, Zone-III, Umiam, Meghalaya. A sample of 250 respondents was randomly drawn from ten states namely Rajasthan, Gujarat, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. An online questionnaire was circulated among KVKs of these states via email and 250 early received responses were recorded. Responses of 190 Males and 60 female respondents were ultimately analyzed to understand the mobile phone use pattern. In the study it is found that majority of respondents purchased mobile to keep in contact with family, friends and colleagues. Handsets’ battery life and ease of use are top rated factors which influenced purchase decisions of respondents. The SAR value is the least considered factor while purchasing handset which is mainly because of lack of awareness about standard to limit radiation exposure. All respondents use cell phone for voice communication and more than 50 per cent respondents use functions like texting, alarm clock, calculator, to take photographs and for internet browsing. Emailing, downloading files and m-banking are three top internet services subscribed by most of the respondents. Mobile phone use pattern suggests that majority of KVK employees are optimally using cell phones but awareness about health friendly use of cell phone needs to be spread with due priority as long-term exposure to radiation emitted by cell phones and base stations (towers) is considered as hazardous for human health.

Keywords: Cell phones, mobile phones, electromagnetic radiation, cell phone use pattern, scientific cell phone use.
1.24

Partnership Programme for Upscaling Agricultural Technologies in Hill Region of Uttarakhand

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Voluntary organizations (VOs) have a strong presence at village level and their strength lies in mobilizing and reaching out to the farmers. It has also been well established that the effectiveness of extension system can be enhanced by working with VOs in the public-private partnership mode. Indian Agricultural Research Institute (IARI) has been conducting transfer of technology programmes in partnership mode with different VOs spread across several states of the country since last four years. One such programme has been in operation in collaboration with Himalayan Environmental Studies and Conservation Organization (HESCO), Dehradun, Uttarakhand since 2010-11. Under this project from rabi 2010-11 to rabi 2013-14, demonstrations were laid on improved varieties of different crops on the selected farmers’ fields of 4 villages of Taluk/ Tehsil Johnpur, Sahaspur, Raipur in the district of Dehradun and Tehri Garhwal of Uttarakhand. A total of 241 demonstrations were laid covering an area of 12.33 hectare consisting of 111 demonstrations on wheat crop, 25 on rape seed mustard, 62 on pea, 8 on gram, 10 on lentil and 25 on spinach. The average yield increase of improved varieties of wheat has been found to be in the range of 27.27 to 62.16 percent over the local check, and the benefit cost ratio ranged from 2.06 to 2.9. In case of rape seed mustard crop, an average increase in productivity ranged between 32.93 to 57.15 percent over the local varieties of the area. The B C ratio calculated for the crop ranged between 2.6 to 3.6. The pea crop witnessed an average yield increase over local check in the range of 28.15 to 46.48 percent and the corresponding B C ratio ranged from 2.12 to 3.5 due to good marketability variety Pusa Pragati. In general the IARI varieties of different crops proved to be higher yielder and having early maturity than local varieties. Infestation of weed in improved varieties was lesser and they fetched higher return to the farmers. This partnership programme is found successful in terms of production, productivity and profitability.

Keywords: Voluntary organization, IARI, PoP
Performance of MGNREGA: A Comparative Study

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The MGNREGA, a self-targeting programme, is intended in increasing outreach to poor and marginalized section of the society such as women and helping them towards the cause of financial and economic inclusion in the society. In this comparative study, an attempt has been made to analyze the performance of the MGNREGA in terms of awareness of women beneficiaries about various provisions in MGNREGA and constraints faced by them while working under it. The study was conducted in Bikaner and Ludhiana districts of Rajasthan and Punjab states respectively. The sample consisted of 120 randomly selected respondents comprising of 60 women beneficiaries from each district. The Personal interview technique was used for collecting data. The findings of the study show that the respondents in both the districts are not aware about the provisions under MGNREGA. Similarly, the respondents faced many problems while working regarding delay in issuing of job card, delay in payment, lack of crèche facilities, harassment at work site etc. The study has made some suggestions for incorporating improvement in the present MGNREGA scheme based on the constraints reported by the women beneficiaries associated with this act.

Keywords: MGNREGA, Women beneficiaries, Awareness, Constraints, Suggestions
1.26

Philosophy, Background and Organizational Structure of Farmer Organization FAPRO

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In order to understand the institutional mechanism of working of the farmer organizations, one needs to have a clear view of the genesis, mission, objectives and principles of operation adopted by the organization. The present study was undertaken with the objective of studying the philosophy, background and the organizational structure of the farmer organizations. The study was conducted in purposively selected organization, “Farms Produce Promotion Society” (FAPRO) in Hoshiarpur. Data were collected from fifty members and ten officers of the organization. The organization established at Kangmai village of Hoshiarpur has served as a boon to eliminate the farmers’ problems. These farmers no longer are cultivating wheat and paddy. Instead, they are growing turmeric and pulses, besides producing honey and jaggery. Before FAPRO was born, Punjab used to get all its turmeric from Andhra Pradesh and Maharashtra, as the indigenous production was only 2-3 percent. But, FAPRO has brought about a revolution and made Punjab self-reliant in turmeric. It caters to 100 per cent demand now. Earlier study on FAPRO reported that FAPRO handles nearly 72 per cent of the sale of turmeric powder in Punjab. The organization has established roadside outlets at every 8-10 kms facilitating direct marketing and these outlets serve as one stop shops for all kitchen ingredients. The present membership of FAPRO is 380 members. The farmers of Hoshiarpur district have proved how an alert farming community can bring about a revolution in farming. The organization has been handling production, promotion and sale of produce without any Government help. Such an initiative is a win-win situation for both farmers and the consumers. Active steps should be taken by the State Agriculture Department to mobilize the farmers to realize the benefits of collectivization into such organizational mechanisms and thus form more and more number of such groups, thereby replicating the model throughout the country for national development.

Keywords: FAPRO, Direct marketing, Farmers organization
Portfolios of Climate Resilient Agriculture Practices vis-a-vis Conservation Agriculture: Learning for Scaling from Plot to Landscape at NICRA Villages

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In India, during the period of 2008 to 2012, the total fresh water withdrawals was about 761 km$^3$ and about 90 percent of this was associated with agricultural water withdrawals, which includes both irrigation and livestock production. In order to satisfy growing demand for food, India would require to produce 37% more rice and wheat by 2025 with nearly 10% less water available for irrigation. Solution lies in identifying, adapt and evaluate demand-driven climate smart agriculture practices (CSAPs) aimed at improving the adaptive capacity of rural livelihoods to climate change. Under this impression, National Initiative on Climate Resilient Agriculture (NICRA) working in Jammu identified target domains for CSAPs as: design, monitor and evaluate the processes for integrating and delivering CSAPs to facilitate scaling-up and-out from adopted NICRA villages. Innovative business models for CSAPs are capacity development of stakeholders, good mix of ‘bottom-up’ and ‘top-down’ approach, policy that influence the trajectories of farmers households towards better adaptation to progressive climate change, raise the awareness of farming communities about CSA technologies, institutional and policy options that have a potential to increase climatic resilience, adaptation, agricultural productivity and income while reducing environmental footprints. The key focus of the NICRA villages is to enhance climate literacy of farmers through linking existing government schemes and investments and with very less additional financial investment integrating and synergizing investments in agriculture and rural development for livelihood security. Convergence of multiple approaches at one point is very necessary to get the maximum benefit of intervention under different portfolios. Conservation agriculture is one of the most important directions towards climate resilient farming and future food security. Portfolios under conservation agriculture are; take a stock of the available technologies/practices adapted to different production systems and define their domains for up-scaling and out-scaling, capture farmer innovations on conservation agriculture and align them with scientific validation and refinements, provide a common neutral platform, convergence and synergy of investments and go to farmers with a clear message, capacity development and empower youth, local innovation systems, out of box extension strategy, analyse adoption pattern and behavioural change of farmers under different typologies to understand adoption of conservation agricultures(CA) and institutional arrangements and enabling policy.

Keywords: CSAP, NICRA, Conservation agriculture
Priorities of Various Stakeholders in Seed Quality Control and Regulation: A Multi-Stakeholder Analysis

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The new Seed Bill, aimed to replace the existing Seeds Act 1966, was introduced in the Parliament in 2004. Various stakeholders including farmers, farmers’ organizations, Non-Governmental Organizations (NGOs), Members of Parliament cutting across party lines, academia and media strongly criticized various clauses and provisions in the bill terming them as ‘anti-farmer’ and ‘pro-industry’. The extent of disagreement between various stakeholders is evident from the fact that the Seed Bill is not yet enacted into an Act even after ten years of its first introduction in the Parliament in 2004. In the meantime, various amendments have been made to the bill based on the recommendations of the Parliamentary Standing Committee on Agriculture (PSCA). However, there is no consensus on certain important issues. In this context, it was found to be of immense importance to study the contentious issues in the bill from the perspective of various stakeholders and to identify their priorities to be addressed in Seed Bill. A study was conducted in Andhra Pradesh and Bihar states covering 120 farmers and 30 respondents each from NGOs, Agriculture Department Officials (ADOs), researchers from ICAR and State Agriculture Universities, seed dealers and Private Seed Companies (PSCs) with a total sample size of 270. The study found that most contentious issues were related to violation of farmers’ rights, regulation of sale price and trait fee of seeds, granting powers to state governments to regulate seed industry, compensation to farmers in case of seed failure and strict punitive and accountability clauses. NGOs and ADOs expressed that state governments should be granted enough powers in the Bill to regulate seed industry in their jurisdiction to safeguard the interests of farming community. Priorities of researchers were to uphold farmers’ rights and to strengthen public sector seed R&D to develop superior innovations. Strengthening infrastructure related to seed storage and marketing; checking malpractices in the seed market and price regulation were the priorities of seed dealers. The priorities of PSCs were completely different and were in contrast to those of farmers. Deregulation of seed prices; liberalization of seed policy with least intervention by the government and access to germplasm available with public sector organizations were the priorities of PSCs. The degree of agreement on contentious issues among various stakeholders using Mann-Whitney U test proved that PSCs were in disagreement with the farmers’ priorities on all the 12 contentious issues, followed by seed dealers on eight issues. It was interesting to note that even researchers were in disagreement with farmers’ priorities on eight issues. The NGOs and ADOs were in agreement with farmers’ priorities on most of the issues. Amendments concerning protecting and upholding farmers’ rights in consistent with Protection of Plant Varieties and Farmers’ Rights Act (PPVFRA) have already been incorporated into the bill based on the recommendations of PSCA. Granting powers to state governments to regulate seed industry including price and trait fee regulation in the final draft of the seed bill before its enactment into Seed Act is important from legal and administrative standpoint.

Keywords: Compensation, Farmers’ rights, Power, Price regulation, PPVFRA, Royalty/trait fee, State government, Seed bill.
Promoting Multiple Income Sources for Livelihood Security in Bikaner Region

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Rajasthan state is divided into 10 agro-climatic zones and encompasses most of the area of the Great Indian Desert. Its large tracts of arid and semi-arid central and west-central regions witness low and erratic rainfall. The state faces recurrent droughts every 3-4 years hence a high dependence on ground water which is also depleting day by day. The state is a rich source in agro-biodiversity, seed spices, legumes, aromatic plants and medicinal plants. The ground water situation is alarming in which out of 249 zones nearly 200 blocks are in highly critical zone, due to which the production and productivity is highly affected. Looking to the vigorous economic problem of the people of the state apart from agriculture and animal husbandry, multiple income sources for livelihood security needs to be promoted in the state. Livelihood security is the adequate and sustainable access to and control over resources, both material and social, to enable households to achieve their rights without undermining the natural resource base. Unemployment and underemployment are endemic in the economies of the developing world and up to 10 million people are unable to obtain the food they need for an active and healthy life. India is one of the fast growing economies in the world GDP grew by 9.6% in 2006-07 and at the macroeconomic fundamentals, the gains have not been inclusive enough. Poverty and unemployment continues to be the central challenges confronting policy makers. The livelihood security in western Rajasthan can be possible by providing multiple sources of income to the rural poor dairying, making of bhujia-papad, promoting agriculture/livestock enterprises, small agro business enterprises, promoting rural cottage industries, ceramic industry, guar gum industry, carpet making, tourism industry, solar energy, wool industry, embroidery etc. The need of the hour is in active participation in formulation of SHGs and also promoting poverty eradication programme through skill development of rural poor. The multiple income sources for the rural poor with government support in strengthening strong social infrastructure through research centers, training institutes, and motivational techniques to produce more of agricultural produce develop proper marketing strategies for export of commodities.

Keywords: Multiple income sources, Livelihood security, Bikaner region
Role of Mobile Based Agro Advisory

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The information need of the farmers is a major concern especially for the developing countries due to insufficient rural infrastructure lack of funds and other reason as well. The percentage of farmers who access information about new agriculture technology through extension agent is very less. Today’s world has been better connected than ever before because of advent of new age ICT’s (Information & Communication Technologies), namely Mobile, Internet, PC’s, web-based video’s etc. ICT, and in particular mobile technologies, are often seen as a ‘game changer’ in smallholder agriculture. It helps in linking poor farmers to urban, regional and global markets, helping farmers manage a range of risks, helping poor farmers participate in high value agriculture. “Mobile phones do have a multi-dimensional positive impact on sustainable poverty reduction”. Mobile projects in agriculture extension can be clustered in two broad categories namely (i) “m-learning” i.e., transfer of general know-how on farming techniques and trends, information on plants and varieties and how to grow them (ii) m-farming: Individual decision support system. There are several levels of complexity of m-Agriculture initiatives, for price information, weather forecast, crop disease warning. In call centre approach, farmers can call a tele-center where agents, usually agronomists, answer their question and provide vital information on cultivation techniques such as planting, irrigation, disease treatment and other input related issues. It uses SMS & voice message delivery (push & Pull), e.g. IFFCO: Mobile operator Bharti Airtel partnered with IFFCO to form the joint venture IKSL in 2007. India Kisan Sanchar Limited (IKSL) is mainly targeting 55 million farmers who are members of IFFCO. Mobile based markets interaction uses two different clusters of mobile applications that support market interaction: one is the provision of price information and other goes one step further and also provide trading opportunities e.g. Market intelligence & Trading facilities. Although mobile phone play an important role in accessing the information, using that information to make decisions depend many factor including availability of input, labour, machinery, seed fertilizer, pesticides, energy storage facilities, irrigation and affordability by the farmer.

Keywords: m-learning, m-farming, Market interaction, Trading facilities
Solar Energy Policies and Rural Electrification in India: A Step towards Sustainable Development

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Energy has been recognized as one of the most pertinent contributors for economic growth and human development universally. In an effort to meet the demands of a developing nation, the Indian energy sector has witnessed a rapid growth. Accelerating the use of renewable energy is indispensable, if India is to meet its commitments to reduce its carbon intensity. Due to its location between the Tropic of Cancer and the Equator, India has an average annual temperature that ranges from 25°C-27.5°C. This means that India has huge solar potential. Hence, it is important to understand the initiatives taken by the Indian government to promote renewable sources of energy, with specific reference to solar energy. It is important to understand the programs, policies and incentives started by the government in detail. Further, there is a need to understand the awareness and satisfaction level of the end users or the beneficiaries. The study also envisages understanding the impediments in implementing these initiatives from the perspective of the government and generating a framework for better acceptance and implementation of such programs and policies. The study was conducted in the state of Chhattisgarh in India. Deciduous forests of the Eastern Highlands Forests cover roughly 44% of the state and this is the reason these areas have not yet received grid connected power. After conducting the research, many major impediments came out both from the implementers’ and the users’ perspective such as lack of awareness, high costs involved, discontinuous supply of electricity, less capacity and so on. It is suggested that solar power projects be developed taking care of the local needs of the people. Thus, the local people ought to be involved at every stage to have a clear understanding of their requirements so that the project can be made to suit their needs.

Keywords: Solar energy, Rural electrification, Sustainable development
1.32

Strategy for Enhancing Effectiveness of Farmers Field School through Community Wall Newspaper

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As an extension education tool Farmers Field School (FFS) is catching attention of extension scientists, development professionals and academicians as it has many benefits over traditional technology transfer approaches. Traditional top-down technology transfer systems have a role in some aspects of agricultural development, but for creation of independent commercialized farmers and farmer organizations new approaches are required. FFS provide not only specific technical skills but also organizational skills and practice, analytical skills and practice, besides basic group assets such as trust and confidence required for joint enterprises. The FFS methods promote exploration, discovery and adaptation under local conditions. For the sustainable agricultural development the technology must not only be production oriented but also it must fit into local ecological, economical, social, cultural sub-system of the farming community. The FFS may serve all these purposes. The main outcomes of FFS are the experiences gained by the farmers through learning by doing and analyzing the farm situations. These experiences can also be shared within the farming community of similar situations through the Community Wall Newspaper. A Community Wall Newspaper is a hand-lettered or printed newspaper to be displayed and read in public places, such as walls. Community Wall Newspaper is a participatory communication approach. It can be run by the clientele farmers of the FFS. Since through FFS farmers get new orientation for looking into the problems and gain knowledge, skills and experiences fruitful for sharing within the community. By providing orientation trainings in development journalism they might be empowered to share their experiences through the Community Wall Newspaper. The present paper discusses in detail the process of implementing the Farmers Field School and participatory management of running the Community Wall Newspaper within the community of the farmers with similar situations.

Keywords: FFS, Community wall newspaper, Top-down technology transfer system, Journalism
1.33

Structural and Functional Mechanism of Mobile Based Agro-advisory Services

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Among modern information and communication technology (ICT) modes, mobile phone has been most recent and widely accepted mode of delivering information in most of the developing country including India. Increasing mobile phone and its services enhance the availability to access information and to increase awareness, education, better adoption of technology, better health and efficiency, reduced transaction costs, better market efficiencies, etc. These in turn will catalyze the rural sector development and economic growth. As an information platform to receive messages – SMS or voice-message information provide the ability to get connected to new knowledge and information sources not previously available with the possibility of real-time, highly tailored information delivery. The overall goal of using the mobile phone-enabled information delivery mechanism is to have inclusive growth by reducing the knowledge gap between large and small farmers and by creating awareness among the farming community. Most of Indian farmers are small and marginal so they cannot afford costly ICT based services. In this context, mKRISHI® which was started in the year 2006 is more appropriate as compared to all other ICT based projects in India because mKRISHI® operated through mobile phone which is very cheap and affordable by farmers. After the early success in the popularization of sustainable farming practices through the use of localized message in local language in the Maharashtra state, it had been deployed in thirteen other states of the country. There were totally 11 languages in which message had produced in 13 states of the country. This unique approach is popular among farmers which resulted in better adoption of improved farm practices. Most of member farmers belong to young aged group, small farmer, high social participation and high contact with extension agency.

Keywords: ICT, mKRISHI®, Mobile
Technology Dissemination in Rural Areas: An Integrated Approach

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More than 70 percent of Indian population residing in rural areas largely depends on land waste and its allied activities for its livelihood. It is, therefore, imperative to develop the suitable technologies, which utilize local resources and are eco-friendly, simple and income generating. At Centre for Rural Development and Technology (CRDT), Indian Institute of Technology (IIT), Delhi, the work has been done on many such technologies namely sericulture, mushroom cultivation, fodder conservation, biofertilizers, biopesticide production etc. If these technologies are employed in an integrated manner, the outcome of these may enhance many folds. The present paper deals with the success stories of the technology developed by the CRDT and disseminated in number of villages in states of Haryana, Rajasthan and Uttar Pradesh. As these technologies have been tested and accepted by the beneficiaries particularly farmers in rural areas, there is lot of scope exist in their wide scale dissemination and adoption across the country.

Keywords: Technologies, Local resources, Integrated approach, Dissemination
Technology Protection, Production, and Transfer/Commercialization at ICAR: An Overview

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The Indian Council of Agricultural Research (ICAR) has recently focused on the demand for research and technology and on the development of innovation systems, because strengthened research systems may increase the supply of new knowledge and technology. The analysis of the XI plan experiences show that agricultural technologies generated in the National Agricultural Research System (NARS) are of diverse nature; and may be categorized on the basis of social span; scope of microenterprise; revenue generation potential; and scope of industrial application. The technologies which have high social span and scope for microenterprise development can be disseminated directly to farmers and end-users through the extension network or wherever applicable suitable entrepreneurship programmes can be taken up for the grassroot innovators and entrepreneurs. Creating an innovation system and agri-incubation network would provide the conducive environment in NARS, for appropriate technology development and its faster dissemination by creating an interfacing and networking mechanism between R&D institutions, industries, farmers and grassroots innovators. From 2007 to 2012, there were 422 patents and 895 plant variety applications filed. The number of granted patents was 58 and published and granted plant variety applications were 600 and 372 respectively. Besides, 29 trademarks, 42 copyrights and 12 designs have been registered/granted. In 2007, the number of ICAR institutes engaged in technology commercialization was 18. This number has increased to 67 by the year 2012. During this six year period, ICAR’s private/government/NGO partners have increased from 40 to 544. ICAR’s total partnerships developed have increased from 53 to 755 and the number of technologies transferred through these partners has increased from 40 to 290. Further, the scheme has led to dealing with companies and individual entrepreneurs in a professional manner, therein leading to different types of written partnership agreements for commercialization of ICAR’s goods and services. The enhanced scope is thus come in new areas namely Innovation, Incubation and ARYA (Attracting and Retaining Youth in Agriculture).

Keywords: Technology, Production, Protection, Commercialization
1.36

Transfer of Technology through Mobile Based Video in Tribal Areas

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The information and communication technologies (ICTs) play an important role in their endeavour of reaching the unreached farmers. The increasing penetration of mobile phone networks and handsets presents an opportunity to make useful information more widely available. Among the modern information and communication tools (ICTs), mobile telephony has been widely accepted mode of delivering information. Mobile phones provide valuable information on far away commodities. Mobile phone coverage and adoption had positive impacts on agricultural and labor market efficiency. Now-a-days everybody has mobile phone. Mobile based video production technology is a simple, effective and economical. It is highly useful to the unreached farmers in tribal areas, as farmers are scattered in different hamlets. It involves production of different useful, ready made agricultural technologies like integrated pest management, efficient water usage, crop production, mushroom production, animal husbandry etc. It is a ready reckoner for the farmer. Introduction and promotion of innovative applications like ICT products would not only meet the specific needs for improving efficacy of technologies but also assist the field functionaries in collecting, organizing and communicating useful information to farmers in an efficient way.

Keywords: ICT, Mobile phone, Tribal, Video production technology
Upscaling of Farmer Led Innovations: Institutional Interventions

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Indian agriculture is unique with diverse agro-climatic conditions and is one of the oldest professions practiced by the farmers. Technology transformation for sustainable production, productivity and profitability depends on the decision and action of millions of farmers. The technologies or practices that are developed through research are innovations which may be new varieties of crops and plants, new breeds of livestock, new chemicals and medicines, new technique of doing things etc. An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption. Agricultural development is largely driven by innovations in the entire value chain of different commodities. Farmers has selected several varieties that has higher productivity and better quality and farmers’ innovations are a product of farmers’ informal experimentation. There are many institutions recognizing and rewarding the grass root innovations like National Innovation Foundation, ICAR, IARI, NIF, PPV & FRA (Protection of Plant Varieties and Farmer’s Rights) etc. Farmer-led innovations are evolving under specific agro-climatic and socio-economic conditions and such innovations should be widely adopted and sustained. It is highly essential to document innovations and traditional knowledge and disseminate them further by various organizations. Involvement of research institutions is quite critical to understand and blend the traditional innovations with scientific refinements for their large scale adoption and popularization. Innovative technologies identified in one region need to be popularized in similar eco-regions elsewhere, through publication, documentation and dissemination of “success stories”. Agro-tourism around farmer’s innovative efforts would not only generate greater public awareness but would also help in revenue generation and greater community involvement in protecting our rich biodiversity. Hence, there is an urgent need to have institutional reforms especially for better coordination, convergence and efficiency. And the scientific talents behind such grass root level innovations need to be recognized and encouraged. Benefits accrued from such innovative ideas need to be widely shared across the country. Mainly the objective of this paper is mainly to get thorough understanding of the role of institutions in promotion of farmer led innovations and suggest effective strategies in up scaling and out scaling of grass root innovations.

Keywords: Farmer led innovations, Upscaling, Institutional interventions
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Value Chain Mapping: A Powerful Tool for Analyzing Value Addition to Agricultural Produce

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A value chain is the full range of activities which are required to bring a product of service from conception, through different phases of production involving a combination of physical transformation and the input of various produce services and its delivery to final customers and final disposal. The chain actors who particularly transact a particular product as it moves through the value chain include input supplier, farmers, traders, processors, transporters, wholesalers, retailers and final consumers. Value chain analysis includes both quantitative and qualitative tools. A qualitative analysis is used first which is followed by a quantitative approach. A value chain sums up the addition of value as the product progresses from input supply to production to consumption. Value chains are also the paths through which finance (revenues, credit and working capital) move from consumers to producers; technologies are disseminated among producers, on customer demand preferences are transmitted from consumers to producers and processors. In reality value chains are more complex than the above example. A value chain of *Phyllanthus emblica* (aonla) was identified in Udaipur district of Rajasthan in 2012. Value addition in Aonla can be done to make candy, murabba, aonla powder and juice. Various players of the chain starting from seed supplier, herbicide and pesticide suppliers, fertilizer suppliers to local processors, cooperative marketing units, local wholesaler, retail market and consumers were mapped. The input and output chains comprised more than one channel and these channels supplied to more than one final market. Comparative analysis of per hectare cost and returns of production and value addition of *Phyllanthis emblica* was done through different value chains. The per quintal and per hectare net returns from value addition in Aonla by processing it into Aonla powder were Rs 6500 and Rs. 13,00,000. The per quintal and per hectare net returns from value addition in Aonla by processing it into Aonla juice were Rs 1980 and Rs. 3,96,000.

**Keywords:** Value addition, Anola, Value chain
Session 2

Farmer-Led Innovations, Specialty and Secondary Agriculture for Rural Prosperity
Role of PPV&FR Act 2001 in Promoting Farmers’ Innovations

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1. Introduction

Recognizing the need to conserve crop diversity and to protect the rights of the breeders, farmers and communities is a matter of global interest and International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture, Convention on Biological Diversity (CBD), Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO), Convention of the Union for the Protection of New Varieties of Plants (UPOV) and World Intellectual Property Organization (WIPO) of the United Nations (UN) are among the international agreements which have been instrumental in effectively handling these issues. In 1961, five European countries agreed to provide sui generis (of its own kind; unique) intellectual property rights to plant varieties and formed the International Union for the Protection of New Varieties of Plants (UPOV) which provided for the rights of plant breeders, and prohibited two or more types of protection to a particular plant species. The UPOV Acts underwent three amendments in 1972, 1978 and 1991. The third amendment of UPOV Act, UPOV Convention (1991) requires that member countries provide a monopoly of limited duration to reward the development of new plant varieties by way of an exclusive property right, often called “Plant Breeder’s Rights” (PBRs).

The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), an international agreement administered by the WTO, set standards for many forms of intellectual property (IP) regulation. The Article 27.3 of TRIPS states that “Members may also exclude from patentability (a) diagnostic, therapeutic and surgical methods for the treatment of humans or animals; (b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof”.

Keeping in view the national requirement and international commitment under Article 27(3) (b) of TRIPS Agreement, India adopted a sui genesis system for plant variety protection and Government of India enacted the “Protection of Plant Varieties and Farmers’ Rights (PPV&FR) Act, 2001” with farmers’ rights being the unique feature emphasizing farmers’ rights as positive rights. The Act provides intellectual property rights not only to plant breeders but also to the farmers by protecting new, extant and farmers’ varieties. The PPV&FR Act provides an effective system for protection of plant varieties and rights of farmers and plant breeders and encouraging development of new varieties, recognizing and protecting the rights of farmers in respect of their contribution made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties. The objective of the Act is to facilitate the growth of seed sector for ensuring the availability of quality seeds and planting material to the farmers. In light of FAO and CBD Agenda 21 and also keeping in view of the millions of farming community whose ingenious conservation of land races and wild types were the corner stone of plant breeding and Green Revolution in India that provides for food security to a more than one billion population, the PPV&FR Act, 2001, provides for an effective implementation of farmer’s rights.
Intellectual Property Rights is a monopolistic right given under the law for the innovation and for a specific period to prevent others from drawing a commercial advantage from the innovations of others. Although a number of IPRs are available, the Protection of Plant Varieties and Farmers’ Right (PPV&FR) Act 2001 in India is unique and takes care of the farmers, breeders and industry.

The Biological Diversity Act (BDA), 2002 of India aims at conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner. The Act regulates access to biological resources of India and also provides for benefit sharing in case of access to such resources. The objective of this Act is “to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.” Prior Informed Consent (PIC) is a principle incorporated in the Act.

The Convention on Biological Diversity (CBD) is the main international instrument for addressing biodiversity issues. It provides a comprehensive and holistic approach to the conservation of biological diversity, the sustainable use of natural resources and the fair and equitable sharing of benefits deriving from the use of genetic resources.

CBD Article 8 (j) provides that:

“Each Contracting Party shall, as far as possible and as appropriate, subject to its national legislation respect and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity and promote the wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of benefits arising from the utilization of such knowledge, innovations and practices.”

This provision has relevance for farmers’ knowledge about agricultural and other practices.

One of the mechanisms by which the CBD achieves its objectives is in-situ conversation of plant genetic resources. In-situ conservation involves the preservation of ecosystems and natural habitats and the maintenance of viable populations of species in those natural settings. Such conservation occurs, for example, where farmers and indigenous communities safeguard traditional plant varieties in the locations where they grow naturally or are cultivated. It is appropriate to mention here that Article 16 of this Agreement deals with IPRs and it should be interpreted so as to preserve the rights of IPR owners recognized in international law.

The International Treaty on Plant Genetic Resources for Food and Agriculture, (2001) aims at the conservation and sustainable use of plant genetic resources for food and agriculture, the fair and equitable sharing of benefits arising out of their use, and sustainable agriculture and food security. It provides for a Multilateral System (MLS) to facilitate access to a negotiated list of plant genetic resources, of course on condition of fair and equitable sharing of benefits arising from the use of such plant resources. Genetic resources listed on the MLS are to be circulated freely. Ex-situ collections are also included under this treaty.

PPV&FR Act 2001 has also mandate for recognizing the contribution of the farmers in respect to the contribution of the conservation of plant genetic resources and make them available for the development of new varieties. This promotes innovation in terms of development of new varieties of plant and conservation of plant genetic resources in agro-biodiversity hot spot makes available unique germplasm which may be used for development of new varieties. The authority also promotes conservation efforts of farmers and the community by the way of awards and rewards recognition to the farmers and the community from the Gene Fund.
2. **Farmers’ Rights under PPV&FR Act, 2001**

Under the provisions of PPV&FR Act, 2001 farmers’ rights are covered under section 39 and gene fund under section 45. Under section 39 farmers’ rights includes farmers who bred or develop a new variety. The farmers also engaged in conservation and plant genetics resources of land landraces and wild relatives of economic plants and their improvement through selection & preservation are entitled for recognition and reward from the National Gene Fund.

The Act provides for the following shelters to the Indian farmers:

1. A farmer as the provision in the Act if bred or developed a new variety shall be entitled for registration in the like manner as a plant breeder.
2. The farmer is also entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a registered variety under the Act like wise entitled before the enforcement of the Act. Farmers are not entitled to sell branded seed of the variety registered under the Act.
3. Farmers’ Variety is the variety which has been traditionally cultivated and evolved by the farmers in their fields or is a wild relative or land race of a variety about which the farmers possess the common knowledge.
4. Registration of farmers variety: - farmers are entitled for the registration of the variety which were bred are developed by them.
5. Farmers are exempted from payment of any fees in respect any proceeding, inspection of any document or obtaining any decision/order/document under the Act before the Registrar/Authority/tribunal/High Court.
6. Compensation to the farmers: - farmers are entitled to the compensation in case of failure of expected performance by registered varieties under the given condition.
7. Rights of communities/ compensation - any person on behalf of any village community file any claim for compensation if the village or local community has contributed significantly to the evolution of the variety which has been registered under the PPV&FR Act, 2001. The Authority upon receiving objection from the registered breeder shall give an opportunity to breeder and determine the compensation which should be deposited in the Gene Fund within a period of two months.
8. Protection of innocent infringement: - A right established under the Act shall not be deemed to be infringed by a farmer who at the time of such infringement was not aware of the existence of such right and a relief in an infringement suit shall not be granted by court against a farmer who proves at the time of infringement he was not aware of the existence of the right so infringed.
9. Compulsory licence: - The Authority can grant compulsory licence after the expiry of three years from the date of issue of a certificate of registration of a variety on the ground of inadequate supply, unreasonable price to the public with the consultation on Central Government.
10. Benefit Sharing: -The claims after due examination and receiving counter-claims will be disposed by the Authority. The benefit claim will be decided after providing proper and fair opportunity to be heard to both the claimer and Breeder.

In addition to farmers rights, the breeders, researchers and community rights were also framed in the PPV&FR Act, 2001 as follows:

**A. Breeders’ Rights:** Breeders will have exclusive rights to produce, sell, market, distribute, import or export the protected variety. Breeder can appoint agent/licensee and civil remedy in case of infringement of rights.
B. **Researchers’ Rights:** Researcher can use the variety using such variety for conducting experiment or research, use of the variety as an initial source of variety for the purpose of developing of another variety but repeated use requires prior permission.

C. **Community Rights:** Under section 41 any person on behalf of any village community file any claim for compensation if the village or local community has contributed significantly to the evolution of the variety which has been registered under the PPV&FR Act, 2001. Compensation to be determined by the Authority and deposited in National Gene Fund.

3. **National Gene Fund**

   A National Gene Fund has been established by the Govt. of India under PPV&FR Act, 2001. The contribution in the National Gene Fund is mainly for:

   - The benefit sharing received in the prescribed manner from the breeder of a variety or an essentially derived variety registered under the Act, or the propagating material of such variety or essentially derived variety, as the case may be;
   - The annual fee payable to the Authority by way of royalty;
   - The compensation deposited by breeders and
   - The contribution from any National and International organization and other sources.

   The Gene Fund is meant for:

   - Payment of benefit sharing and compensation to village and local communities and
   - Supporting the conservation and sustainable use of genetic resources including in-situ and ex-situ conservation and strengthening the capability of panchayats in carrying out such conservation and sustainable use.

**Awards under PPV&FR Act:** PPV&FR Authority has constituted two types of awards to farmers viz; community award and individual farmers reward and recognition

3.1 **Plant Genome Savior Community Awards**

   While the contribution of agricultural scientists in the advancement of agriculture is measurable and quantifiable in the form of desired outcome, the contribution of large number of individual farmers and farming communities who are engaged in agriculture for generations in conserving the plant genetic resources who have contributed significantly in the development of improved varieties goes unnoticed. To recognize their important contribution and role in enhancement of quality in research and development in agriculture, PPVFR Authority confers annually Plant Genome Savior Community Awards from the National Gene Fund. The award consists of Rs. 10 lakhs in cash along with citation and memento. A maximum of 5 such awards are conferred every year to communities/tribal communities. The selection of awardee (s) is done by a high level national committee.

   The Award is open to all Indian farming communities, particularly the tribal and rural communities engaged in conservation, improvement and preservation of plant genetic resources of economic plants and their wild relatives particularly in the areas identified as agro-biodiversity hotspots. The applicants are required to submit evidences in support of the conservation work done by them, provide seeds/planting material of the conservation varieties, brief proposal for the utilization of the award money in community welfare and also to inform if the material has been utilized by any breeders in developing any other improved varieties etc.

   Rule 70(2)(a) of PPV&FR Rules, 2003 provides that Gene Fund could be utilized to support and reward farmers, particularly the tribal and rural communities engaged in conservation, improvement and preservation of genetic resources of economic plants and their wild relatives, particularly in areas identified as agro-biodiversity hotspots. To energise and implement the said Rule, the PPV&FR Authority initiated Plant Genome Savior Community Awards.
3.2 Plant Genome Savior farmers reward and recognitions

Section 39 of PPV&FR Act, 2001 confers the power to the central Govt. to make rules for reward and recognition to individual farmers namely Plant Genome Savior farmers reward and recognition. In reward and recognition maximum ten farmers are rewarded which comprises of citation, memento and cash of Rs. 1 lakh each.

Till 2013, the Authority has rewarded ten farming community with PGSC Award; ten farmers with Farmer award and recognised twenty nine farmers/communities for their conservation work.

Details of the awards, rewards and recognitions are given below-

<table>
<thead>
<tr>
<th>Awards/ Reward/ Recognition</th>
<th>Awarded</th>
<th>Since</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Genome Saviour Community Awards (max. 5, consisting of a citation, memento and cash of Rupees Ten lakh each)</td>
<td>10</td>
<td>2009-10</td>
</tr>
<tr>
<td>Plant Genome Saviour Farmer Reward (max. 10, consisting of citation, memento and cash of Rupees one lakh each)</td>
<td>10</td>
<td>2012</td>
</tr>
<tr>
<td>Plant Genome Saviour Farmer Recognition (max. 20, consisting of a citation and memento)</td>
<td>15</td>
<td>2012</td>
</tr>
</tbody>
</table>

4. Registration of Plant Varieties of Farmers

The PPV&FR Authority follows a broad principle of internationally recognized system of Distinctiveness, Uniformity and Stability (DUS) and Novelty for a new variety. Any person can apply for registration of any of the following categories of varieties:

- New Variety: A new variety should conform to the criteria of novelty [not been sold or otherwise disposed of in India, earlier than 1 year and outside India (in case of trees and vines earlier than six years, or, in any other case, earlier than four years)], distinctiveness (for at least one essential character from all varieties of common knowledge), uniformity (sufficiently uniform in its essential characteristics) and stability (if its essential characteristics remain unchanged after repeated propagation, or, in the case of a particular cycle of propagation, at the end of each cycle).

- Extant Variety means a variety available in India which is
  o notified under section 5 of Seeds Act, 1966,
  o about which there is a common knowledge;
  o in public domain,
  o farmers’ variety
    ▪ that has been traditional by cultivated and evolved by farmers in their fields,
    ▪ is a wild relative or landrace about which farmers possess common knowledge.

- Essentially Derived Variety: In respect of the initial variety, shall be said to be essentially derived from such initial variety when it:
  o is predominantly derived from the initial variety, or from a variety that itself is predominantly derived from initial variety, while retaining the expression of the essential characteristics that results from the genotype or combination of genotypes of initial variety;
  o is clearly distinguishable from such initial variety; and
  o conforms (except for the differences which result from the act of derivation) to such initial variety in the expression of the essential characteristics that result from the genotype or combination of genotype of such initial variety;
Authority has developed crop specific “Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability’ which provide detailed practical guidance for the harmonized examination of DUS of the candidate variety and, in particular, to identify appropriate characteristics for the examination of DUS. Many more crop species are at final stage and will be notified and opened for registration in the due course of time. So far the Authority has notified DUS test guidelines for 88 crop species which are open for the purpose of registration and protection of plant varieties in these genera and species is given below-

CROP SPECIES (88) NOTIFIED FOR REGISTRATION

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>Crop Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>9</td>
<td>Bread wheat, Durum wheat, Dicoccum wheat, Other Triticum species, Barley, Rice, Pearl millet, Sorghum, Maize</td>
</tr>
<tr>
<td>Legumes</td>
<td>7</td>
<td>Chickpea, Mungbean, Urdbean, Field pea, Rajmash, Lentil, Pigeon pea</td>
</tr>
<tr>
<td>Fibre Crops</td>
<td>6</td>
<td>Diploid cotton (two species), Tetraploid cotton (two species) and Jute (two species)</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>11</td>
<td>Indian mustard, Karan rai, Rapeseed, Gobhisarson, Groundnut, Soybean, Sunflower, Safflower, Castor, Sesame and Linseed</td>
</tr>
<tr>
<td>Sugar Crops</td>
<td>1</td>
<td>Sugarcane</td>
</tr>
<tr>
<td>Vegetables</td>
<td>14</td>
<td>Tomato, Brinjal, Okra, Cauliflower, Cabbage, Potato, Onion, Garlic, Ginger, Turmeric, Bottle gourd, Bitter gourd, Pumpkin, Cucumber</td>
</tr>
<tr>
<td>Flowers &amp; Ornaments</td>
<td>9</td>
<td>Rose, Chrysanthemum, Bamboo Leaf Orchid, Spray Orchid, Vanda or Blue Orchid, Orchids (Cattleya, Phalaenopsis), Orchid (Oncidium), Bougainvillea</td>
</tr>
<tr>
<td>Spices</td>
<td>4</td>
<td>Black pepper, Small cardamom, Coriander, Fenugreek</td>
</tr>
<tr>
<td>Fruits</td>
<td>14</td>
<td>Mango, Almond, Walnut, Cherry, Apricot, Apple, Pear, Pomegranate, Grape, Ber, Acid lime, Mandarin, Sweet orange, Banana</td>
</tr>
<tr>
<td>Medicinal and Aromatic plants</td>
<td>5</td>
<td>Isabgol, Menthol mint, Damask Rose, Periwinkle, Brahmi</td>
</tr>
<tr>
<td>Plantation crop</td>
<td>8</td>
<td>Coconut, Eucalyptus (two species), Casuarina (two species), Tea (three species)</td>
</tr>
</tbody>
</table>

Farmers can register their varieties under any category as any other breeder. The duration of protection under various categories is given below:

<table>
<thead>
<tr>
<th>Period of protection (in Years)</th>
<th>Total</th>
<th>Initial period</th>
<th>Extended period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees &amp; Vines</td>
<td>18    from date of registration</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Other Crops</td>
<td>15    from date of registration</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Extant Notified varieties</td>
<td>15    from date of notification of variety under the Seeds Act, 1966 by the Central Govt.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The details of the applications received are as follows:

<table>
<thead>
<tr>
<th>Application received year-wise/applicant-wise</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>287</td>
<td>322</td>
<td>193</td>
<td>31</td>
<td>125</td>
<td>129</td>
<td>141</td>
<td>122</td>
<td>1350</td>
</tr>
<tr>
<td>Private</td>
<td>143</td>
<td>220</td>
<td>368</td>
<td>505</td>
<td>295</td>
<td>266</td>
<td>534</td>
<td>381</td>
<td>2712</td>
</tr>
<tr>
<td>Farmer</td>
<td>2</td>
<td>5</td>
<td>127</td>
<td>4</td>
<td>941</td>
<td>304</td>
<td>1002</td>
<td>1947</td>
<td>4332</td>
</tr>
<tr>
<td>Total</td>
<td>432</td>
<td>547</td>
<td>688</td>
<td>540</td>
<td>1361</td>
<td>699</td>
<td>1677</td>
<td>2450</td>
<td>8394</td>
</tr>
</tbody>
</table>

The details of the certificates issued are given below:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>-</td>
<td>-</td>
<td>149</td>
<td>49</td>
<td>95</td>
<td>154</td>
<td>154</td>
<td>219</td>
<td>820</td>
</tr>
<tr>
<td>Private</td>
<td>-</td>
<td>-</td>
<td>16</td>
<td>-</td>
<td>21</td>
<td>55</td>
<td>104</td>
<td>118</td>
<td>314</td>
</tr>
<tr>
<td>Farmer</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>46</td>
<td>417</td>
<td>469</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>168</td>
<td>49</td>
<td>116</td>
<td>212</td>
<td>304</td>
<td>754</td>
<td>1603</td>
</tr>
</tbody>
</table>

5. Creation of Awareness, capacity building and trainings for the farmers

To create awareness and capacity building amongst the farmers about their Rights under the Act, a farmers’ cell has been established in the Authority under the supervision of the Registrar. Funds are remitted by the Authority for conducting awareness, capacity building and training programs for creation of awareness among the farmers with the ICAR, CSIR, ICFRE institutes, KVKs/SAUs academic institutions, societies and NGOs as resource centres. Measures are also been taken for creation of awareness through vernacular press, radio, television etc.

The module for the awareness, capacity building, training programs include provision and implementation of the PPV&FR Act, 2001 procedures for registration of extant, new and farmers varieties, agro-biodiversity hot spots- provisions under PPV&FR Act Farmers’ Rights and their implications, DUS test guidelines, maintenance breeding in relation to DUS procedures, achievements of the Authority, Biological Diversity Act, 2002- features, procedures, implementation and field visit.

Support is also being provided to Biodiversity Management Committees for Panchayat level activities for conservation and preservation of Plant Genetic Resources, with the involvement of the KVKs and State Biodiversity Boards.

6. DUS testing and centers

Distinctiveness, Uniformity and Stability (DUS) test can characterize and generate an official description of a variety seeking plant breeders’ rights to identify the distinct characters. To ascertain distinctiveness in the field based test, a comparison of the candidate variety with morphologically similar reference varieties of common knowledge is generally done. These varieties of common knowledge can include extant varieties, VCKs/registered var/Farmers’ varieties. Provisions are as follows:

(i) New variety: a new variety is tested in a replicated trial in comparison with suitable reference varieties of common knowledge over two similar growing seasons at two locations to determine DUS.

(ii) Varieties of common knowledge: similar test but for one season

(iii) Farmers’ variety: Grow out test for one season at two locations
Trees and vines: The testing shall be field and multi-location for at least two similar crop seasons and there is an option for on-site testing.

In case, field based DUS testing fails to resolve distinctiveness, “Special Tests” (which can be on physical, biochemical, molecular, response and organo-leptic parameters) can be undertaken. Guidelines for testing for each crop species are notified in the Plant Varieties Journal of India for locations, descriptors, plot size, replication, plant population, manner of data recording etc. Authority developed DUS infrastructure in more than 68 centres at ICAR institutes/SAUs/other research organisations since 10th Plan, developed crop specific guidelines and entrust these centres to characterize reference/example varieties.

7. Conclusion

The Indian PVP&FR Act is an effective sui generis system providing a balance between plant breeders’ rights along with farmers’ rights and researchers’ rights. The practice of small, marginal farmers to exchange the harvested material with others are essential for their livelihood and being practices not only in India but to a large extent to most of the developing countries in Asia-Pacific. All efforts are being made by PPV&FR Authority to implement different provisions of the PPV&FR Act and also to make the availability of quality seeds of registered varieties but also to support farm families for conservation and sustainable use of genetic resources including in-situ and ex-situ collections and for strengthening the capability of the stakeholders in carrying out such conservation and sustainable use. The farmers can take advantage of this Act to get IPR on their innovations in the form of improvements in plant varieties and also for their role in their preservation and conservation of landraces and traditional varieties.
A Scale to Measure Attitude of Farmers towards Rapeseed Mustard Crop

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A summative type of rating scale based on Likert’s technique was developed to measure the attitude of the farmers towards rapeseed mustard crop. A tentative list of 40 statements was drafted keeping in view the applicability of statements suited to the area of study. The statements drafted were edited in the light of the informal criteria suggested by Thurstone and Chave, Wang, Bird, Edward and Kilpatrick and after consulting the experts 13 statements were eliminated. These statements were framed in a way that they expressed the positive or negative attitude towards rapeseed mustard cultivation. The statements were written in local language to avoid any ambiguity while administrating these to the farmers. These statements were administered on 52 respondents, comprising 26 respondents each from Suchetgarh and Gazia Villages of R.S. Pura block of Jammu district. The score of each individual respondent was calculated by summing up the score of each respondent for individual statements. On the basis of total score, 25 percent of the respondents with the highest total score and also 25 percent of the respondents with lowest total scores were taken assuming that these two groups provide criterion group that is high and low in terms of which to evaluate the individual statements. In order to find out the discriminating index for each statement, ‘t’ value was calculated using the formula and procedure given by Edward. The ‘t’ values calculated for 27 statements range between -1.68 to 3.34 and the statements with ‘t’ value greater than 1.75 were retained out of which 9 were positively worded and 7 were negatively worded.

Keywords: Attitude, Rapeseed mustard, Summated rating scale, Item analysis
Adoption of Improved Animal Husbandry Practices by Dodhi Gujjar in Jammu District for their Sustainable Livelihood

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Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu
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A study was conducted in Jammu district of Jammu and Kashmir, with a view to find out the adoption of improved animal husbandry practices by Dodhi Gujjar. The data was collected from 120 Gujjar respondents belonging to Jammu district with the help of a structured interview schedule containing selected dependent and independent variables, through personal interview technique. Majority of the respondents were middle aged with low education level and most of them were involved in caste occupation with low social participation and poor extension contacts. The respondents had medium herd size of 15-54 animals, with poor mass media exposure level. The overall risk orientation of the respondents was low, however they fared well in terms of economic motivation and most of them had no exposure to training. The respondents had medium level of adoption of improved animal husbandry practices (33.27%). Majority of respondents (70%) were having medium adoption whereas 18.3 percent had low and 11.7 percent had high adoption. Adoption of respondents was the highest for improved breeding practices (58.45%), followed by improved feeding practices (32.85%). Lowest adoption scores were observed for improved management practices (24.52%), followed by improved healthcare practices (26%). Age, occupation and herd size were negatively and significantly related to adoption. Education, social participation, mass media exposure, risk orientation and exposure to training were significantly and positively associated with adoption.

Keywords: Animal husbandry practices, Gujjar, Adoption
Adoption of Improved Gram Production Technology under Front Line Demonstrations

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Krishi Vigyan Kendra, Pratapgarh has conducted 88 front line demonstrations on gram in 35.2 ha area under real farming situations in 2012 in the farmer's fields of six adopted villages namely Avleshwar, Basad, Dalmu, Dhamotar, Manohargarh and Kherot of Pratapgarh. The area under each demonstration was 0.4 ha (1 acre). Before conducting front line demonstrations a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation. All the 6 villages where FLDs were conducted by KVKs were included in the study. The total sample size was 176 consisting of 88 beneficiary and 88 non-beneficiary farmers. The field demonstrations conducted under the close supervision of the scientists of the national agricultural research system is called front line demonstration because the technologies are being demonstrated for the first time by the scientists themselves, before; it is fed into the main system of the State department of agriculture. Gram is called chickpea or gram in South Asia and Garbanzo bean in most of the developed world. Gram is a major pulse crop in India and is widely appreciated as a health food. It is a protein-rich supplement to cereal based diets, especially to the poor in developing countries, where people are vegetarians or cannot afford animal protein. It offers the most practical means of eradicating protein malnutrition among vegetarian children and nursing mothers. It has a very important role in human diet in our country. There was significant difference in existing adoption of beneficiary and non-beneficiary farmers with respect to gram production technology.

Keywords: Gram, Front line demonstration, Production technology, Adopted villages
2.04

Agricultural Waste Utilization for Clean Environment and Sustainable Living

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The study was conducted in two districts of Haryana state namely, Hisar and Sonipat, from each district two blocks, from each block three villages and from each village, ten farmers were selected randomly. Thus, total one hundred twenty farmers were selected and interviewed with the help of a well-structured schedule. The study indicated that utilization of biogas plant waste and mushroom waste was very high, utilization of livestock waste, poultry waste and mushroom waste was medium, utilization of horticultural wastes, floricultural wastes and cotton waste was low and utilization of wheat crop waste, paddy crop waste and sugarcane crop waste was very low. Thus, overall awareness about utilization of agricultural waste was very high but utilization of agricultural waste by the farmers was very less. Results pertaining to benefits to farmers after utilization of agricultural waste revealed that most of the farmers were benefited in very ordinary ways like high milk yield, addition income by selling waste to brickyards, reduced expenditure on chemical fertilizers, reduced waste available for disposal, clean and safe environment, etc. Very few farmers were employed, as there were very few employment opportunities in villages. Employment opportunities will increase if industries like processing units for making value added products, handicrafts industries for making bags, mats, hats, carpets, etc., handmade paper industry, development of waste collection centers in villages and others are developed in villages. The study further results that majority of farmers showed their consent for getting benefits via getting additional income from composting of waste, biogas production, mushroom cultivation, selling wastes to power plant, selling wastes to paper industry, selling to brick yard etc. Farmers were benefited because of less expenditure on chemical fertilizers, Increase in crop production, Better quality of produce and Sustainable development. Agri waste management renders benefits to community also by promotions to rural artisans. (Hats, mats, mattress, bags, baskets, etc.), empowerment of women through small scale industries, (Handicrafts, processing, etc.), clean surroundings, better employment opportunities, decreased pressure on government for importing chemical fertilizers etc. Agri waste management proved benefits to environmental benefits via improvement in soil heath, improvement in water retention capacity of soil, reduction in air pollution due to less burning of agricultural waste, reduction in water pollution, more use of organic fertilizers, less emission of carbon dioxide in atmosphere, clean and safe environment.

Keywords: Agricultural waste, Management & utilization, Agriculture diversification, Sustainability and environment

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Olive is a small tree of the oleaceae family and is native to the coastal areas of eastern Mediterranean (Italy and Spain), northern Iraq and northern Iran south of the Caspian Sea. Its fruit adorns salads, but is used primarily to extract olive oil, one of the most expensive cooking oils. The increasing awareness of olive oil by consumers around the world has encouraged investors to plant olive groves in many countries outside the traditional production area of the Mediterranean. In the world, the olive is grown in Italy, Spain, Greece and Portugal. In India, it is grown in Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh. In J&K, it is grown in Uri and Ramban. The study on training needs for olive growers in olive cultivation in Uri block of district Baramulla indicated that majority of farmers require training with special emphasis on latest technology in establishing olive farm, procurement of root stocks of improved varieties, soil management, proper spacing and planting, manures and fertilizers, irrigation and drainage, insect-pests and diseases, harvesting and marketing, etc. The area of insect-pests and diseases require ‘high’ extent of training need followed by soil management, selection of varieties, manures and fertilizers, harvesting and marketing, irrigation and drainage, establishing olive farm and procurement of root-stocks of improved varieties.

Keywords: Olive growers, Training needs
Assess the Attitude Level of Agricultural Students towards Vermiculture Technology

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Access to the information and improved communication is a crucial requirement for sustainable agricultural development. In India, most of the villagers are engaged in agricultural activities, but at present, agricultural landholding per head is decreasing and demand of food according to population increasing. The regular use of fertilizers and agrochemicals has not only aggravated multi nutrients in soil plants system and also deteriorate soil health by generating nutritional imbalance, reduction in soil biomass and organic matter. Vermi-compost is one of the most valuable compost, which is rich in plant nutrients, beneficial microflora, several enzymes and growth regulators, vermi-compost is free from pathogenus, toxic elements, weeds, seeds etc. The attitude level for agriculture students towards vermiculture technology is important for the need of vermi compost for improvement in soil fertility, crop production, soil maintance and environmental hygine. The study to assess the attitude level was undertaken in Bikaner district of Rajasthan. The respondents were selected from Agriculture College and the procedure for selection of respondents was random. The structured questionnaire schedule consisted of section for attitude scale developed by Likeart’s. In attitude scale there were 23 statements (12 favourable and 11 unfavourable) which was administered to the 50 respondents. The responses were obtained on five point continuum namely “Strongly agree” “Agree” “undecided”, “Disagree” and “Strongly disagree” with weightage of 5,4,3,2, and 1 respectively for favourable statement of weightage of 1,2,3,4 and 5 respectively for unfavourable statement. Attitude score of the respondents was calculated by adding up the score of all the statements and due care was exercised while selecting and working the statements so as to cover all the relevant aspects of vermiculture technology thus, ensuring a fair degree of content validity. The scale was found to be reliable and valid. Therefore, it would correctly measure the attitude of agriculture students towards vermiculture technology of the maximum precision possible. Further, study clearly shows that majority of respondents (58% and 42%) had neutral to favourable attitude towards the vermiculture technology. None of the respondents had most favourable, unfavourable, most unfavourable attitude towards the vermiculture technology.

Keywords: Attitude level, Vermiculture, Vermicompost
Attiude of Agricultural Students towards Vermiculture Technology

Priyanka Matted and Jyoti Rajvi
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Access to the information and improved communication is a crucial requirement for sustainable agricultural development. In India, most of the villagers are engaged in agricultural activities but at present agricultural landholding per head is decreasing and demand of food according to population increasing. The regular use of fertilizers and agro-chemicals has not only aggravated multi-nutrients in soil plants system and also deteriorate soil health by generating nutritional imbalance, reduction in soil biomass and organic matter. Vermicompost is one of the most valuable compost, which is rich in plant nutrients, beneficial micro flora, several enzymes and growth regulators, vermicompost is free from pathogens, toxic elements, weeds, seeds etc. The attitude of agriculture students towards vermiculture technology is important for the need of vermi compost for improvement in soil fertility, crop production, soil maintenance and environmental hygiene. A study to assess the attitude level was undertaken in Bikaner district of Rajasthan. The respondents were selected from Agriculture College and the procedure for selection of respondents was random. The structured questionnaire schedule consisted of section for attitude scale developed by Likeart’s technique. In attitude scale there were 23 statements (12 favourable and 11 unfavourable) which were administered to the 50 respondents. The responses were obtained on five point continuum namely “Strongly agree” “Agree” “Undecided”, “Disagree” and “Strongly disagree” with weightage of 5, 4, 3, 2, and 1, respectively for favourable statement of weightage of 1, 2, 3, 4 and 5, respectively for unfavourable statement. Attitude score of the respondents was calculated by adding up the score of all the statements and due care was exercised while selecting and working the statements so as to cover all the relevant aspects of vermiculture technology thus, ensuring a fair degree of content validity. The scale was found to be reliable and valid. Therefore, it would correctly measure the attitude of agriculture students towards vermiculture technology of the maximum precision possible. Further, study clearly shows that majority of respondents (58% and 42%) had neutral to favourable attitude towards the vermiculture technology. None of the respondents had most favourable, unfavourable, most unfavourable attitude towards the vermiculture technology.

Keywords: Attitude, Vermicompost
2.08

Changes in Biochemical Constituents of Fruiting Substrates with the Activity of *Ganoderma* spp.

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*Ganoderma* is a very high valuable medicinal mushroom, which is well recognized as a “miracle herb” due to its effectiveness in treating broad range of diseases and disorders. The fruiting body of *G. lucidum* is popularly known as “Reishi” in Japan and “Lingzhi” in China. Being as an oldest medicinal mushroom, it is used for more than 2,000 years in Traditional Chinese Medicine (TCM) Recent studies on this mushroom have demonstrated many interesting biological activities, including antitumour), hypotensive, cytotoxicity anticomplementary, antimicrobial hepatoprotective hypolipidemic, anti-diabetic and anti-inflammatory effects. Recently, this mushroom came into spotlight as a specific medicine for cancer as it cleanse the body from toxins and strengthen the immune system. The anti-cancer agents in *Ganoderma* are the polysaccharides and Germanium. The polysaccharide fraction of *Ganoderma* is largely responsible for its antitumor efficacy. Indications for *Ganoderma* use in cancer include supplementation a) to reduce side-effects during chemotherapy or radiotherapy, b) to prolonging survival and minimize metastasis, c) to improve quality of life, and d) to prevent occurrence or recurrence. It enhances liver detoxification, thus improving liver function and stimulating the regeneration of liver cells - making it a very important supplement for those who have liver cancer. Qualities of *Ganoderma* that help in the treatment of cancer include: enhancing and regulating the immune and endocrine system, prevent tumors, improving the circulation and eliminating harmful free radicals, Inhibits DNA synthesis of the cancer cells, destroys the terminal enzyme activity of the tumor cells, promotes macrophages and regulates T and B lymphocytes, thus restraining the spread of cancer cells.

Chhattisgarh state of India is rich in mushroom with high diversity which is still to be conserved and identified. *Ganoderma* is a forest mushroom and several species of *Ganoderma* are still unidentified and unexplored. Tribal people of this state use mushrooms as medicine for healing wounds and pain since centuries. A study was undertaken to find out the amount of various bio-molecules present in *Ganoderma* spp. by utilizing various standard chemical methods. Wild collected sample of from *Ganoderma* spp. from different regions of Chhattisgarh was found to contain a perceptible amount of bioactive molecules. An increase in the degradation per cent was found in lignin, cellulose and total sugars by the activity of *Ganoderma* spp. from initial time and the time when the fungus reaches the fruiting stage. No trend was found in phenol content as it showed marked variation. Degradation of cellulose, lignin and total sugars was less after 20 days of inoculation but it increased rapidly when fungus reached to fruiting stage. No particular trend was found in phenol content as it showed marked variation at different stages.

**Keywords:** *Ganoderma* spp., Forest mushroom, Bio-molecules, Tribal people
Development of Scale to Measure Attitude of Tribal Livestock Owners towards Vaccination in Ruminants

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In India, animal husbandry sector makes significant contribution to the agricultural GDP. This sector has further potential to grow, if livestock and poultry management is addressed properly. However, the animal health has not received due attention in tribal areas that it deserves. The present study was conducted in Dahod district of Gujarat state to develop and standardize a reliable and valid scale due to non-availability of a proper scale to measure attitude of tribal livestock owners towards vaccination in ruminants. The statistical methods “Scale product method” which combines Thurston’s technique of Equal Appearing Interval Scale for selection of the items and Likert’s technique of summated rating for ascertaining the response to the scale items were used. A tentative list of twenty five (25) statements was drafted in view of the applicability of statements suited to the area of study. The statements collected were edited in the light of the informal criteria suggested by Edwards. These statements were framed in such a way that they expressed the positive or negative attitude of tribal livestock owners. Scale and Q value were calculated by using Thurstone and Chave inter-quartile range. Finally the scale consisted of fourteen (14) statements. Reliability was tested with 20 non-respondents and reliability coefficient was 0.78.

**Keywords:** Reliable and valid scale, Vaccination in ruminants, Scale product method
2.10

Disease and Insect Pest Management in Apple: Farmers’ Perception and Adoption in Jammu & Kashmir

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Apple contributes 83 per cent of the total fruit production of J&K state and the annual turnover from the sale proceeds are estimated around Rs. 300 crore. The productivity of apple in J&K is around 12 tonnes per hectare, far below the level achieved by other countries (40-60 tonnes/ha). Diseases and pests are one of the limiting factors for low productivity of the crop. A study on disease and pest management of apple towards management of resources, extent of adoption and constraints in the recommendations of plant protection technology for increasing apple production in J&K state was undertaken. The study revealed that to increase apple production, farmers should conceive the disease and pest management as a complex function of possessing adequate knowledge and favourable perception about recommended plant protection technologies from reliable sources. Proper availability and efficient use of resources and eliminating constraints in technology and resource management to achieve high degree of adoption of technological innovations were outlined. It was concluded that growers socio-personal characteristics operating in the background were controlling the quality of management. A well planned systematic holistic approach with proper integration and interaction of the components of disease and pest management to achieve sustainable apple production was suggested.

Keywords: Apple, Adoption, Disease, Insect pest management and plant protection
Empowerment through Handloom Weaving

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Handloom sector is bread and butter for millions of families in India especially in rural areas. This sector provides livelihood opportunity, supplement incomes in seasons of agrarian distress, prevent migration and uphold traditional knowledge. It plays a vital role in terms of providing employment and cloth production. Fabrics produced through handloom have uniqueness, exclusivity of designs and can be produce in small batch sizes. Because of these qualities handloom products are in high demand in the national as well as international market. According to census 2009-2010, 77.90 percent women contribute the majority of weavers. A significant mass of weavers consisting of scheduled castes, schedules tribes and religious minorities. The sector accounts for approximately 15 percent of textile production and makes a significant contribution in export earnings. The Government of India introduced a number of policies and programmes namely. Integrated Handlooms Development Scheme, Marketing & Export Promotion Scheme, Mill Gate Price Scheme, Handloom Weavers’ Comprehensive Welfare Scheme and Diversified Handloom Development Scheme. The aim behind these policies is the infrastructure development, skill up-gradation, design and product development as per the market demand so that weavers get better remuneration for their products and health insurance of weavers. The present study is aimed at survey of various handloom weavers and weaving units at Uttarakhand with special reference to woven designs. Data for the study was collected from different categories of the respondents. These respondents belonged to both organized and unorganized textile sectors. Simple random sampling was used for the selection of respondents. Observation cum questionnaire method was used to assemble information. Results show that most of the weavers of Uttarakhand are interested to continue this work and want to start their own business. It’s also evident from the study that not much of them are aware about different designs through which they can titivate their products and only few items are able to make their place in international market. Thus by providing them knowledge concerning designs modification weavers can earn a reverential sum of money and their weaved products may see the face of international market.

Keywords: Empowerment, Handloom, Weaving, Designs
2.12
Entrepreneurship Development through Ornamental Fish Farming- A Case Study
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The growing interest in aquarium fishes has resulted in steady increase in aquarium fish trade globally. India’s share in ornamental fish trade is estimated to be less than 1% of the global trade. The development of entrepreneurship in ornamental fish farming and breeding by the Jammu farmers are nil due to the lack of awareness while the climatic condition of Jammu is suitable for its culture and breeding. The present study was conducted on one such successful farmer Sh. Girdhari Lal of Jammu district who started ornamental fish culture in the year 2014 after intervention of KVK Jammu. After an intensive round of consultations, motivation and exposure, he decided to adopt ornamental fish farming. Sh. Girdhari Lal was provided with 75 pairs of Koi carp of 3-6cm size under Front line demonstration. The culture of Koi carp was done in excavated fish pond of size 25’ x 20’ x 1.2’ with a regular monitoring of water quality parameters. Water level was kept at 1.0 meter by filling fresh water from pump set when needed. The various water parameters such as temperature, pH was determined daily during the period. Feeds offered contained readymade pelleted feed and homemade prepared feed including rice bran and mustard oil cake. Fishes were fed twice a day, in the morning and in the evening. The growth of the fishes were measured every month. In the 3rd week of December, the weight of fishes ranged from 500-700 gm each and were fetching a price of Rs. 150-500/piece. The net estimated earnings from the said practice would have been Rs. 20000. Sh. Girdhari Lal decided to keep the fishes as brood stock and breed the fishes for regular income every year and expected revenue generation would be to the tune of Rs. 40000 marking an increase of Rs 20000 in comparison to selling of brood stock. Even officials from Dept. of Fisheries, J&K also availed few brooders from him to reproduce this year. This is generating an impact on the fish farmers to culture and breed the ornamental fishes because most of the exotic species can be reared and bred easily to produce the seed by small-scale or back yard type of breeding units and the unit value of ornamental fish is higher than that of the food fish.

Keywords: Ornamental fish culture, Breeding, Entrepreneurship, Koi carp
Estimation of Post Harvest Losses in Mangoes at Different Stages from Harvesting to Consumption

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India has achieved self-sufficiency in food grain production but not in fruit production. In recent years, greater attention is being paid to horticulture, for better utilization and development of marginal, poor and wastelands, which are hardly suitable for economic cultivation of field crops. Horticulture has great potential for growth. Mango (*Mangifera indica* L.) is eulogized as the king of fruits which belongs to the dicotyledonous family *Anacardiaceae*. It is believed that the fruit originated from India and its cultivation has been traced back to more than 6000 years in the past. Groves and gardens of mango find mention in descriptions in the epics *Ramayana* and *Mahabharata* also. They are rich source of Beta-carotene, the precursor of vitamin-A, which is essential for the prevention of night blindness in human beings and rich source of vitamin-C also. However it is observed that post horeves is more in mango accounting to more than 15%. Hence, it is important to reduce losses in post harvest and increase the reduction, with thin banglore. The study was carried out in Dharwad and Belgaum districts of North Karnataka during the year 2003-04. Following the simple random sampling, 120 respondents were selected from six villages of two taluks. The data was elicited through personal interview method. The important findings of the study were; Majority (79.16%) of the respondents had followed manual harvesting by labourers, cent per cent of the respondents stored the mangoes on the ground itself. Majority of the respondents (81.66%) had used truck for transportation. Only 20.00 and 15.00 per cent of the respondents followed the processing for juice and pickle making, respectively. Majority (59.17%) of the respondents belonged to the middle age group. A considerable percentage of respondents (23.33) educated upto primary school. Post-harvest losses at farm level were quantified, which accounted for about 8.44 per cent. Losses at wholesale market including transportation accounted for about 4.93 per cent. Losses at retailing market, losses at storage unit and losses at consumer level accounted for about 5.46, 3.19 and 6.82 per cent respectively. Overall post-harvest losses in mango at different stages from harvesting to consumption were quantified which accounted for about 34.49 per cent.

**Keywords:** Post harvest losses, Horticulture, Mango
2.14

Ethno-Festive Foods of Karnataka, India- A Route to Foster Sustainable Rural Livelihood

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Food plays an important role in strengthening bond of friendship and belongingness. There has been considerable mixing of culture and cuisines since pre historic times. The foods prepared and served habitually during ceremonies, festivals and rituals are influenced by the ethno botanical resources. Traditional foods were considered as sacred and consumed during special occasions. These foods not only demonstrate the creativity and treasure of food heritage but also pave way for developing healthy community. Karnataka, a state in India has a rich heritage of festivals with a variety of ethnic foods prepared that signifies the festival and the occasion, like Sankranti (Madeli, Yellu bella), Ugadi (Hooggi, Bevu bella), Ganesh chaturthi (Modaka, Kadabu), Dasera (Holagi), Diwali (Karchi kai, Kodabalige, Chakkuli), Yellamavase (Hurakki holige) and many more regional ceremonies. The ethnic foods prepared in these festive occasions are tailored to suit to that particular season of the year and climate. This in turn fulfills the nutritional requirements of community. Festival foods encompasses five food groups of balanced diet like cereals, millets, pulses, oil seeds, raw vegetables, green leafy vegetables, fruits, milk and milk products, ghee, oil, jaggery, etc., which definitely influence nutritional status of the community. Madeli a wheat based traditional sweet of North Karnataka was documented by Pattan et al. (2001) which can also be prepared with bajra and Bengal gram already in practice in Raichur district of Karnataka. These traditional foods have scientific rationality in respect of nutritional and physiological requirement of farmers and wage workers in developing nations. In the present era, due to the changing scenario in the life styles of people, especially in urban and peri-urban areas of growing economy the traditional foods are becoming extinct from the dining table. A decline in consumption of traditional foods was reported by Kuhnlein (1989). Hence, it is imperative to provide knowledge on traditional food wisdom to the present generation to avert the process of extinction and there is need to hasten the process of preparation by using present day cooking gadgets. Significance of such traditional foods is more appreciable when nutritive value is taken in to cognizance.

Keywords: Festive foods, Traditional foods, Ethnic foods
2.15 Evaluation of Factors Affecting Adoption of Mustard Production Technology among the Farmers

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An evaluative study was conducted to find out the factors impacting adoption of rapeseed mustard production technology in Madhya Pradesh. The study revealed that, mustard covers about 7.41 lakh hectares with a production of 9.73 lakh tones and productivity 1313 kg/ha. During 2012-13, in India, mustard is grown in 6.3 Million hectare with a production and productivity of 7.4 million tones and 1176 kg/ha, respectively. Finding the study showed, 81 percent had more complete adoption, while 19 percent respondents had partial adoption about the sowing time. 18 percent had least complete adoption, while 82.00 per cent respondents had partial adoption about the use of micro nutrients.

Keywords: Evaluation, Adoption, Farmers
Evaluation of Work and Work Related Postures of Tailors

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Tailors are performing various activities to create new pieces of clothing from patterns and designs or alter existing garments to fit to the customers. Due to nature of these job tailors adopted awkward postures and repetitive motion, which cause musculoskeletal discomfort and occupational health hazards. The present study was undertaken to evaluate the various tasks performed by tailors, and work posture adopted by them, while operating the sewing machine. The study was conducted on 60 male respondents engaged with tailoring profession from Pantnagar (Uttarakhand, India). The result of postural analysis by RULA and REBA score indicate that more than 65%, 60% and 58% of the respondents were under in high risk when performing ironing, stitching and cutting activity at the workplace. The majority of the respondents reported that high rate of musculoskeletal discomforts were not avoided due to the job characteristic of tailors. The above findings indicate that the tailors were doing very hard but not realizing the risks of musculoskeletal discomforts associated with their workstation, tasks and working postures. Therefore, new low cost workstation design was proposed to the tailors of safety and health measures at the work place.

Keywords: Postures, Tailors, Discomfort
Family Farming for Sustaining Livelihood of Farmers

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Food and Agriculture Organization (FAO) declared year 2014 as ‘Family Farming’ year. Its objective is to raise the profile of smallholder family by focusing world attention on its significant role in eradicating hunger and poverty, providing food security and nutrition, improving livelihoods, managing natural resources, protecting the environment, and achieving sustainable development, in rural areas. Farmers in eastern India particularly in Chhattisgarh, cultivate vegetables in kitchen garden locally known as badi system which has tremendous potential for improving livelihood of smallholders. Hybrid vegetable seed, irrigation and skill development for vegetable production was imparted in 2010-11 to the farmers already practicing badi cultivation (114 nos.) as the basic interventions for promoting productivity of the system in charama cluster (villages Araud, Kotela and Hatkacharama) district Kanker (Chhattisgarh), India. The size of badi varied from 0.02 to 2.5 acres with an average of 0.70 acre and 80-90 percent badi’s were irrigated through shallow wells and tube wells. After intervention, the size of badi’s increased from 0.04-2.7 acres with an average of 0.82 acres and 90-95% percent irrigated badi’s. Farmers were growing crops thrice in a year under irrigated condition whereas one to one and half crops under rainfed condition. Major crops grown by the farmers were tomato, brinjal, cowpea, cauliflower, cabbage, coriander, chilli, bitter guard, lady finger, spinach, bottle guard, onion, potato, radish, ginger and turmeric. The badi area was divided for 2-4 crops in a season by the farmers depending on availability of resources and market. Significant improvement in vegetable yields were recorded before (2010-11) and after (2013-14) interventions. Annual net income from each badi system (0.70 acre) was Rs. 40730 before intervention and Rs. 82543 (1US $=60 Rs.) after intervention under rainfed condition. Farmers (based on average of 114 farmers) were getting Rs. 134400 and Rs. 292004 before (2010-11) and after (2013-14) interventions under irrigation condition. The cropping intensity increased from 144.7 to 155.1 percent under rainfed condition whereas, under irrigated condition, the intensity improved from 236.6 to 257.9 percent owing to interventions in the badi system. Farmers were harvesting produce daily and transporting throw cycles or motor cycles for selling in the local market. Thus, it can be concluded that the badi system is very attractive for survival and sustaining livelihoods of rural smallholder but support for skill development and adoption of improved package of vegetables including growing some fruit crops is required.

Keywords: Family farming, Bedi system, Vegetable cultivation.
2.18

Farmer Led Innovations

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S. Devinder Singh a progressive farmer of Nakodar, district Jalandhar, Punjab has 20 years experience of farming. He has done correspondence course in Agriculture from the Department of Extension Education, Punjab Agricultural University (PAU), Ludhiana, in the year 1990-91. For the last 20 years, he is associated with PAU and Krishi Vigyan Kendra, Jalandhar and attended all Kisan Melas organized at PAU. He is regularly visiting KVK, Jalandhar and PAU, Ludhiana for seeking latest knowledge and technology besides attending training camps extension activities organized by KVK, Jalandhar. To conserve natural resources, he installed micro-irrigation system on his farm, application of fertilizers on soil test basis, bed planting of crops for water saving, need based application of pesticides/chemicals, use of tensio-meter for applying the irrigation to rice, green manuring all land and using vermin-compost. He has established a protective cultivation unit of size 100’X27’ feet at his farm for off season cultivation of vegetables, nursery raising of vegetables and cultivation of pesticide free vegetables. He practiced various innovations at his field like intercropping of onion with cabbage, intercropping of onion with cucumber, multiple cropping of onion, tomato and coriander, multiple cropping of onion, capsicum and cucumber, intercropping of cabbage with marigold, intercropping of cucumber and marigold, off season cultivation of cucumber and water melon. One of his innovation namely intercropping of onion with cabbage selected by the ICAR at National Innovators’ Meet at KVK Mysore. He received various awards like Chief Minister Award for Innovative Farmer in Agriculture for the year 2013 by P.A.U., Ludhiana at Kisan Mela. He received S. Surjit Singh Dhillon Award (Self cultivating small farmer) for the year 2010 from PAU, Ludhiana. He is also member of various societies related to agriculture.

Keywords: Natural resources, Micro irrigation, Innovations, Intercropping, Multiple cropping
2.19

Farmer-Led Innovation of Sugarcane Cultivation for Rural Prosperity in Koderma, Jharkhand

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Sugarcane occupies an important position in an agrarian economy of India. About 6 million farmers and a large number of agricultural labourers are involved in cane cultivation. Besides, more than half a million skilled and semi-skilled workers, mostly from rural areas are engaged in the sugar industry, the largest agro-processing industry of India. The area under sugarcane is around 4.4 million hectares with an average productivity of 68 t/ha. The highest production of 355 million tonnes of cane has been achieved during 2006-07 crop season from an area of 5.15 million hectares. On an average, white sugar production accounts for nearly 60 percent of the total cane produced in the country, 15-20 percent sugarcane is utilized for gur and khandsari production and rest is utilized for other purposes including seed. In Jharkhand, an average 10-15 percent sugarcane production is utilized as a seed material. Krishi Vigyan Kendra, Koderma developed an innovated technology for sugarcane cultivation with farmer participation approach. Under this method, the farmers cut 2-3 pieces from top position of cane for planting purpose and rest portion is used for jaggery purpose. They make bundle for 100 sets, put it into 1-1.5 feet deep trench, then they cover the sets with leaves and fill the trench with soil and irrigate the trench after two days. They take out the sprouted set in bundle after 2 weeks for planting. The sprouted sets are then planted in furrow opened by desi plough at about 1.5 feet (line to line) by end to end method. Before planting the set, the farmers treat the sprouted sets with insecticide “malathion” and cow dung with kerosene oil. After completing the planting of whole field, planking is done followed by inter-culture operation by kudali after 2-3 days of planting. Farmers irrigate the field after one week of planting. This technology helps in increasing sugarcane yield and recovery of Gur and Jaggery by 20 percent.

Keywords: Farmer-led innovation, Sugar cane cultivation
2.20

Farmers’ Perception towards Extension Services of Private Organization

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Diverse agricultural extension funding and delivery arrangements have been undertaken since the mid-1980s by governments worldwide in the name of “privatization.” Privatization is used in the broader sense - of introducing or increasing private sector participation, which does not necessarily imply a transfer of designated state-owned assets to the private sector. In fact, various cost-recoveries, commercialization, and other so-called privatization alternatives have been adopted to improve agricultural extension. The privatize extension is carried on extension services for providing the various inputs, such as seeds, fertilizers, pesticides, farm machineries, post harvest tools etc. These private extension services are carried out by the private organization with the motive to sell their products as well as to increase their role in agricultural development. Various private organizations are operative in the district of Udhampur (Jammu and Kashmir) for carrying out extension services along with the government organization. The study revealed that the majority of farmers (72%) still had faith on government department extension services such as Department of Agriculture, SKUAST-Jammu, Department of Horticulture and other development departments. Only, 30 percent of the farmers has accessed private extension services for purchasing the inputs of agriculture. Among the various private extension services, the animal husbandry services ranked first, followed by the agriculture and horticultural service which ranked second and third while the extension service of fisheries ranked last i.e. IXth among the services utilized by the farmers.

Keywords: Privatization, Extension services, Farmers, Input supply
2.21

Flower and Bulb Production of Lilium at Farmers’ Field at High Altitude in Himachal Pradesh

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Floriculture is fast emerging as a major venture in the world scene. Improvement in the standard of living has a direct impact on demand of modern flowers. This was reflected earlier in Europe, USA and Japan and very recently in India also. The flowers have been used in social ceremonies and also for religious purpose. In Himachal Pradesh, Lilium crop is gaining popularity among the high altitude flower growers due to congenial climatic conditions of districts namely Lahaul & Spiti, Chamba, and Shimla. The genus Lilium belongs to the family Liliaceae. Lilies are native to northern hemisphere in Asia, Europe and North America and widely used in the floral industry as cut flowers and potted plants. Lilium is evaluated as a high income generating flower crop in Indian Floriculture industry. The flowers produced in the State are being sold in the domestic markets, especially in Delhi. Growers associations and co-operatives have been formed for marketing the flowers grown in the region. CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur (H.P.) is playing a very important role to promote floriculture industry in the State. The Institute is providing quality planting material of lilium to the growers either directly or through grower societies and regular training programmes are organized by the institute for the benefit of the farmers. The present demonstration was conducted to investigate the scope and economic viability of lilium cultivation in summer season in high altitude areas of Himachal Pradesh. It was observed that the climatic conditions of district Lahaul & Spiti is most suitable for lilium bulb as well as cut flower production. Two flower production societies namely Chandra Valley and Patan Valley Flower Associations were formed. The impact of this transfer of technology was realized by farmers through the sale of cut flower at Delhi flower market. It was analysed that the income generated by the cultivation of Asiatic hybrid lily was maximum as compared to other horticultural crops like Potato and Pea growing in Lahaul valley. They are growing lilium as intercrop under new apple orchard conditions. Lahaul valley is now known for production and supply of quality lilium cut flowers in domestic flower market.

Keywords: Floriculture, Growers association, Cooperatives, Intercropping
Formative Evaluation of Horticulture Mission for North-East and Himalayan States (HMNEH) in Resource Poor Rainfed Areas of Jammu District

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The Horticulture Mission for North East and Himalayan states (HMNEH) programme was launched by the Government of India in order to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies for ensuring an end-to-end approach covering production, post-harvest management, processing and marketing to assure appropriate returns to growers/producers. Besides, it aims at promoting R&D technologies for production, post-harvest management and processing. Formative evaluation of the HMNEH programme was conducted in Jammu district of Jammu and Kashmir state to analyze the worth and merit of the programme being implemented since 2003-2004. Multi-stage random sampling technique was employed for selecting the sample size of 50 beneficiaries covered under HMNEH. Interview schedule and adoptability rating scale was used for collection of the data. The collected data was analyzed by using parametric and non-parametric statistical tests. The relationship between the independent variables namely socio-personal, bio-physical and communication behaviour, and the dependent variable adoption of recommended technologies were analyzed using binary logistic regression model. The results showed that the beneficiaries established the mango orchards for the first time with the recommendation of Department of Horticulture (except four orchardists). The beneficiaries were less educated as 54 percent of them were illiterate, and had less farming experience (4.34 years). Source of information was an important variable which impacted the adoption decision of urea ($R^2=0.215$), DAP ($R^2=0.170$), and MOP ($R^2=0.295$) by the orchardists. The adoptability indices for recommended cultivars, pit size, manure and inter-cropping were: 0.50, 0.70, 0.92 and 0.67, respectively. The major constraints faced by the beneficiary mango orchardists were lack of irrigation facilities (78%), lack of knowledge (26%) and financial problems (2%). This study provides an empirical feedback to research and extension agencies in the Jammu region for making farmer specific research and extension endeavors in horticulture. Formative evaluation of the HMNEH programme is meant for development of the programme for its improvement by the implementing agency that is Department of Horticulture, Jammu.

**Keywords:** HMNEH, Resource poor, Rain fed, Adoptability.
Growing Mulberry and Vegetables as Companion Crops- A Novel Option for Sustainable Rural Livelihood under Kashmir Conditions

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Mulberry silkworm (Bombyx mori L.) is a monophagus insect feeding exclusively on the leaf of mulberry (Morus spp). The availability of quality leaf has a direct bearing on the success of silkworm rearing and is the major contributing factor towards it. In Kashmir, availability of less land with farmers, short growing period and possibility of only two crops at the farmers’ level makes the farmers reluctant to devote their land exclusively for mulberry cultivation, which consequently results in a shortage of leaf in the region and thus low cocoon production. The present paper explains the feasibility of using mulberry as a tree with short duration vegetables both during Rabi and Kharif seasons to help the farmers to get better returns per unit area and that too almost round the year, besides generating work for engaging the family labour. This can therefore provide a very good option for sustainable rural livelihood, popularization of sericulture and increased production of cocoons in the region.

Keywords: Mulberry, Vegetables, Sustainable rural livelihood
2.24

Herd Composition and Productivity of Dairy Animals in Female Headed Households: A Comparative Study with Male Headed Households

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Small scale dairy plays a vital role in the livelihood security of women in rural India. Despite this, even the work performed by these women are seldom recognized, although the responsibilities ultimately impinge on them. These responsibilities naturally increase in communities where women head the household due to widowhood, migration of male for employment or divorce etc. In India, there are 19,987,858 female headed households and out of this, Uttar Pradesh has 2,031,752. The present study has been carried out in Bareilly district of Uttar Pradesh. Ten female and ten male headed households were selected randomly from each of the 5 clusters comprising 50 villages and the data were collected through personal interview schedule. Eighty two per cent of the females, heading the households had small herd size with cattle equivalent score of 0.4-3.25 followed by 18 per cent of female headed households owned medium number of livestock size (3.25-6.10). 52 per cent of male headed households owned medium size of herd. Fifty eight per cent female headed households depended on single animals either cattle, buffalo or goats, however, male headed households owned large animals more in combinations. Majority of goats (35.24%) were reared by female headed households followed by desi buffaloes (32.38%) and desi cows (19.05%) as compared to male respondents who were rearing majority of desi buffaloes (33.54%). Twenty two per cent male headed households, achieved higher (112.75-144.15 litres) productivity of their milch animals in comparison to only 8 per cent female headed households.

Keywords: Livelihood security, Female headed households, Personal interview schedule
2.25

Housing Practices Followed by Crossbred Cattle Owners in Baramati Tehsil of Pune District

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One hundred fifty crossbred cattle owners were chosen randomly as respondents from the selected villages. These owners were distributed in three groups on the basis of crossbred cattle possessed by them as group-I less than 5 crossbred cattle, Group-II 6-10 crossbred cattle and group-III more than 11 crossbred cattle. It was found that, 53.33 percent farmers were having pacca cattle shed and remaining 46.66 percent were having kaccha cattle shed. It was observed that, 44.66 percent farmers were having thatched roofing, 50.66 percent farmers were having G.I. sheets and very few farmers 4.38 percent were using asbestos for roofing. The kaccha flooring was provided by 42.00 percent farmers while 54.66 percent farmers provided bricked floor and remaining 3.33 percent provided cemented type of floor for cattle shed. Disinfectant was adopted by 12.66 percent farmer while 87.33 percent did not use disinfectant in cattle house. It was observed that, 30 percent farmers were having adjacent location of manure pit and remaining 70 percent farmers at distinct location. The size of house was optimum for 65.33 percent of respondents while remaining 34.66 percent farmers were not having optimum size of cattle house. It was observed that, 80 percent farmers provided had optimum height of house while remaining 20 percent did not have optimum height of cattle shed. The optimum floor space was provided by 60.66 percent farmers while remaining 39.33 percent did not provide optimum floor space for cattle. The present study indicated that, adoption of scientific housing management practices were poor in Baramati tahsil of Pune district. Improper housing of livestock leads to stress in farm animals resulting in declined milk production particularly in summer season. To improve persistency of milk production proper housing for livestock is necessary which will eventually result in persistency in milk production and rural prosperity.

Keywords: Housing, Crossbred cattle, Baramati
2.26

Imbalanced Ration and Endoparasites: Limiting Factors in Milk Production in Hilly Regions of Rajouri

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Milk production is an important activity of Indian agriculture playing important role in the Indian economy and socio-economic development of the country. The fact that dairying could play a more constructive role in promoting rural welfare and reducing poverty is increasingly being recognized. However, lack of balanced ration and incidence of endo-parasitic infection in milch animals considerably reduce the productivity of milk. A survey was conducted in ten villages of district Rajouri to find out the yield potential and actual yield of milch animals of the area. The study revealed that though farmers are rearing improved breeds of cattle, yet the milk productivity is considerably low in hilly areas of the district. Average yield of milk per cattle was found to be 4.3 litre/day. The yield gap in the potential yield and actual yield was found out to be 45 per cent. It was found out that 87 per cent of the farmers were feeding their animals with imbalanced ration. The study also enlightened the fact that about 93 per cent of the farmers were relying on the farm produce for the supply of ration to their farm animals. Only 7 per cent of the farmers under study were feeding their animals with the supplementary dietary rations and artificial feeds. Among the animals under study, about 68 per cent animals were found to be infested with endoparasitic infection. It was observed that only 48 per cent of the animals were given treatment of de-worming. The major cause observed in case of suffering animals was found to be unhygienic conditions or poor management practices. None of the farmers under study had ever gone for disinfection of the cattle shed. Studies conducted by various workers suggest that milk yield can be increased upto 50 per cent with the adoption of good management practices like proper hygiene and management of ecto and endoparasites.

Keywords: Milk production, Endoparasitic infection, Imbalanced ration
Impact of Dhobha on Rainfed areas in Dumka district of Santhal Pargana, Jharkhand

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In Santhal Pargana, Jharkhand, most of the farmers are not able to meet sufficient food for their families though there is sufficient rainfall with rich natural resources due to the lack of awareness and modern technologies. With an objective to make the water available, indigenous water conserving structure “dhobha” was introduced and impact was analyzed to find out their effectiveness. It was found from the study that the dhobhas in the low-land was most successful with water almost throughout the year where as they were unsuccessful in the up-land storing water only for 2-3 months. In Karela village of Dumka District of Jharkhand area irrigated increased about 434 and 456 decimals respectively in rabi and kharif season and in Guhiajori village of Dumka district of Jharkhand the area irrigated increased to 100 decimals in rabi season and to 220 in kharif season.

Keywords: Dhobha, Indigenous water conserving structure, Rabi, Kharif
2.28

Information Need of the Farmers about Mustard Production Technology

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The present investigation was conducted in Gohad block of Bhind district Madhya Pradesh and the total sample was consisted of 110 farmers. In this study, policy information, market information, technological information and others were included as information need of the farmers. Most of the farmers (39.09%) belonged to high information need category about recommended production technology of mustard. The correlation coefficients in respect of - education, social participation, size of land holding, farming experience, annual income, risk preference, source of information, knowledge about mustard production technology, adoption behavior of mustard production technology were found positively significant with information need whereas the size of family was found having no significant relationship. The training programme should be organized for need based information and was the major suggestion suggested by 75.00 per cent respondents.

Keywords: Information Need, Mustard Production Technology
2.29

Knowledge Level of Dog Owners in Rural Area

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Increasing interest has been observed to keep dogs for different purposes in rural areas. Use of dogs for protecting livestock farms by owners remains the most common purpose of dog-ownership in villages. The present survey was carried out to evaluate the knowledge level of dog-owners by a total of 115 owners from five villages near Anand, Gujarat. Around 62.61% of owners kept dog(s) on their cattle farm. Guarding purpose at farm was the most preferred (53.91%) reason for dog-ownership in rural areas and 76.09 percent owners owned only one dog. 89.57 percent owners reported controlled behavior of dogs in presence of strangers and other farm animals. 50.43 percent owners offered homemade diet to dogs. Majority (44.35%) of dogs were kept in pakka house with access to open areas. 48.70 percent dogs were housed with fair hygienic condition. 72.17 percent owners were aware about breeding of dogs which helped them to control overpopulation. 89.57 percent owners were aware about deworming and 68.70 percent owners were aware about vaccination protocols for dogs. 51.30 percent owners preferred to bathe dogs fortnightly. 77.39 percent owners were aware of the shampoo products to be used for dogs. 87.83 percent owners observed a variable level of vices in dogs. All (100%) dog-owners were unaware about various infectious as well as zoonotic diseases in rural area. Results suggest that extension education is required among rural dog-owners to impart knowledge on management as well as diseases of dogs.

Keywords: Dog owners, Knowledge level
Knowledge Level of Farmers about Recommended Production Techniques in Bt Cotton

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Cotton is an important fiber and cash crop of India, and it plays a dominant role in industrial and agricultural economy of the country. Punjab has more than 90 percent of total cotton area under Bt cotton. The present study was conducted in Muktsar district of Punjab to assess the knowledge level of farmers about recommended production techniques of Bt cotton crop. Two villages from each of the four blocks of Muktsar district namely Muktsar, Malout, Lambi and Kotbhai were selected for the study and the total sample size comprised of 160 farmers for the present study. Data were collected with the help of structured interview schedule based on Bt cotton production techniques recommended by PAU, Ludhiana. Study reveals that majority of the respondents (90.63%) had knowledge about recommended varieties of Bt cotton. Only 10 percent of the respondents had knowledge about the economic threshold level (ETL) of whitefly, whereas 13.75 percent of the respondents had knowledge about economic threshold level of cotton jassid. Majority of respondents had knowledge about the recommended insecticides for the control of jassid and bollworms. It was found that 36.88 percent of the respondents had knowledge about the purpose of refuge crop grown in Bt cotton whereas only 8.15 percent possessed knowledge about the ratio of Bt cotton to non-Bt to be grown as refugea. Overall mean knowledge score of the respondents was calculated to be 13.85 and majority of the respondents (60.00%) was found to have low knowledge level about recommended production techniques in Bt Cotton.

Keywords: Bt-cotton, Recommended practices, Farmers’ knowledge level
Management of Cutworm (*Agrotis ipsilon*) in Mixed Crop of Maize and Rajmash Grown in Temperate Hills of Poonch District of Jammu & Kashmir

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Maize cutworm (*Agrotis ipsilon*) is major insect pest in the temperate hills of Poonch district. The pest is polyphagus and devastates all the crops grown in the hills during summer as the area is majorly monocropped. During *Kharif*, maize is grown mixed with rajmash and potato, whereas fields are kept fallow during *rabi* due to snowfall. Maize is staple food in hills whereas rajmash is cash crop having high market value. Cutworm is the major insect pest which causes damages in the mixed crop up to the extent of even 50 percent. The only method adopted by the farmers to combat the ravages due to the insect pest is application of high seed rate (35-40 kg/ha). Dense cropping with hybrids leads not only to additional cost of cultivation but also leads to less yield and lodging at the time of tasseling. Studies conducted on chemical management of the insect pest revealed that the losses can be minimized by using fipronil as seed treatment and carbofuran as soil application. Minimum losses (9%) were recorded in the crop where carbofuran was applied as soil application at 20 days after germination at the rate of 20 kg per hectare. Fipronil also gave significant control of the pest and the crop recorded less infestation (13%) as compared to control (38%). However a higher B:C ratio (4.82) was recorded in crop treated with fipronil as compared to the crop where Carbofuran was applied as soil application. Hence, farmers in these hilly areas can minimize the losses in mixed crop by treating the seeds of maize and rajmash with fipronil or soil application of carbofuran.

**Keywords:** Cutworm, Maize, Rajmash, Carbofuran, Fipronil
2.32

Methane and Nitrous Oxide Emission from Livestock Manure in Climate Change Perspective

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Livestock contribute to climate change through the emissions of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) which cause global warming. The global warming potential of N₂O and CH₄ are 310 times and 21 times the global warming potential of CO₂ respectively. They together contribute 18 percent of global greenhouse gas (GHG) emissions. The livestock sector contributes about 75 percent of the agricultural N₂O emissions that is equivalent to 2.2 billion tonnes of CO₂ emissions. Cattle and feedlots are responsible for 26 percent of N₂O emissions from anthropogenic sources. Manure management systems can be classified into dry and liquid/slurry manure management systems. Dry systems include solid storage, dry feedlots, deep pit stacks and daily spreading of manures. Liquid systems use water to facilitate manure handling and manure is stored in concrete tanks and lagoons. The cattle manure is generally categorized into liquid stable manure, solid stable manure and meadow manure. Mostly aerobic condition occurs in meadow manure, produced by the animals in grazing period during the summer months. Liquid systems create the ideal anaerobic environment for methane production. Warm climate make the condition more conducive. In solid system methane production is very less though an increased production has been noticed with rainfall. Better manure management and methane recovery techniques under which the recovered methane can be used for energy generation/flaring. Avoiding grazing at moist conditions might be helpful in mitigating N₂O emissions from urine patches in pastures. Methane and nitrous oxide is produced from livestock via two sources, enteric fermentation and manure management. There is rising concern over their increased production due to their hazardous effect on the environment. Nutritional, management and other amendment strategies could be exploited for reducing their release and simultaneously converting the released gases in to a source of useful energy.

Keywords: Methane, Nitrous oxide emission, Fermentation
Occupational Profile of Rapeseed Mustard Farmers in Kathua District of Jammu and Kashmir State

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Oilseed plays an important role in agriculture economy in many regions of the world. Oilseed is a major source of protein and contributes considerably to the export earnings. Major oilseed producing countries in the world are USA, Brazil, Argentina, China and India, and account for 82 percent of oilseed production in the world. In the category of oilseed crops, rapeseed mustard is grown in both the regions of Jammu and Kashmir (J&K) state. In Jammu division rapeseed mustard is grown in sub-tropical and temperate agro-climatic zones. The present investigation was carried out to study the adoption of production recommendations of rapeseed mustard in subtropical zone of Kathua district. A list of 522 mustard growers was procured from Department of Agriculture office in Kathua district, and 94 respondents were selected randomly with the help of random number generator. A comprehensive data collection tool was devised for collection of data. After pretesting and needful modifications the data were collected from selected 94 respondents. It has been found that only 14 percent of the respondents’ families were dependent on farming, where as majority (65%) of the respondents’ families had other sources of income in the family, namely, labour (22%), government job (12%), private job (11%), business (12%) and retired from government service (10%). Rest of the respondent families (21%) has more than two sources of income. It was also found in the study that 97 percent of the respondents had grown toria in their field either as a sole crop or in combination with raya, gobi sarson or both, whereas 21 percent of the respondents had cultivated gobi sarson in their field either as a mixed crop with toria or with both toria and raya.

Keywords: Occupational profile, Rapeseed mustard growers, Sources of livelihood
2.34

Participation of Farm Women in Decision Making

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Animal Husbandry is one of the important sectors in Gujarat, where farm women work participation is high. Participation of farm women in animal husbandry was decided on the basis of different animal husbandry practices performed by them. Farm women perform various activities related to the maintenance of dairy animal, milking, feeding and care & management of young ones. There were many capacity building programmes for women participation in animal husbandry activities organized by different organization. The present study was undertaken in Anand district of Gujarat state to know the participation of farm women in decision making related to home, farm and livestock operations. Three talukas of Anand district namely Bhanpura, Bhetasi and Khadol were selected purposively for the study. A sample of 130 tribal farm women were selected for the study. Majority of farm women were jointly involved in the process of decision making for home management aspects as well as in fodder management and 53.85 percent decisions were taken by farm women regarding taking loans. And least participation in decision making was noticed in giving veterinary treatment to animals.

Keywords: Decision making, Participation, Farm women
Problems and Prospects of Direct Seeded Rice (DSR) Cultivation in Haryana

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The study focused on constraints and prospects perceived by farmers’ for growing rice in direct seeded cultivation mode namely DSR in Haryana state since it is a most feasible and sustainable alternative rice-ecosystem in view of depleting water resources, reduced labour use and climate risks being major concerns in conventional method of cultivation. Among constraints; non-availability of quality seeds, fertilizers, weedicides and pesticides in required quantity and at proper time, high weed infestation in DSR in comparison to transplanting, wide fluctuation in prices of basmati paddy due to lack of MSP, lack of storage facilities in villages, lack of proper knowledge of irrigation schedule, non-availability of extension personnel, non-availability of agricultural magazines and literature in time in villages, lack of stable procurement policy for basmati rice and lack of trained field staff to provide technical guidance during cultivation process were serious constraints faced by farmers in adoption of DSR technology in Haryana. Concerted efforts should be made by government and non-government agencies to address the problems faced by farmers in adoption of DSR especially quality inputs and strengthening the capacity building of both field functionaries and farmers regarding DSR technology for its establishment in farmers’ field. Since majority of respondent farmers agreed that DSR technology give better net returns in comparison to transplanting, less water requirement, less labour requirement and best suited to climate change risks. Promotion and establishment of such technology in the field is very essential for harnessing greater benefits of this eco-friendly and resource conservation technology to have a sustainable food production system ensuring food security and enhancement of farmers’ income.

Keywords: Basmati rice, Climate change, Constraints, Direct seeded rice, Prospects
Production and Marketing Problems of Flower Growers in Jammu Region

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Flower cultivation is an activity which has immense entrepreneurial opportunities for small and marginal holding farmers and has potential of good earnings. The floriculture industry is very dynamic in its varieties and trade volumes demonstrating 6 to 9 percent of annual growth. Productions of flowers are estimated to be approximately 1031.3 thousand metric tonnes of loose flower and 69027.4 million (numbers) of cut flowers in the year 2010-2011. A study was conducted in Jammu region to study the technological gap and marketing of flower cultivation during the year 2012-13. Two community blocks each from three districts namely Jammu, Samba and Reasi were purposively selected. From each selected block, four prominent flower growing villages were selected purposively and from each village ten farmers were selected randomly, making a total sample of 240 flower growing farmers. In order to find out problem faced by the flower growers, a structural interview schedule was prepared and data collection was done by personal interview method. Mean, standard deviation, ‘Z’ score and ranking were used to find out the seriousness of production and marketing problems among marigold and gladiolus growers. Problems were conceptually defined as the factors that worked as bottlenecks to achieve full potential. For a comprehensive view, the major problems were categorized into five broad categories. The problems such as non-availability of hi-tech production and propagation structures, lack of knowledge about diseases, insect pests and their control methods, lack of exporting agencies, middlemen/agents huge share, and high cost of inputs were considered as most serious problems with the highest weighted mean score in their respective categories whereas lack of literature in simple language, non-availability of quality packing material and pain in fingers due to cutting/picking of flowers were considered as not so serious problems by the respondents.

Keywords: Flower growers, Technological gap, Marketing, Problems
Protection of Farmer Led Innovations in Agriculture: Importance and Need

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India is a rich diversified country with diversity in plants, soil, water availability, climate and living fauna. Farmer led innovation refers to the information generated or gained over a period of time and passed on from generation to generation by the word of mouth. It is now being increasingly recognized that farmer’s led-innovations are valid and more useful. Farmers have earned knowledge through generation of experiences and enriching it through continuous practices. It is now increasingly believed that the integration of the knowledge stores—the scientific and the indigenous accumulated through traditional wisdom, will help to develop technologies which would be more need based, better problem solving, locally applicable, easily acceptable, ecologically friendly, more intelligible, convincing and credible to the farmers and would be able to bridge the technological gap. The studies on farmer led innovation need to be undertaken periodically to document, rationalize, modify and integrate farmers’ knowledge with modern science. This is required because farmers knowledge plays important role in agricultural development as it is compatible, economical, easily available, widely known, environment friendly, helps in management and conservation of the natural recourses and is evolved through farmers own research and extension agenda. The important steps for inclusion of farmers knowledge in technology generation, reassessment and adaptation process are documentation, validation, refinement and integration. These innovations are regional specific and low cost, which will reduce the input cost and increase the profit in farming. Hence, there is a need to protect valid and useful farmer identified/developed innovations in agriculture by suitable corrective measures.

Keywords: Farmer led innovations, Documentation, Validation, Refinement, Integration
**2.38**

**Pumpkin as an Additional Income Generating Crop in Sugarcane- A Farmer Led Innovation**

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An innovative farmer Mr. K.C. Shivaramegowda in Keelara village of Mandya district, Karnataka state has innovated new agronomic practice of growing pumpkin as an additional income generating crop in sugarcane. The Agronomists recommends for intercropping of sugarcane with French bean/ Soya bean at the time of planting. The idea behind the recommendation was effective utilization of space, additional income and avoiding weeds, within 90 days from cane planting. On the contrary Mr. K.C. Shivaramegowda grows pumpkin after 90 days. He grows sugarcane Co 62175 variety in 6 feet spacing taking tenth ratoon crop in 0.80 ha of land. He practices in-situ mulching of sugarcane trash and opens pit at a spacing of 25 X 25 feet (Preferably bunds) 15 days to one month after earthing up. He applies one Kg FYM per pit and dibbles 2-3 seeds of pumpkin. Usually earthing up in sugarcane is done 90 to 110 days after planting. The matured pumpkins are harvested in 5-6 months after planting. Approximately 325gms of pumpkin seeds is required for one hectare and harvests 3.50 to 3.75 tonnes of pumpkin/ha. He sells it in the local market at the rate of rupees ten thousand per ton. The gross income from pumpkin sale is Rs. thirty five thousand and net income is thirty thousand, which is an additional income. The growing of pumpkin does not affect the yield of sugarcane which is 153 ton/ha. This technology is rapidly spreading in Karnataka state and nearly 975 farmers have adopted the technology. The farmer is recipient of many awards; among them important ones are “Krishi-Pandit state award” from Karnataka state and best farmer award from university of Agricultural Sciences, Bangalore. This farmer led innovation requires least cost, fetches highest returns with higher B.C ratio without much complication. It is an environmental friendly technology which can be adopted by all the sugarcane farmers to get additional income.

**Keywords:** Innovative Farmer, Intercropping, In-situ mulching, Farmer led innovation
Reducing Yield Gap in Pulses for Food and Nutritional Security

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Pulses are important sources of edible vegetable proteins, which are taken in the form of dal. Also it adds nitrogen in the soil and provides food and nutritional security to large number of vegetarians and weaker sections of the society who cannot afford other sources of protein. However, the production and productivity of pulses are very less as compared to cereals; also there is a huge yield gap at farmers’ field. As a result, every year, we are importing pulses from neighboring countries to meet the demand of country’s population. The pulses crops are more risky as compared to cereal crops due to more incidences of pest and diseases. Moreover, farmers have differential preferences for pulse crops as compared to relatively less risky crops like wheat and paddy. Considering the above points, study was conducted at farmers’ field in selected locations of Uttar Pradesh and Haryana during 2010 to 2014. The results of micro yield gap analysis from a sample size of 120 farmers revealed that the average yield gap-I (technology gap) for pigeonpea was 1167 kg/ha in Uttar Pradesh and 1250 kg/ha in Haryana. While, the average yield gap-II (extension gap) for pigeonpea was relatively lower i.e. 183 kg/ha in Uttar Pradesh and 125 kg/ha in Haryana. The average yield gap-I for chickpea was observed as 1641 kg/ha in Uttar Pradesh and 877 kg/ha in Haryana. Whereas, the average yield gap-II for chickpea was relatively lower i.e. 614 kg/ha in Uttar Pradesh and 622 kg/ha in Haryana. Therefore, it is summarized that technology gap in pulses (pigeonpea and chickpea) was more than extension gap at farmers field. Hence, extension interventions are needed to reduce the yield gap (technological gap as well as extension gap) in pulses to enhance the production for food and nutritional security.

Keywords: Pulses, Yield gap, Nutritional security
Relative Effectiveness of Selected Extension Education Teaching Methods in Imparting Knowledge about Poplar Cultivation to the Farmers

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Various extension teaching methods are available to the extension workers for communicating information related to agriculture and allied subjects. Different extension teaching methods differ in their effectiveness and applicability from one situation to another, and from learner to learner and has to choose extension teaching methods which are most effective and suitable in achieving the educational objectives according to the programme, situation, availability of resources and time. It is, thus, useful to compare the relative effectiveness of the selected extension teaching methods in imparting knowledge about agroforestry to the farmer. The lecture-cum-discussion and slide-cum-tape recorded message methods were selected to be studied. The present investigation was carried out in two districts namely Gurdaspur and Hoshiarpur of Punjab state. From each district one block was selected randomly and from each selected block three villages were selected randomly falling within seven kilometers radius from the block headquarters. A group of 20 farmers was selected from each village. The content of topic selected for the present study was “Poplar Cultivation”. Two extension teaching methods namely Lecture-discussion and slide-cum-tape recorded message were selected. The findings of the study revealed that selected extension teaching methods were significantly effective in imparting knowledge to the farmers about poplar cultivation and varied in their effectiveness. Lecture-cum-discussion method was found to be significantly more effective than slide-cum-tape recorded message method. Age had negative but non-significant relationship, whereas education and extension contacts had positive and significant relationship with gain in knowledge through selected extension teaching method. Mass media exposure had positive but non-significant relationship with gain in knowledge through the selected extension teaching methods.

Keywords: Relative effectiveness, Poplar cultivation, Teaching methods
Resource Management for Disease and Insect Pest Control of Apple in Jammu & Kashmir

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Apple cultivation is a highly profitable economic activity in the state, which is famous for its quality apple. It is farm-based, labor intensive and commercially attractive economic activity. The income per acre is much higher than any other horticulture crops, if done in systematic way. The apple production plays an important role in improving the standard of living, per capita income and employment generation. More than half of the percentage of population is engaged in the cultivation of apple directly or indirectly in the state. The study attempted to study the resource management for Disease and Pest Control of Apple in J&K. This was done by studying the farm practices of a sample of apple orchardists from the four selected villages of the highest apple producing districts of the state of Jammu and Kashmir. The aim being, to objectively analyze the farm management practices for disease and pest control. The sample size was 200. Findings of the survey were further supplemented with secondary data.

Keywords: Apple Industry, Jammu and Kashmir, Disease and Insect pest management
2.42

Role of KVKs for Promoting Secondary Agriculture for Rural Prosperity

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Indian agriculture has registered a phenomenal growth during the last five decades. Today the production of all agriculture commodities like rice, wheat, coarse cereals, millets, pulses, oil seeds, vegetables, fruit, milk, egg, fish and other commodities has touched new heights. We are one of the major food producers in the world and have to view this achievement against the backdrop of challenges like climate change, shrinking resources base, fragmentation of land holdings, changes in farming system and changes in demand and consumption patterns. At the same time the decreasing bio-diversity resources use efficiency, nutrient and water resources, water quality and factor productivity have put tremendous challenges from less available natural resources. In a predominantly agricultural country like India, farming is the principle source of work and income security. Therefore, productive employment in the agriculture sector is to be ensured as the means to poverty reduction and economic well being of rural people. In the context of increased and surplus production, value addition through appropriate post harvest technologies is the most important option for the farmers to minimize the loss incurred in their produces and maximize their profits through value addition and processing. KVKs as an important link between research system and farmers play a crucial role in empowering and enabling farmers with appropriate technologies related to value addition, minimal processing, product, preparation and prevention of storage losses. The main objective of this study was to explore potential of particular district for secondary agriculture and type of technical support to be provided by KVKs in a particular field/ aspect. The Dindori district of Madhya Pradesh is the largest producer of niger(oil seed crop) and minor millets and there is a huge scope for value addition in kodo-kutki products which is beneficial for diabetic patients. In Dindori upto 40 SHGs of farm women has been run by Tejaswini Mahila Sasaktikaran Pariyojna which are technically supported by KVK. These groups are making kodo kutki value added products and ensured their livelihood as well as empowered their selves.

Keywords: KVKs, Role of KVKs, Secondary agriculture, Rural prosperity
Seasonal Impact on the Minerals of Jamunapari Goat Milk under Field and Farm Rearing Condition

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The study was conducted at the central institute for research on goats, Makhdoom, Mathura; under the division nutrition feed resources and products technology for the study of farm rearing condition. A total of 479 milk samples were collected from field and farm rearing condition 106 summer (field 26 and farm 80), rainy 255 (field 18 and farm 237) and winter 118 (field 58 and farm 60) milk samples. The calcium per cent was found to be 0.142±0.0018 and 0.148±0.0018, 0.146±0.0019 and 0.150±0.0019 and 0.147±0.0019 and 0.155±0.0020 in the milk of Jamunapari breed under field and farm rearing conditions for rainy, winter and summer seasons, respectively. Phosphorus content was highest in winter seasons and lowest in summer seasons in goat milk under field and farm rearing conditions. The highest potassium percentage was recorded in winter seasons either field or farm rearing conditions. Magnesium content under field rearing conditions in Jamunapari goat breed milk in all seasons was significantly lower than that of farm rearing samples. The highest magnesium content was observed in winter seasons under field as well as farm rearing samples. The calcium, phosphorus, potassium, magnesium and chloride percentage in the milk of Jamunapari goat breeds under farm rearing conditions was significantly higher than that of field rearing conditions. Season had conspicuous effects on milk quality of goats under study.

Keywords: Minerals, Jamunapari goat milk, Field condition, Rearing condition
Small Ruminant Rearing for Sustaining the Livelihood Source of BakerwalPastoralists of Jammu & Kashmir

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The Bakarwal are the “high-altitude goatherds/shepherds” as implied by the name itself. Goat and Sheep rearing is their main livelihood source. Because, of their transhumant character they are living a socially, economically and politically marginalized life, besides, they have to face the vagaries of weather and problems due to geopolitical conditions in the border regions which makes their life very tough. Bakarwals are the largest small ruminant rearing pastoralists in Himalayan region of Jammu & Kashmir. They start up migration after April-May and down migration in September-October months. Rest of the time they spent in winter locations and in migration routes. Keeping the above facts in mind, the present study was conducted to screen out the various management practices in feeding, breeding and health care followed in goat and sheep rearing by Bakerwals. For this purpose 50 respondents, 25 from each of the selected routes of migration were selected randomly for the study. It was found that there is a good availability of lush green pastures during major part of the summer but faced scarcity of feed and fodder during some months in winter and during a part of their migration. The Bakerwals were also found good in breeding management of their flock, selecting breeding males based on the performance of the parents and progeny besides selecting for favorable physical characteristics. Regarding health management, it was found that Bakerwals are following regular vaccination schedule for selected diseases and were also doing deworming of their flocks. The services of which were provided by the state Sheep Husbandry department. It was also observed that they were going for self medications in various disease conditions of the animals, which adversely affected the performance of their business. Besides diseases they were suffering losses due to mortality of animals in view of harsh and unpredictable weather and climatic conditions. It is concluded that there is a need to arrange the awareness camps and training programmes about the efficient management of Goat and Sheep flocks with respect to their health and nutritional care, as per the local conditions, so as to make business enterprise a sustainable one. Since these Bakerwal pastoralists are nomadic, a very least group formation was found among them, which needs to be handled by organizing various training programmes, highlighting the need and benefits of group formation and group action.

Keywords: Pastoralists, Bakerwals, Nomads, Livelihood
2.45

Standardization of Sowing Time and Seed Rate of Buckwheat under Cold Arid Conditions of Kargil

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Buckwheat is traditionally cultivated in relatively warmer areas of Ladakh division, where double-cropping is possible, and is generally grown as the second crop after harvesting of the barley crop. It is one of the quickest growing green manure crops, taking only 4–5 weeks from seeding to flowering. Keeping in view, the nutritional quality of its grain and early maturity and suitability of the crop for marginal and degraded lands, this annual grain has a potential for use in sustainable cropping systems. However, due to the non-availability of package of practices in the region, the production and productivity of buckwheat is very low. In the present study an attempt was made to standardize the seed rate and time of sowing of buckwheat in Kargil and it was seen that among the three dates of sowing (1\textsuperscript{st}, 16\textsuperscript{th} and 31\textsuperscript{st} July), 16\textsuperscript{th} July date of sowing was found to be the best in terms of increase in the grain yields. Among the seed rates of 45, 60, 75 and 90 kg ha\(^{-1}\), seed rate 75 kg ha\(^{-1}\) was found to be superior to other seed rates in enhancing grain yields on all the three dates of sowing, however maximum grain yield (10.35 qha\(^{-1}\)) was obtained when seed were sown on 16\textsuperscript{th} of July at rate of 75 kg ha\(^{-1}\).

Keywords: Buckwheat, Climate, Standardization of sowing time
Studies on Yield and Chemical Composition of Paneer Prepared from Cow and Soy Mix Milk

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The investigations were carried out to study the yield and chemical quality of paneer prepared from cow and soy mix milk. From the study, it was revealed that paneer prepared from cow milk had significantly (P< 0.05) higher yield, total solids, fat and ash (14.15, 44.34, 24.23 and 2.03% respectively) than those prepared from cow milk and soymilk blend and sole soy milk. The protein content went on increasing in case of blended milk paneer as compared to cow milk paneer. Yield of paneer ranged from 10.17 to 14.15 per cent. It was significantly affected by the type of milk. The type of milk significantly affected whey yield, which was found to increase as the proportion of soy milk in cow milk increased.

Keywords: Soymilk, Soy mix milk, Whey, Blended milk
Technology Dissemination in Rural Areas: An Integrated Approach

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More than 70 percent of Indian population residing in rural areas largely depend on land waste and its allied activities for its livelihood. It is, therefore, imperative to develop the suitable technologies, which utilize local resources and are eco friendly, simple and income generating. At Centre for Rural Development & Technology (CRDT), Indian Institute of Technology (IIT) Delhi, the work has been done on many such technologies namely sericulture, mushroom cultivation, fodder conservation, biofertilizers, biopesticide production etc. If these technologies are employed in an integrated manner, the outcome of these may enhance many folds. The present paper deals with the success stories of the technology developed by the CRDT and disseminated in number of villages in states of Haryana, Rajasthan and Uttar Pradesh. As these technologies have been tested and accepted by the beneficiaries particularly farmers in rural areas, there exists a lot of scope in their wide scale dissemination and adoption across the country.

Keywords: Land waste, Technologies developed, Technologies disseminated
The Relationship between Profile of the Tomato Growers and their Information Needs

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Horticulture is a prominent sector among agriculture and allied activities as a means of diversification for making agriculture more profitable through efficient land use, optimum utilization of natural resources and creating skilled employment for rural masses. Tomato is one of the most important protective foods due to its special nutritive value. It is one of the most versatile vegetables with wide usage in Indian culinary traditions. The present investigation was undertaken in Vadodara district of Gujarat State. The district has twelve talukas, out of which Kawant and Pavi-Jetpur talukas were selected purposively and from each of the selected 2 talukas, 6 villages, having large area under tomato cultivation were selected purposively. Thus, total of twelve villages were selected for the study. From each village ten tomato growing farmers were randomly selected thereby total of 120 tomato growers were selected for the study. “Ex-post Facto” research design was applied for the study. It was found that size of family was significantly related with the tomato growers information needs and social participation, extension contact, economic motivation, scientific orientation and risk orientation were high significant but negatively related with the tomato growers information needs.

Keywords: Tomato growers, Diversification, Ex-post facto
The Socio-economic Aspects of Land Degradation in the Lower Shiwaliks of Jammu Division

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The Himalayas are a naturally fragile eco-system having large scale land degradation problems. The foothill Himalayas or lower Shiwaliks of Jammu division of Jammu and Kashmir, India are no different having its own set of problems in terms of degradation of land and soil along with vegetation. The weak lithology of the lower Shiwaliks consisting of rocks like sandstone, conglomerate, shale, silt stone and limestone are relatively easily weatherable and therefore prone to quick erosion. Sloping relief pattern results in accelerated erosion causing removal of surface material. Surface runoff is higher on sloping lands resulting in lesser percolation of water which is essential for profile development. The high intensity rainfall during monsoon disturbs the top soil, and in turn loosens it, resulting in sheet and rill erosion. Although natural conditions of the region play a strong role in the continuous process of land degradation, it’s the socio-economic conditions of the region that also act as a bottle neck for arresting or slowing down this process of land degradation. Increased population coupled with poverty is putting pressure on land maintenance. In fact poverty is probably the most important factor contributing to the inability to adopt land degradation control measures. Moreover, the younger generations among the farming community has lesser interest in farming and, therefore, the maintenance of land takes a back seat. Lack of knowledge regarding soil and water conservation measures is another important factor contributing towards land degradation in the area. Increased population pressure and smaller land holdings have promoted deforestation leading to unabated soil loss and land degradation. All the above factors lead to continuous land degradation, thereby reducing the productivity of these lands, which in turn affects the economic condition of the farmers luring them to other sources of employment and the cycle of land degradation continues. The challenge lies in protecting the limited land resource from further degradation through improving productivity and making land tending a viable option for the local populace.

Keywords: Land degradation, Lower shiwaliks, Farmers, Socio-economic conditions
2.50

Traditional Agroforestry Practices for Sustainable Livelihood in Jammu

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Agroforestry practices differ considerably from area to area as farmers adopt these practices according to their needs and circumstances. In spite of imparting an important role in sustainable livelihood to the farming communities, traditional Agroforestry systems also provides some assistance in the form of knowledge that are helpful to the farmers in one way or the other. Traditional Agroforestry systems of Jammu district systems are: Agri-silvi-pastoral and silvi-pastoral which are mostly practiced on the marginal and wastelands. Farmers maintain naturally regenerating tree species and grasses, particularly on edges of agriculture fields without any significant input of manpower. This system is called as indigenous Agroforestry system and include trees like Jamun (Syzygium cumini), Bauhinia variegata (Kachnar), Melia composite (Drenk), Ficus roxburghii (Fig), Celtis australis (Khirak), Grewia optiva (Dhaman), Morus alba (Mulberry), Toona ciliate (Toon), Albizia lebbeck (Kikar), Acacia catechu (Khair), Dalbergia sissoo (Shisham) and local grasses like Dicanthiun spp and Crysopogon fulvus with some of the introduced perennial grasses like Napier hybrid and Setaria spp. Fodder trees are primarily grown for fuelwood and small timber, however, their value for feeding ruminants necessitates the planting of multipurpose fodder trees on the farm bunds, boundaries and sometimes grown scattered in the fields commonly known as Gassnies. Such systems provide valuable feeds at low cost and are easily accessible; however, utilization pattern varies from season to season and from altitudinal ranges. Traditional practices not only provide production from the system but also have tremendous amount of tacit knowledge and practices which needs to be documented. Many times such knowledge has been communicated in good faith by local people and has been used without acknowledgement or reciprocity to claim intellectual property. In times to come, traditional system and practices will be a boon for sustaining the rural economy.

Keywords: Agroforestry system, Practices, Sustainable livelihood
Upscaling of Farmer Led Innovations: Institutional Interventions

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Indian agriculture is unique with diverse agro-climatic conditions and is one of the oldest professions practiced by the farmers. Technology transformation for sustainable production, productivity and profitability depends on the decision and action of millions of farmers. The technologies or practices that are developed through research are innovations which may be new varieties of crops and plants, new breeds of livestock, new chemicals and medicines, new technique of doing things etc. An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption. Agricultural development is largely driven by innovations in the entire value chain of different commodities. Farmers has selected several varieties that has higher productivity and better quality and farmers’ innovations are a product of farmers’ informal experimentation. There are many institutions recognizing and rewarding the grass root innovations like National Innovation Foundation, ICAR, IARI, NIF, PPV & FRA (Protection of Plant Varieties and Farmer’s Rights) etc. Farmer-led innovations are evolving under specific agro-climatic and socio-economic conditions and such innovations should be widely adopted and sustained. It is highly essential to document innovations and traditional knowledge and disseminate them further by various organizations. Involvement of research institutions is quite critical to understand and blend the traditional innovations with scientific refinements for their large scale adoption and popularization. Innovative technologies identified in one region need to be popularized in similar eco-regions elsewhere, through publication, documentation and dissemination of “success stories”. Agro-tourism around farmer’s innovative efforts would not only generate greater public awareness but would also help in revenue generation and greater community involvement in protecting our rich biodiversity. Hence, there is an urgent need to have institutional reforms especially for better coordination, convergence and efficiency. And the scientific talents behind such grass root level innovations need to be recognized and encouraged. Benefits accrued from such innovative ideas need to be widely shared across the country. Mainly the objective of this paper is mainly to get thorough understanding of the role of institutions in promotion of farmer led innovations and suggest effective strategies in up scaling and out scaling of grass root innovations.

Keywords: Farmer led innovations, Upscaling, Institutional interventions
2.52

Value Addition of Dried Flowers through Packaging

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Dried flowers and foliages are fragile and require careful handling. Before using dried materials for making decorative items, it is necessary to protect them from all possible hazards. Therefore, recent advances in packaging and presentation of dried flowers and foliages with the research needs are presented in this study. Rose, Chrysanthemum, Gerbera, Orchid, Carnation, Chandani, and Gloxinia were dried using various techniques like air drying, press drying and desiccant drying (silica gel, borax and sand) whereas glycerin drying was used for foliage drying. After that the dried flowers were arranged in five of different packaging materials i.e. wooden fiberboard, glass, acrylic, plastic (PVC) and thermocol and developed various dried flower products (photo frames, table mounts and paperweights). The colour of the dried flowers was analyzed before and after three months storage through spectrophotometer and weight method was used for moisture analysis before and after three months of storage. The result revealed that different display packaging materials can be used to enhance the appearance of the products and also to retain the overall quality of the dried flowers for longer period.

Keywords: Dried flowers, Value addition, Keeping quality, Packaging
Session 3
Market Driven Farming Systems, Institutional Convergence for Promotion of Agribusiness, Rural-Tourism and Social Sustainability
Lead Paper 3.1

Market Driven Farming Systems and their Role towards Livelihood Security of Rural Communities

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1. Introduction

About 60 per cent of India’s population lives in its villages and a majority of household depends on agriculture and related activities for their livelihood. Agriculture continues to support numerous downstream linkages with industry by becoming a supplier of vital industrial raw material. Transformation of agriculture in to business activities has created a demand for the use of modern technologies in areas such as specialized production, post harvest management, promotion of value added agriculture products, supply chain management, marketing etc. so as to position these competitively both in the domestic as well as in the international market. While rural communities suffer from inadequate access to food and lack of employment. The problem is compounded with the low adoption of technologies because these are evolved under resource endowed conditions, which do not match with the resource poor farmers because they work in diverse, location specific and risk prone conditions hence invite attention for developing technologies involving different disciplines and taking in to account the realistic environment prevailing with the farming families.

2. Challenges for food security

During the last five decades, agricultural research emphasized mainly component and commodity based research involving development of crop varieties, animal breeding, farm implements and machinery, fertilizer use and other production and protection technologies mostly conducted in isolation and at the institute level which enabled the farmers to grow more but at the same time over exploited the resources (decline in water table, soil health degradation, decrease in biodiversity, high cost of inputs, resistance in new biotypes, and adoption of monotonous rice-wheat system). It resulted in decreasing factor productivity, resource use efficiency and ultimately less farm productivity and profitability. It further coupled with the national problem like environment degradation, ground water contamination and entry of toxic substances in the food chain. Presently, rice and wheat are the staple food crops which have become the integral part of human diet. Both crops require contrasting edaphic environment in the sense that the rice is grown predominantly under anaerobic soil condition, whereas wheat is grown under well aerated soil having good tilth. Excessive wet tillage (Puddling) reduces infiltration of water at the risk of destruction of soil structure adversely affecting the physical, chemical and biological conditions of soil. It is further coupled with high nitrate content on account of leaching in ground water has been noticed where this system practiced at extensive scale (Bajwa et al., 1993). In addition, the crop residue which contains 80-90 percent of the micronutrients is not being recycled. Even in Punjab, where rice cultivation is practiced on 28 lakh ha area, paddy straw of about 16 million tones is produced which is destroyed by burning leading to environment pollution along with adverse affect on soil health.

3. Farming system- A holistic approach

Farming system is a resource management strategy to achieve economic and sustained production to meet diverse requirements of farm households while preserving resource base and maintaining a high level environmental quality (Lal and Miller, 1990). An efficient farming system is an integration of appropriate viable technologies within the enterprise and/or integration of one or more additional enterprises at a farm according to the availability of resources and to sustain and satisfy as many necessities of the farm owner as it is possible. The research in this regard has grown to the point where there not a single method but rather a number of alternatives paradigms designed for different purpose in response to different institutional, social, economic or political influences. Our country is fortunate to have different types of agro-climatic regions, varying from temperate to tropical and deserted to humid climates along with vast seasonal and soil variability. Each agro-climatic region in
the country has suitability for the best productivity of a certain production system. However, sustaining household food security, creating employment opportunities, making the income regular, enhancing the income through value addition, promotion of agricultural oriented industry and improving the standard of living of farming families with the others objectives. The market intelligence determines the level of profit margin. Better intelligence leads to quick disposal of the main as well as by product at reasonable high price without any glut problem.

Multiple use of water for raising crops, fruits, vegetables, and fishery may also enhance the water productivity. Likewise, in villages, the sewerage water can be purified through hydrilla biomass before its release to village pond. Such ponds can be used for fish culture. In addition, the community land in the villages, can be used for social forestry, water harvesting and recycling and stall feeding to the animals (goatry/piggery) will add to the profit margin with other numerous indirect benefits of employment and to improve the ecology of the area. The preliminary investigations reveal that such types of enterprise integration generate additional income varying from Rs. 20000 to 25000/ha under irrigated and Rs. 8000-12000/ha under rainfed ecosystem. The income enhancement due to integration of processing and on-farm value addition by 25-50 percent, yield improvement on account of improved soil health by 0.5-1.0 tonne/ha, cost reduction by Rs. 500-1000/ha and employment generation by 50-75 man days/household have also been observed.

3.1 Market-Driven Strategy in Farming System

Market driven strategy is a planning and deployment of resources to achieve a central set of objectives through a continuously changing set of circumstances. It is customs focused and organizational wide with every level of the organization having its business unit strategy. Finally, it is concise, clear and complete and must be communicated to everyone concerned.

In farming system, the establishment of any enterprise depends upon the initial capital investment, knowledge, skill, infrastructure, space requirement and its adaptation to the existing environment and above all of the marketing of the product and value addition. There are enterprises which require less space (rabbitary, piggery, mushroom, bee-keeping, poultry etc.) or large space (horticulture, vegetable, crops, dairying) shall produce sizeable quantity of products for sale after fulfilling their domestic requirements. Thereby, market strategy will decide the fate about the success of any enterprise. The by-product disposal shall be directly to the customers or through the third party. It is observed that involvement of third party loosen the credibility of the producer and thus leading to reduce the profit margin. The recent approach being followed by the farmers is through the Kisan hut and in the Marts established with the help of district administration and NABARD. It can further be strengthened by formulation of farmers’ associations, farmers club and commodity specific self help groups associated with the production and marketing. Numerous groups in the country are the role models and their associations with the SAUs help to acquaint them with the latest developments in production and consumption. It further includes those organizational characteristic and performance that are influenced by the market forces and adapted to meet changing market needs. Market driven organization tends to focus on internal competency that foster greater responsiveness to their customers and their target market.

An example of rabbit enterprise, which multiply at faster rate owing to less gestation period of only 30 days with main focus on the sale of meat, wool and hide along with farming. In case of broiler rabbit, its by-product skin with fur is as important as of meat. Its production part is highly encouraging but disposal part is highly skill oriented because the meat will be consumed by the high gentry on account of its high costand in the cities. Similarly, its skin with fur will be used for making textile fancy dresses in areas where winters prevail. The other ICT means can also be tapped for the disposal of products such as mobile phone, SMS, e-mail and print media, advertisement in the newspapers, posters etc. may be used for creating awareness among the end user. Such types of studies need to be conducted while making choice of any enterprises. Every enterprise has advantages and also limitations which can be overcome using different tools of market strategy. It will also create employment opportunities while spreading the market network.

There are many schemes such as AGRI-CLINICS AND AGRI-BUSINESS CENTRES (ACABC) SCHEME implemented by the Department of Agriculture & Cooperation, Ministry of Agriculture, Government
of India for the educated youth with the objectives: to supplement efforts of public extension by
necessarily providing extension and other services to the farmers on payment basis or free of cost as
per business model of agri-preneur, local needs and affordability of target group of farmers, to
support agricultural development and to create gainful self employment opportunities to unemployed
agricultural graduates, agricultural diploma holders, intermediate in agriculture and biological science
graduates with PG in agri-related courses.

**Agri-Clinics:** are envisaged to provide expert advice and services to farmers on various technologies
including soil health, cropping practices, plant protection, crop ensurance, post harvest technology and
clinical services for animals, feed and fodder management, prices of various crops/animals and
ensure increased income to farmers.

**Agri-Business Centres:** are commercial units of agri-ventures established by trained agriculture
professionals. Such ventures may include maintenance and custom hiring of farm equipment, sale of
inputs and other services in agriculture and allied areas including post harvest management and
market linkages for income generation and entrepreneurship development.

4. **Technological interventions**

Numerous technologies have been developed such as paired row planting of sugarcane in
trenches and growing of vegetables (garlic, onion, spinach, coriander, peas, radish), cereals (wheat,
barley, oats), pulses (pea, gram, lentil) and oilseeds (rapeseed & mustard, linseed) on beds. All the
crops give near optimum yield on account of difference in their growth habit and growing period. An
economic evaluation of alternate land use system under arid situations over 18 years showed 1.41- 1.87
benefit-cost ratio over 1.24 under arable farming. This proves worth of grasses-tree-animal system
over arable farming under arid ecosystem (Narain and Bhatt, 2005). The best system under arid
situation is agri-pasture followed by agro-forestry, sivi-pastural, agri-horticulture and lowest in crop
production. The results of a case study conducted in the trans-gangetic plains (Punjab) revealed that
rice-wheat cropping system gave a net return of Rs. 66465/ ha. The net return improved when it was
supplemented with dairy, dairy + fishery and dairy + fishery + piggery by 13.1, 20.8 and 30.2 percent,
respectively clearly advocating the superiority of integration of enterprises (Gill et al., 2009).

In another study conducted in Southern Plateau and Hill region (Tamil Nadu) involving crops,
poultry, pigeon, goat and fishery (400 nos. fish, 20 babkek layer, 40 pairs pigeon and 20 female
Tellicherry breed) resulted in higher productivity with economic return of Rs. 1,31,118 (mean of 3 years).
The integration of enterprise creates the employment opportunities in comparison to 369 man days/
year generated in cropping alone system, cropping with fish and goat created additional 207 man
days/annum. The resources were recycled in such a way, fish were fed with poultry, pigeon and goat
dropping (Jayanthi et al., 2001). The studies conducted at ICAR Research Complex, Goa further
advocate the higher energy use efficiency of integrated farming system with rice. The mean total
energy input varied considerably among systems. Integration of poultry and mushroom enterprise
with rice-brinjal system required highest energy input (52,030 MJ/ha) and followed by rice-groundnut
system integrated with mushroom and poultry (46,077 MJ/ha). The energy output was maximum
(165,334 MJ/ha) under rice-brinjal + mushroom + poultry with 3.18 system energy efficiency mainly due
to the lesser energy input involved as contrast to energy rich output enterprises. The output of all
multi-rice based enterprises was reasonably good varying from 100,911 to 105,627 MJ/ha excluding
brinjal crop based farming system.

The results of a study conducted in a farmer participatory mode at the farm of Sh. Mohinder Pal
Singh of village Anihar, Distt. Jalandhar (Punjab) revealed that the dairy enterprise gave Rs. 7383/ha
more return over rice- wheat system and the net profit margin (Rs./ha) further enhanced to Rs.
24289/ha when it was coupled with fishery. The integrated approach generated 70 man days/ annum
over rice- wheat system and the benefit-cost ratio varied from 1.86- 2.00 (Gill et al., 2009). In another
study conducted at the farm of Bhpinder Singh at village Birk, Distt.- Jalandhar (Punjab), the dairy
enterprise could give additional income Rs. 10762/ha over rice- wheat system and profit margin
further increased to Rs. 22308/ha with poultry component (mean of 2 year). In Kerala, each home is
having small land, in which coconut, banana, jack fruit, mango, pepper, nutmeg, cloves, cinnamon,
ginger, turmeric are commonly cultivated for the family requirement in a multi-storey or multi- tier
cropping. Results of a study conducted in Kerala clearly advocate the supremacy of multi-stories cropping where coconut + ginger and coconut + clove system gave 3.52 and 3.70 folds more net return over pure crop of coconut (Parthasarathy et al., 2004).

In addition, some management manipulation such as low tunnel technology in cucumber during winter at the time of sowing enabled the farmers to get an ostensible price premium by advancing the fruiting by 20-25 days. The installation of underground pipelines to supply water at the farm instead of an open water channel improved the irrigation water use efficiency by 30 per cent and 1.0 q/ha grain yield of each crop rice and wheat obtained additionally from the crops grown on water channel area. Application of irrigation water through drip method to vegetables increased the yield of by 26 percent and quality is also improved. Use of domestic ingredients while preparing feed for the milch animal/piggery/ poultry etc. reduced the cost to about half as compared to the readymade feed available in the market.(Gill and Brar, 2001). There are some enterprises which require very less space such as rabbitry, mushroom, vermin compost, apiculture etc. can also be practiced along with the main enterprise. Watershed management itself is a farming system on individual as well as community basis. It includes conservation, development and optimum utilization of natural resources.

5. Inference

There is an urgent need to develop interdisciplinary modules of agriculture based enterprises under different farming situations and agro-ecological conditions for their large scale adoption to ensure food security of rural masses, to create employment opportunities, making the income regular, inculcating the sense of group marketing along with high productivity and profitability levels and making the system eco-friendly and sustainable over a longer period of time. The Government of India Schemes such as Agri-Clinics and Agri-Bussiness Centres will act as knowledge centres for the farmers who have started Integrated Farming Systems to solve their day to day problems and making their enterprise more promising.

References


A Case Study on Scenario of Sugarcane based Farming System of District Ghaziabad in Western U.P. and Future Strategies for Livelihood Security

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Sugarcane is a major source of income in India and economic backbone for western Uttar Pradesh farmers. Area under sugarcane in Uttar Pradesh is 2.2 million ha, which is 43.7 percent of total area (5.06 million ha) of sugarcane grown in India. The main cropping systems in western U.P. are sugarcane-ratoon-wheat, rice-wheat and rice-wheat-sugarcane. District Ghaziabad enjoys subtropical climate with assured irrigated land. A survey based study through personnel interview was conducted to know the cropping pattern of sugarcane based farming community and their perspective on farming. It is revealed from secondary data that percentage of small and marginal holdings is 90.6 percent which holds 60.4 percent area of district. Significant number of farmers i.e. (42% Ca.) want to leave practising agriculture due to less net-return and are searching for a better option for their livelihood. The reasons for reducing interests of marginal, small and semi-medium landholding farmers in agriculture is decrease in net return, and for medium and large holding farmers are labour related issues and cooperation from family members. The total area of sugarcane cultivated in district Ghaziabad has increased from 15902 ha (2011-12) to 17116 ha (2013-14), because the total area under pulses has decreased from 1668 ha (2011-12) to 1208 ha in (2013-14). On the other hand the net return per month from sugarcane has decreased from Rs. 5800/ha (2011-12) to Rs. 5300/ha (2013-14) and the net return per month from rice has increased from Rs 7000/ha (2011-12) to Rs 9800/ha (2013-14). But the price of rice is market dependent and is highly fluctuating. Also, rice is highly dependent on rainfall, and farmers cannot totally rely on this crop for their income. Inspite of high cost of inputs in cultivating sugarcane, according to all categories of farmers, they are still interested in cultivating sugarcane because of less risk and supply of fodder for a longer period. So, future strategies should be based on making sugarcane cropping system economically stable and beneficial. A significant percentage of marginal, small and semi-medium categories of farmers are ready to implement intercropping of vegetables and flowers with sugarcane. But due to non-availability of cost effective machines, they find it difficult to implement intercropping system. Thus, for the vast scale implementation of intercropping in sugarcane, new cost effective machines which are more suited to the needs of particular category of farmers should be developed. For the economic sustainability of sugarcane for medium and large farmers, cropping system diversification and mechanization in sugarcane was found suitable.

Keywords: Sugarcane, Case study, Livelihood security
3.02

A Study of Performance and Progress of Kisan Credit Card in Kathua District of Jammu and Kashmir

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Kisan Credit Card (KCC) Scheme aims at introduction of flexibility to the system and improvement in cost efficiency by timely banking support to the farmers for their short-term credit needs for cultivation of crops is in progress with the support of RBI and National Bank for Agriculture and Rural Development (NABARD) since 1998-99. Uttar Pradesh accounts for the maximum number of KCCs issued so far followed by Andhra Pradesh. The KCC scheme in J&K state targets 10.17 lakh farm operating families of the state. The state agriculture department is facilitating in issue and use of KCC by the farmers. A study to analyze the status of the target and achievement, process of finance, farmer problems, their suggestions and recommendation to improve the effectiveness of the scheme was conducted in Kathua district of J&K state. Primary data collected from randomly selected KCC beneficiaries and the secondary data were utilized for the study. Out of 4,46,499 KCC cases sponsored by the Department of Agriculture J&K, 2,72,937 (61%) KCCs were sanctioned, 1,48,633 (33%) KCCs were rejected and 26,333 (6%) KCCs are under progress. Personal contact (neighbours, friends and relatives) exceeded among the sources of information. Diversion of loan money to others than agriculture activities were the main reason for non-payment of loan money leading to indebtedness. There was a provision of 10 percent of scale of finance for the purpose of crop insurance and maintenance of agricultural equipment which was not known by most of the beneficiaries. Timely availability of credit, hassle free procedure, savings in cost and savings in interest burden were the major benefits reported by the beneficiaries. The issues of finance to the farmers having leased land and non-finance for post-harvest loses were the issues reported requiring policy intervention. The paper examines the process of finance, effectiveness in monitory terms and beneficiary suggestions to improve the efficiency of KCC scheme.

Keywords: Kisan Credit Card, Personal contacts, Indebtedness
Adaptability and Profitability of Wheat Variety HD 2967 in Rural Delhi

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Wheat (Triticum aestivum) is an important food grain crop of India and is second largest producer of Wheat in the world after China with about 12% share in total world wheat production. It is main rabi season crop grown in Delhi. The practiced variety becomes susceptible to rust which affects the wheat productivity of the area. A high yielding variety of wheat HD 2967 was developed by IARI, New Delhi and released by Central Sub Committee on crops standards and notifications and release of variety for agricultural crops for timely sown cultivation under irrigated conditions of the North Western Plain Zone (NWPZ) of India during 2011. It has average yield of 50.40 qt ha⁻¹ with yield potential of 66 qt ha⁻¹. KVK Delhi has planned the demonstrations for replacement of yellow rust susceptible varieties PBW 343 and WH 711 with the wheat variety HD 2967 with or without seed inoculation with biofertilizers viz. Azotobacter and Phosphorus Solubilizing Bacteria (PSB) during 2012-13 and 2013-14. 25 and 14 farmers were selected randomly for demonstrating the technology during 2012-13 and 2013-14 respectively. The soil of the demonstrated field was sandy loam with low in nitrogen and medium in phosphorus and potash and the major crop rotation was bajra-wheat and paddy-wheat. The crop was sown in 1st fortnight of November. The HYV HD 2967 and biofertilizer technology was popularized through kisan goshties, field days and training on improved production technologies during both the years. The average yield and economics of demonstration and check plots were calculated. During the year 2012-13 the highest average yield of variety HD 2967 was observed with biofertilizers 59.25 qt./ha which was 5.46% and 11.54% more as compare to HD 2967 without biofertilizers (56.18) and local check variety WH 711 (52.52 qt./ha) respectively. The average net return of demonstrated plots under HYV HD 2967 with biofertilizers was Rs. 63179/- and Rs. 58841/- under HYV HD 2967 without biofertilizers which was 16% and 10.5%, respectively, higher than the local check variety. The same trend was observed during the year 2013-14. The farmers appreciated the wheat variety HD 2967 as it was yielding higher than the other variety used by farmers of the area and adopt the technology of seed inoculation with azotobacter and PSB in wheat.

Keywords: HD2967, Biofertilizers, Demonstrations, Check plots
Agribusiness Promotion through Custom Hiring of Agricultural Implements and Machinery

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Farm mechanization helps in effective utilization of inputs to increase the productivity of land and labour. Besides it helps in reducing the drudgery in farm operations. Mechanization has become a very crucial input to further the development of agriculture. Mechanization saves time in completing different operations, which gives the crop more time to mature; allows the farmer to be more flexible in his farming operations; and facilitates multi and relay cropping. Single farm ownership and use of tractors and machinery on small farms is not economically viable, but, through custom hiring of agricultural machinery even small farmers have been able to get the benefit of agricultural mechanization. The custom hiring got a boost with the onset of green revolution in Mid 1960s and establishment of Agro-industrial Corporations and road network in rural areas. Under Indian conditions, majority of the farmers can benefit from the technological superiority of the agriculture implements and machinery and more such developments in future only through custom hiring. The present trend in agricultural mechanization is for high capacity machines through custom hiring and for contractual field operations. Good networks of rural roads allow easy movement of equipment. Availability of repair and maintenance facilities and finance will greatly determine the growth of custom hiring of machinery in different parts of the Country. There cannot be going back from mechanization but we frame suitable policies such as liberalizing land lease market, encouraging cooperative management and custom hiring of machinery, imparting training to the farmers regarding such investment, encouraging standard service inputs, devising machinery problem from small farmers and dry land cultivation.

Keywords: Custom hiring, Agribusiness, Entrepreneurship development
A study was conducted during the year 2008 in the state of Haryana (India) by interviewing a total number of 80 farmers. The study revealed that reasons for developing agri-tourism were ease of entry (62.50%), high profits (81.25%), employment opportunities (75.00%), and little competition (37.50%). Promotions of agri-tourism were by means of roadside hoardings (82.50%), through internet web sites (62.50%), advertisements in newspapers (37.50%), and local TV channels (18.75%). The farmers believed that Agri-tourism contributes towards the sustainability of agri businesses because: proper planning generates various sources of income (95.00%), it helps farmers enhance their knowledge (87.50%), it is beneficial for small farmers who have low soil productivity (90.00%). They argued that Agri-tourism increases income as it is a new enterprise with less competition (96.25%), it is business activity as compared to traditional farming (93.75%), less land with low productivity can give more returns (90.00%), and it provides employment to a wide range of farmers (85.00%). Agri-tourism is helpful in maintaining natural resources as the nutrient demand is less and soil conservation is good (93.25%), deforestations is avoided (92.25%) and there are no environmental pollution problems (97.25%). In addition Agri-tourism is better for human health and the environment (96.25%) and it provides local heritage and cultural experiences for tourists (90.00%). Lack of funds for publicity and advertisement of farm-tourism (96.25%), insufficient numbers of visitors (93.75%), Lack of technology to develop farm-tourism (93.75%), lack of motivation (86.25%) and inadequate prices for farm products/ activities (88.75%) were reported as major constraints in establishing agri-tourism. Environmental management (96.25%), nursery production (93.75%), fruit and vegetable value addition (93.75%), were the preferred areas of training of the farmers for establishing farm tourism.

**Keywords:** Sustainability, Tourism, Rural development, Environment and Natural resource
Agritourism for Sustainable Livelihood

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Pluri-activity is gaining importance in agriculture sector for sustainable livelihood of farm families and farm diversification is one of the broad and complex systems of agriculture pluriactivism, agritourism as one of the component of farm diversification which provides alternate income for the farmers. Agritourism is a hybrid term which connects primary sector agriculture with the tertiary sector tourism industry, the aim is to familiarize oneself with the farming activity and recreation in agricultural environment and also helps in preserving the rural lifestyle and environment. Agritourism is gaining much importance in developing countries as is proven and widely accepted as a farm diversification component in developed countries like the United Kingdom and the United States of America. Agritourism is prevalent since 1930s and it gained higher momentum with industrialization period onwards. In India, Maharashtra and Kerala are leading states in agritourism sector. Agritourist centre at Baramathi under Agricultural Tourism Development Corporation and Pizhala model pokkali paddy tourism farm in Kerala are the best examples for existing agritourism models in India. Adoption of agritourism is still in a budding stage, where a joint effort of extension agents and agricultural functionaries has to act.

Keywords: Agritourism, Pluri-activity, Diversification, Livelihood
3.07

Agro-Tourism: An Innovative Supplementary Income Generating Activity for Enterprising Farmers

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The term rural tourism intends to bring benefits both for tourists and to the local community. Tourism includes Natural tourism, Cultural tourism, Ecotourism, Village tourism and Agro tourism. The term agro-tourism emerged in the late twentieth century. It includes agricultural farms that are related to tourism. This notion represents all activities related not only to tourists, but those are going to be organized by the entrepreneur farmers generally in holidays. Agro tourism is very important for rural communities as well as urban areas. It can provide several advantages viz., recreation, income, employment, accommodation, natural resource conservation and education. But the main problem in agro tourism is the low level of farm income. Agro tourism intends to obtain higher standards of living for rural communities especially through increased income for people who work in agriculture. Agro-tourism has great scope in the present context because India has a diverse culture and geography. Farmers, village and agriculture were three important factors contributing to the success of agro-tourism. Agro-tourism is a viable income generating activities in many developed counties which would provide lead to promote the same with modifications suit to our conditions. Some of the successful running models of agro-tourism are arts & crafts, demonstrations, farm store, exhibition of farm equipments, selling fresh farm products and craft items through keoisk in the farms, processing of farm products and sale, demonstration of agri-activities etc. Several issues needs attention for the promotion of agro-tourism are publicity, transport, accommodation network, capacity building programme, safety of tourist and public & private partnership.

Keywords: Agro-tourism, Ecotourism, Village tourism
3.08 Analysis of Constraints in Adoption of Biogas Technology

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Traditional fuels like fuel wood, agricultural waste and cow dung cakes are commonly burnt in rural areas for cooking and general heating purposes. Biogas can become a clean and efficient fuel alternative in these areas. The present study was conducted in eleven villages of Moga district of Punjab to analyze the various constraints in adoption of biogas technology. Data were collected from 80 respondents with the help of semi structured interview schedule. It was found that reduction of gas supply in pipe during winter season and poor gas supply were the major operational constraints faced by the 85.0 and 73.8 per cent of the respondents, respectively. Similarly, use of human faeces in bio gas plants and unhygienic conditions in the surrounding of house were considered the most serious socio-psychological constraint by the respondents. High cost of construction and less amount of government subsidy were major financial constraints faced by the respondents. Study reveals that financial constraints were the most serious constraints faced by the respondents followed by socio psychological and operational constraints. Thus efforts should be made to overcome these constraints to facilitate adoption of bio gas technology in rural areas of our country.

Keywords: Biogas Technology, Biogas Plants, Constraints, Adoption, Punjab
Analysis of Small Ruminant Market System in Jammu Region of Jammu and Kashmir

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Small ruminants contribute enormously towards promotion of livelihood security and as an insurance cover to cope with crop failures particularly for rural, landless, small and marginal landholding farmers by providing meat, milk, fibre, skin etc. The profitability of small ruminant farming depends upon the effective marketing of the products. But, in India, marketing of sheep and goats is unorganized and involves various middlemen, unnecessary transportation and death of animals during transportation. Lack of awareness of markets, pricing structure, unorganized marketing facilities coupled with distress sale are the major reasons for not receiving reasonable price for their animals by the farmers. Keeping in view this, the present study was conducted to provide a better understanding of marketing systems for small ruminants in the Jammu region of Jammu and Kashmir state of India. Multistage random sampling technique was used to select 60 small ruminant farmers from Rajouri, Poonch and Kathua districts of J&K state. Data was analyzed using suitable statistical tools. The results of the study revealed that marketing of small ruminants is haphazard in the study areas. Majority of the respondents (65%) sold their animals when they needed cash for home consumption followed by “to pay off loan” (35%). Important marketing channels were relatives and friends, local markets and middlemen. Farmers gave different reasons for selling their animals through different channels. Majority of the farmers used relatives and friends as one of the marketing channels and most of farmers perceived middlemen as the major obstacle in the marketing of their animals, as they underprice their animals.

Keywords: Marketing, Small ruminant, Sheep, Goat, Jammu region.
3.10

Antifungal Activity of Ganoderma spp. against Common Contaminants of Oyster Mushroom Bed

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Ganoderma has been treated worldwide as health maintaining food especially in Japan, China, Korea, Taiwan, Thailand, Malaysia, Vietnam, Indonesia and the United States. Global production of this mushroom was about 4900-5000 tonnes in 2002 of which 3800 were produced in China alone. World trade in this mushroom is around 2 billion US $. In India, market of Ganoderma based nutraceuticals is growing rapidly and was estimated to be about US $ 20.00 million in 2000-2001. Different industries from Malaysia are selling their products in India through multilevel marketing system (MLM). Ganoderma spp. is a member of the order Ganodermatales, the members of which are generally called polypores. Species of Ganoderma, especially G. applanatum, G. lucidum and G. tsugae, have been valued by Chinese who call them as “Ling-Zhi” and the Japanese as “Mannentake” due to their medicinal properties. Since Ganoderma is associated with health, wellness, long life, knowledge and happiness, Chinese call them as the “Miraculous King of Herbs” and “Herb of Immortality”. The basidiocarp, mycelia and spores of Ganoderma lucidum contain approximately 400 different bioactive compounds which mainly include triterpenoids, polysaccharides, nucleotides, sterols, steroids, fatty acids, proteins, peptides and trace elements. In the present investigation, an attempt has been made to study the activity of Ganoderma lucidum (culture filtrate and fruit body extract) against common fungal contaminants of oyster mushroom beds. Antifungal activity of culture filtrate and fruit body extract of local strain of Ganoderma spp was studied against four common contaminants of oyster mushroom beds under in vitro conditions. It was observed that the culture filtrate of Ganoderma spp. inhibit 70 and 75% growth of Rhizoctonia solani and Trichoderma viride respectively over control flasks. There was no sclerotia formation in Rhizoctonia solani in culture filtrate of Ganoderma spp. amended flasks as against complete growth of R. solani with abundant sclerotia in control flasks. Similarly, no sporulation with thinner growth of Trichoderma viride was observed in culture filtrate of Ganoderma spp. amended flasks compared to complete growth and initiation of sporulation at the margin in control flasks. In case of Coprinus spp. and Sclerotium rolfsii, no growth was observed in culture filtrate of Ganoderma spp. but initiation of growth was observed in control flasks. In case of fruit body extract of Ganoderma spp., it was found that the growth of contaminants was suppressed by fruit body extract of 30 and 20 percent concentration whereas 10 percent concentration enhanced the growth and sclerotia formation of all contaminants.

Keywords: Ganoderma Spp., Oyster mushroom.
Aquaponics and Agri-tourism for Sustainable Rural Livelihood

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Agri-tourism is an expanding sector of the agricultural market, one that aquaponic and hydroponic farmers can use to increase product recognition and profits. Increasingly, tourists, school groups and the general public want to experience rural life, meet and interact with individuals involved in agriculture and learn more about how and where their food is grown. Agri-tourism can include educational tours, picnic and camping sites on farms, farm produce and meat sales, farmers’ markets, u-pick farms, farm festivals and even agriculture-related theme parks. Increased profits and product awareness are the primary benefits for unique agricultural enterprises, like Aquaponics or hydroponics, to engage in Agri-tourism.

Keywords: Agri-tourism, Rural development.
3.12

Backyard Poultry Farming: A profitable enterprise for Rural Youth Farming

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To improve the socio-economic status of the traditional farmers, backyard poultry is a handy enterprise with low-cost initial investment. It generates self employment, provides supplementary income with protein rich food at relatively low cost. Raising backyard chickens can be a rewarding experience and a great way to teach rural youth about nature, agriculture and responsibility of caring for animals. It alters economic and nutritional status of the rural people and increases the production potential of agriculture land by using poultry manure. Poultry are efficient converter of food into egg and meat and feed items unsuitable for human consumption and by-products can be used successfully as feed for poultry. Feed cost of backyard poultry farming is considered to be minimum as the birds can be let loose for scavenging in the open yard and collect the required protein, energy, minerals and vitamins etc from insects, snail, termites, seeds of grasses and weeds, leftover grains, crop residues and household wastes. Due to small generation interval the returns from this venture is quite quick compared to other livestock species. The biggest advantage with the poultry is that it can be done as family business where all the members whether male or female, adult or children, old or young can contribute substantially for successfully running of this enterprise. At present poultry farming is a scientific and organized industry and playing an important role in creating job opportunities. Backyard poultry farming is the one among different enterprises in the present situation which gives some assured income to rural youths of the country. Over and above, poultry farming is quite and eco-friendly activity and can revert the trends of migration of rural youth.

Keywords: Backyard poultry farming, Rural youth, Empowerment, Migration, Manure, Sustainable development
3.13

Beekeeping Enterprise: A Case Study of Progressive Beekeeper

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Punjab is a leading state in bee keeping and honey production. At present there are more than 25000 bee-keepers producing more than 10000 ton honey per year. Beekeeping is a good enterprise for earning high income with less effort and helps in generating employment. Mr. Jagjit Singh is a progressive beekeeper of Village Mithra, District Jalandhar. Since childhood he helped his father in agriculture and after graduation he wanted to adopt some subsidiary occupation besides agriculture. He got training in mushroom cultivation, fishery and beekeeping from Punjab agricultural Ludhiana. Finally he decided to adopt beekeeping as Subsidiary occupations in the year 1999 and started this occupation with 20 colonies received from the Department of Agriculture. Under the guidance of KVK and PAU scientists, for continuous flush of bee flora and for enhancing the productivity of honey he started the migration of colonies to the nearby states such as Rajasthan and, Himachal Pradesh. He also obtained advanced training on “Mass Queen Bee Rearing and royal jelly production” and “Agro based industries for processing and agriculture structures” from PAU Ludhiana and increased the number of bee colonies. Jagjit Singh is an active member of PAU Kissan club and Punjab state Bee Keeper Association. He registered his product with AG- MARK and sold the honey produced by him under brand name “Marok honey” @ Rs. 240 per kg directly to retailers. At present he works with 350 colonies and earns Rs. 5 lac per annum from the sale of honey and honey bees. He also gave employment to two persons and one person started beekeeping after getting training from him. The secret of his success is his self and family involvement in his work and following the practices recommended by Punjab Agricultural University, Ludhiana.

Keywords: Enterprise, Subsidiary occupation, Migration, Colonies
Changes in Food Production and Consumption Pattern in India: Need for Nutrition Education

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Nutrition is a core pillar of human development, unfortunately the statistics for nutrition in India is very alarming and according to NFHS 3 (2005-06) survey, about 30 percent of all adults have BMI<18.5. More than a third (36%) of women have a BMI below 18.5; About 36 percent women suffer with chronic energy deficiencies; 56 percent women are anaemic; Approximately 8.32 cr (17% of female population) of adolescent girls (AGs) in the age group of 11-18 years are undernourished. In this background, this paper discusses the three major issues in nutrition security; (i) production and consumption pattern of major food items like cereals, pulses, oilseeds, fruits, vegetables, fish and meat and (ii) the importance of nutrition education and (iii) the various policy programmes directed towards the nutrition security and their divergences and convergences. Indian diets are qualitatively more deficient in micronutrients (MN) than say proteins or fats, special efforts are needed to improve access to MN. Unfortunately, the Green Revolution has bypassed millets and pulses, which are rich source of proteins in vegetarian diets. However, this trend is changing and it has been observed that horticulture is one of the fastest growing sectors within the larger agriculture sector. It is reported that horticulture production (280 mt) surpassed food grain production (264 mt) in 2013-14. This trend brought tremendous changes in consumption pattern and diet diversification. The per capita availability of foodgrains, fruits, vegetables and milk has significantly increased over the period particularly in last decade. On the other hand, strategies for improving access to balanced diet at affordable cost for all sections of the society are critical for achieving nutrition security. Along with access to food, there has to be nutrition literacy in all sections of the society to ensure right policies and programmes, knowledge about proper feeding practices, disease-free environment and safe drinking water to ensure absorption and assimilation of nutrients from food. For this, the component of human nutrition should be strengthened in agriculture education along with affordable, nutritious, ready to cook/eat processed foods with appropriate forward/backward linkages to benefit the farmers and resource-poor consumers. Considering these facts, Government of India also emphasized in XIIth Five Year Plan on massive awareness generation on household level nutritional security (nutrient profiles, nutrient consumption, cooking methods, safe storage, kitchen and personal hygiene and water and food quality etc.) through mass media and training of extension staff and members of PRIs.

Keywords: Food production, Food consumption, Nutritional security
Conservation Orientation of Fishing Cooperative Members and its Implications for Sustainable Fisheries Resource Management

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Concerns for sustainability of natural resources have led to the attention to newer approaches towards resource management including fisheries resources. Shift in the governance of fisheries to a broader approach, recognizes fishers’ participation, local stewardship and shared decision-making in the management of fisheries resources, has gained increasing ground world over. Co-management i.e. sharing the responsibility for resource management between the government and user groups is widely seen as a key in improving fisheries management and reducing overexploitation. Several factors determine the success of any co-management policy or programme for conservation and sustainable management of resources. One such important factor is the kind of orientation that the resource users have about the conservation of their resources. Therefore, a study was undertaken at two reservoirs of Orissa, namely Hirakud and Suroda, to assess the conservation orientation of the members of fishing cooperative societies. A total of 150 fisherfolk members from three fishing cooperative societies of the selected two reservoirs were taken as respondents. An index prepared by Tyagi et al. 2008 was used to measure orientation of the members of the fishing cooperative societies towards conservation of fishery resources. The findings indicated that the overall conservation orientation of the fisherfolk members was high in Suroda reservoir whereas, it was low in both the societies of the Hirakud reservoir. The paper discusses findings in detail and concludes few important implications of these findings for sustainable resource management of reservoir fisheries in the country.

Keywords: Fishing cooperatives, Sustainable resource management
Constraint Perception of Scientists and Veterinarians Regarding Mixed Dairy Farming in Jammu District Hampering Sustainable Rural Livelihood

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A study on constraint analysis of mixed dairy farming in Jammu district was conducted to find out the constraints affecting mixed dairy farming system. The data was collected from 30 scientists working in Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu and 30 field veterinarians of Animal Husbandry department. The scientists and field veterinarians were given a questionnaire with fifty statements in total for the perception rating regarding the constraints in mixed dairy farming. Constraints were evaluated on the basis of Mean Percent Score. Constraints like; lack of knowledge about balanced ration, lack of interest of young generation in animal husbandry related work, and poor knowledge of farmers about marketing strategies were perceived as most serious constraints by the field veterinarians. On the other hand, constraints like, lack of interest of young generation in animal husbandry related work, lack of organized extension network in the state and non-availability of green fodder throughout the year were perceived as most serious constraints by the scientists. Majority of the independent variables of the respondents except age, land holding and herd size were positively associated with constraint perception scores. Age was significantly and negatively related, whereas other variables like education, family type, social participation, extension contact, mass media exposure, economic motivation and risk orientation were positively associated with constraint perception scores.

Keywords: Constraints, Perception, Independent variables, Constraint, Perception score
Constraints Faced by Farmers of Kathua District in Adoption of Marigold Production Technology

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Marigold is an important commercial crop among all flower crops. Its flowers are available year around. Marigold flowers are used for various purposes like: worshipping, as cut flower, for beautification of beds and borders in lawns, in textile industry and for medicinal purpose. Marigold cultivation is highly commercialised now a days. But still area and production of marigold under Jammu province is less due to several factors. The present study was undertaken in Kathua district of Jammu and Kashmir to investigate the constraints faced by marigold growers during production and marketing of marigold. This district consists of eight blocks from which block Hiranagar, Barnoti, and Kathua were selected purposively. From each block four villages and from each village thirty farmers were selected, where the farmers were having largest area under marigold cultivation. A random sample of 120 farmers was drawn by randomization. A structured interview schedule was prepared for collection of date with a view to study various aspects regarding marigold cultivation. The data was collected through pre structured interview schedule and statistical procedure was employed to analyse the data. The study highlighted that majority of farmers have medium knowledge as well as medium level of adoption of marigold production techniques. The study further highlighted that majority of farmers were not adopting marigold cultivation due to various constraints like input constraint, technical constraints, Economic constraints, extension constraints and Marketing constraints. The major constraints expressed by marigold grower in each group of constraints were lack of timely availability of good quality seed material, lack of knowledge about production technology, high cost of hybrid seeds, lack of information through mass media and lack of cooperative institutions for marketing.

Keywords: Marigold farming, Adoption, Knowledge, Constraints
3.18

Corn Distiller’s Grains with Soluble: Non-conventional Feed for Ruminants and Non Ruminants

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In India, there is a shortage of about 26 million tones of concentrates, 280 million tones of green roughages and 44 million tones of straw for feeding livestock which adversely affects production and reproduction efficiency. To overcome this difficulty and make dairy enterprise sustainable we need to tap new non conventional feed resources. DDGS (Dried distillers grains with soluble) adds to profitability of corn ethanol production since one third of every gram of corn converted to ethanol produces DDGS. Taking into account the importance of corn distiller’s grains for sustainable livestock production the present study was conducted with eight samples of different distiller’s grains with soluble. Proximate constituent contents in DDGS with respect to DM, CP, EE, CF, TA and NFE were 89.7, 30.0, 9.8, 8.4, 4.5 and 47.2 per cent, respectively. Whereas, in WDGS (wet distillers grains with soluble) these contents were 29.9, 30.8, 10.3, 8.6, 4.1 and 46.1 per cent, respectively. Fiber fractions in DDGS regarding NDF, ADF and hemicelluloses were 38.9, 15.1 and 23.8 per cent, respectively. Whereas, in WDGS these contents were 40.4, 16.6, and 24.0 per cent, respectively. The in vitro dry matter digestibility of DDGS was 69.36% while it was 69.78% in WDGS. Mineral composition in maize, rice, sorghum and wheat DGS with respect to Ca was 0.12%, 0.09%, 0.09% and 0.12%, for phosphorous 0.83%, 0.42%, 0.83% and 0.89% for magnesium it was 0.28%, 0.28%, 0.29% and 0.30% and for potassium 1.11%, 1.07%, 1.17% and 1.22%, respectively. Energy values were estimated by using prediction equation concluded that TDN content was 92.16, 77.14, 82.10 and 81.96 per cent in maize, rice, sorghum and wheat DDGS, respectively. Similar trend was observed in TDN per cent of WDGS. The digestible energy content was found to be 4.06, 3.42, 3.61, 3.61 and 4.00, 3.51, 3.62 and 3.60 Mcal/kg in DDGS and WDGS of maize, rice, sorghum and wheat, respectively. On the basis of results obtained in this investigation it was concluded that, distillers byproducts are rich source of crude protein, crude fat, crude fiber and minerals and also superior in digestibility. Hence, DDGS and WDGS can be a good non-conventional feed for ruminants and non ruminants.

Keywords: DDGS, WDGS, Distiller’s byproducts
Double Cropping Rice Fallows for Food and Nutritional Security of Eastern India

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In South Asia, more than 15 million ha of land is left fallow after rice harvest at the end of the monsoon season. The Rice fallows basically imply to those *kharif* sown rice lowlands which remain uncropped during *rabi* (winter) due to various reasons such as lack of irrigation, cultivation of long-duration rice varieties, early withdrawal of monsoon rains leading to soil moisture stress at planting time of winter crops, water logging and excessive moisture at rice harvest, lack of appropriate varieties of winter crops for late planting and socio-economic problems like stray cattle, blue bulls etc. A pilot testing for double cropping was initiated during 2010-11 in two clusters namely Charama (villages Araud, Kotela and Hatkacharama) in Kanker district and Gariyaband (villages Potiya, Amethi, Piperchhedi and Dhamna) in Gariyaband district of Chhattisgarh state, India. The methodology adopted for double cropping of rice fallows in the two clusters was (i) identification of problems, prospects and possibilities, (2) awareness and skill development, (3) social problems and motivation, (4) technological interventions for *kharif* and *rabi* crops, (5) timely input supply, (6) mechanization, (7) water resource development and efficient utilization, (8) fruit, fodder and fuel plantation, (9) livelihood activities and (10) market linkages. These steps were introduced through pilot project fund and by converging ongoing schemes of agriculture and allied departments of the state in the entire areas of the villages in the two clusters. After introduction of all interventions, the progress was review by involving all the farmers of the villages in two clusters during 2013-14. Irrigated area increased from 3 to 28% in Gariyaband cluster and 9 to 26% in charama cluster due to construction of farm pond, check dam, tank, shallow well, shallow bore and tube wells through convergence. Improved technologies like direct dry line seeding, post emergence herbicide, integrated nutrient management (INM) introduced in rice. The dry direct seeding advanced maturity of rice by 15-20 days (June-September) and 20-30% yield of rice over traditional broadcast *biasi* method. This leads to more moisture after rice and thereby advanced sowing of *rabi* crops like chickpea, linseed, lentil, mustard etc. in residual soil moisture. With increased irrigated high tech vegetables were grown by the farmers in sizeable area. The major vegetables adopted by the farmers were ladyfinger, tomato, brinjal, bitter gourd, cauliflower, cabbage and chilli. The cropping intensity increased from 105 to 156% in Gariyaband cluster and 109 to 146% in charama cluster. Thus, it can be concluded that the rice fallow can be cropped with the above suggested methodology and converging the ongoing schemes of agriculture and allied departments of the Government.

**Keywords:** Rice fallow, Dry line seeding, Double cropping
3.20

Dyeing of Pashmina with Natural Dye Extracted from *Eupatorium adenophorium* Leaves

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Pashmina popularly known as cashmere is speciality hair fibre obtained from goat known as *Capra hircus*. Pashmina is the luxury fibre commanding the highest price in the world of textiles and is available mostly in Jammu and Kashmir, Uttarakhand and Himachal Pradesh. Himachal Pradesh is endowed with rich forests, flora and fauna. Many of the plants have the potential to yield eco-friendly dyes. Pashmina dying using natural colours will add value to the end product. Hence, a study was conducted on pashmina yarn dying using a plant based dye extracted from *Eupatorium adenophorium* (Crofton weed) leaves by using mordants for assessing its colour fastness properties. The dyeing technique was standardized by determining the dye extraction medium, concentration of dye material, concentration of mordants, dye extraction time and dying time. The results revealed that the colour obtained from *E. adenophorum* leaves dye ranged from light yellow to dark green depending on the type and concentration of mordant used. Dyed pashmina yarns were also assessed for various colour fastness properties. It was found that *E. adenophorum* leaves can be successfully used for dyeing of pashmina. Further for product diversification designs were developed and handloom woven products were prepared. The designs developed by using natural dyed yarns were found suitable and showed good appearance. As the extraction, application and product development process is quite easy and the technique can also be adopted by local people at cottage level. These efforts can also ensure economic prosperity and ecological sustainability in the hilly states.

**Keywords:** Pashmina, Dyeing of Pashmina, *Eupatorium adenophorium*, Extraction process
3.21

Economic Impact of Front Line Demonstration on Summer Moong in Jalandhar District of Punjab

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A study was conducted in Jalandhar district by selecting 63 farmers and covering 32 hectare area under front line demonstration (FLDs) from 2009 to 2012. As Jalandhar district has a considerable area under potato and sugarcane, summer moong can be of third crop in rice-potato and sugarcane-rice crop rotations by providing additional returns and improvement in soil fertility. Area under pulses was negligible in the district. Farmers were using locally kept seed of unidentified varieties, sowing from end March to end of April by broadcasting, using 30-50 kg/ha of seed without any seed treatment. Farmers also applied non-recommended fertilizers and fertilizer doses. In front line demonstrations highest average yield of 11.4 q/ha was recorded in 2011 and the highest increase of 26.3 percent in yield over check plots was recorded in 2009. Although cost of cultivation was slightly on the higher side in FLD plots, returns were much more. In FLD plots, as well as local check plots average gross return was highest in 2010. Farmers were ignorant about recommended pesticides, time of spraying and their doses. Farmers realized the importance of time of sowing, seed treatment and application of balanced use of fertilizer, recommended pesticides as well as its time of spray after experiencing the results of FLDs.

Keywords: Summer moong, Jalandhar district, Front line demonstrations, Economic impact, Crop rotation
Economic Perspectives through Varietal Spectrum

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Horticulture constitutes a critical area of the state’s economy, contributing about Rs. 400 crores of the state’s domestic product per annum. Of late, as a result of all-round economic and technological advancement and intervention of the state, the fruit industry has received a great boost, leading to more production and export of the produce. This sector constitutes the core of agricultural economy of the state. About 20 percent of the total cultivated area is under horticulture crops. About 4.5 lakh families are engaged directly or indirectly with horticultural activities. Among different regions of the state, Kashmir valley produce bulk of all temperate fruits in the state save apricot the production of which is more in Ladakh region. The apple occupies a predominant position amongst horticulture crops, constituting 45 percent of the total area under tree crops. The other fruits are walnut, almond, pear, cherry, apricot and peach. Jammu and Kashmir leads in area as well as in production of walnut comprising of 87280 hectare and 165024 metric tonnes production with 1.79t/ha productivity. In Kashmir valley, Kupwara is known for production of quality walnuts with an area of 8175 ha, 22103 metric tonnes and yield of 2.70 t/ha. However, the existing plantation is of seedling origin which produces gigantic trees with valuable nut and kernel quality. Furthermore, the plantation is scattered lacking the regular orchards of well defined varieties in order to adopt proper orchard management practices. Krishi Vigyan Kendra Kupwara is on the fore front to disseminate the technology to pave the way for good quality fruit production with minimal input requirement. In apple, KVK introduced SKUAST –K released varieties like Firdous and Shireen that are scab resistant besides Lal Ambri, Sunhari, Shalimar Apple-1 and Shalimar Apple-2 to enhance the varietal spectrum. Similarly, in walnut the varieties like Hamdan and Sulaiman with high shelling percentage were introduced in the district. The farmers were regularly imparted trainings to improve the grafting success through wedge/ cleft grafting and patch budding. The green house technology provided to farmers also helped in propagation of descriptive cultivars like Hamdan and Sulaiman. The walnut is successfully propagated under protected conditions. Under open conditions there is generally less success as it requires a relative humidity of >80% and temperature 25±3°C for successful graft union.

Keywords: Horticulture, Apple, Walnut, KVK, Technology dissemination
Empowerment of Scheduled Tribes Gonda Families of Hilly zone of Karnataka through Integrated Farming System

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Farming system is one of the approach where in the risk in dealing with single component can be minimized by increasing the productivity through effective recycling. Integrated farming system conceptually is a set of elements or components which are supplementary and complementary to each other. It takes into account the components of soil, water, crop, livestock and other resources available with the farm family at the centre and laterally managing agricultural and other related activities. There is a need to suitably combine the various enterprises on the farm to enhance productivity and overall sustainability for secured livelihood. In order to empower the Gonda scheduled tribe community of Bhatkal taluk of Uttar Kannada district of Karnataka state (Hilly zone of Karnataka), a project was operated during 2010 and 2011 at Kuntavani village by Krishi Vigyan Kendra of Uttar Kannada district with the following objectives: Optimum utilization of existing lands, keeping in-view of the land and environmental sustainability; Judicious use of natural resources for improving the livelihood and income generation; providing food better nutrition and employment securities on a sustainable basis. The impact of the study revealed that land utilization increased from an average of 1.5 acres to 6 acres; diversification of the cropping system from monocropping rice and pulse crop for their household purpose with judicious mixing of allied activities namely olericulture, fruit crop cultivation, animal husbandry, vermicompost, bio digester etc.. As a supportive activity, the animal husbandry intervention had provided an opportunity to increase the overall sample farmers milk yield from 91,560 to 1,65,910 litre/annum which resulted an increase in milk consumption by 125 percent. In addition to this, under backyard poultry component for the total sample farmers, the egg production level was increased from 44,460 to 46,300 numbers. As a result the family income increased from Rs.39,466 to Rs.89,939 per annum. Further, because of the introduction of the new crops and allied activities the family employment was increased from 131 man days to 197 man days which checked migration of the youths to the neighbouring cities.

Keywords: Integrated farming system, Scheduled tribes, Impact
Ensuring Nutritional Security and Sustainable Rural Development: Some Successful Interventions of KVK Pratapgarh

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Sustainable agriculture development is essential for boosting socio-economic status in our rural areas. Agriculture, livestock and allied sector development is the major support system to rural economy which provides livelihood, nutritional and income security to the farmers. At present the technology is developing very fast in terms of quality and quantity. KVKs through advisory services and progress forges to reinforce the people’s capacity to innovate. Present day status shows that role of extension has changed from production incentive to income facilitator, because now-a-days farming is beyond subsistence, it is more like a business. Agriculture extension is no longer just about improving yields and providing food but also to make money. For this, KVKs of Rajasthan are making necessary field level interventions. Looking to the need, low cost technologies have been demonstrated at KVK, which are being adopted by farmers namely Azolla unit, Low cost shade net house, Honey bee rearing, Nutritional gardening and Vermi-compost unit. Azolla unit- It is protein rich and helps in increasing milk productivity (15-20%) as well as good egg production of poultry and fast weight gain of broilers. Low cost shade net house- It is prepared by using bamboos by which a farmers can earn extra income of Rs. one lakh within a year by selling seedlings of different fruits and vegetables. Honey- bee colonies - It helped TSP farmers to earn additional income through selling of honey. Nutritional gardening by using only vermi-compost- It helps all members to eat fresh and organic vegetables and keep themselves healthy. Hence, in addition to farmers practice, extra and low cost technologies can help farmers for livelihood and nutritional security.

Keywords: KVKs, Lowest technologies, Azolla, Shade houses, Honeybee rearing, Nutritional gardening, Vermi-compost
Entrepreneurial Behaviour of Strawberry and Vegetable Entrepreneurs in Jammu and Kathua Districts of J&K State

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The major thrust in the present investigation was on certain psychological characteristics among the farm entrepreneurs. Entrepreneurial behavior is the extent of qualitative and innovative activities carried out by an entrepreneur in their respective enterprises. It was measured on various dimensions of entrepreneurship behavior namely, achievement motivation, risk taking capacity, decision making ability, communication skills, adoption propensity, locus of control and self confidence. The study on 60 entrepreneurs, thirty each selected from strawberry and vegetable entrepreneurs from Jammu and Kathua districts revealed that majority of the entrepreneurs had medium level of achievement motivation, risk taking capacity, communication skills, adoption propensity, and self confidence. The strawberry entrepreneurs had high level of decision making ability and more internal locus of control than vegetable entrepreneurs. The overall entrepreneurial behavior index (EBI) was high in case of strawberry entrepreneurs. The major constraints identified in case of strawberry entrepreneurs were difficulty in borrowing loans (60%), lack of conviction (36.66%), and lack of technical guidance (60%) whereas the major constraints faced by the vegetable entrepreneurs were lack of cosmopoliteness (66.66%), fluctuation in prices (50%), small units of operation (33.33%) and the most common constraint faced by the vegetable growers was the attack of insect-pest (60%)

Keywords: Entrepreneurial-behavior, Psychological-characteristics, Farm-entrepreneur, Achievement-motivation, Innovators, Productivity
Entrepreneurship Development in Agriculture

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Entrepreneurship is a key factor for the survival of small-scale farming in an ever-changing and increasingly complex global economy. It is a function of handling economic activity, undertaking risk, creating something new and organizing and coordinating resources. For a successful entrepreneur one should have many characteristics such as achievement motivation, self confidence, risk taking, taking initiative, dealing with failure, leadership etc. There are mainly four dimensions of entrepreneurship i.e., agripreneurship, women entrepreneurs, co-operative entrepreneurship and rural tourism. The entrepreneurship development considers new and unexplored fields as its subject matter where the capability of men and women are being developed in order to cope up with the impact of globalization. There are many institutes for promoting entrepreneurship and agripreneurship such as National Science and Technology Entrepreneurship Development Board (NSTEDB), National Institute of Agricultural Extension Management (MANAGE) etc. It cannot be assumed that every enterprise will be successful. It needs the right environment. But often there are barriers outside the control of the farmer that limit success and make the environment hard for new businesses. Becoming an agripreneur is not a career path to be undertaken lightly. Entrepreneurs have to be prepared to take calculated risks. Entrepreneurship in agriculture is becoming increasingly important at a time when many traditional avenues for farmers are closing.

Keywords: Entrepreneurship development, Entrepreneurship in agriculture
Entrepreneurship Development of Woman through Agriculture

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Entrepreneurship development among women plays an important role in agriculture & allied activities related to domestic work. Women have been the backbone of agriculture and in India 90 percent of the rural women engaged in agriculture and grow half of the world food. Women are engaged in various farming activities starting from seed sowing to harvesting, livestock management, horticulture, value addition, agro forestry and other related activities. There are opportunities in abundance for rural women to facilitate them in improving their standard of living an empowered women must have equal capabilities & equal access to resources. Entrepreneurship development among women has emerged an important pathway towards empowering the rural women of rural areas and monetary independence gained through entrepreneurship activities bring change in motivation level, attitude, values, knowledge and skill of women. Entrepreneurship in agriculture will help in accelerating the economic growth and self help group will surely help the majority of rural population to secure livelihood by taking up the income generating activities in value added form based products, dairy products, bakery products, mushroom & vermicomposting. The economic empowerment of women leads to development of family and community. The need of the house is improve them technically to cope with the changing times and productivity using their free time and existing skills for setting and sustaining enterprises.

Keywords: Entrepreneurship development, Empowerment, Value added products
3.28

Grass Root Entrepreneurship through Self-Help Groups (SHGs)

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A scheme for entrepreneurship is the self-help group (SHG), which enables the rural poor to earn their own livelihood besides participating in the process of development. MFS has grown at a fairly significant pace and has become a full fledged programme today. The SHG scheme has been extensively used by voluntary agencies for a long time but it has been incorporated in the conventional development programmes only recently. A typical rural women’s SHG is a good example of capacity building for perspective entrepreneurs. The process of organizing women into self help groups started during the Ninth Plan, has made a tremendous progress in the Tenth Plan Period and the Eleventh Plan also continues with the commitment to the sector-specific 3-Fold Strategy for empowering women, based on the prescriptions of the National Policy for empowerment of women. The group formation helps to generate peer group support and solidarity. The group meets regularly initially for awareness generation. After selecting a specific project, some of the members of the group leave for training. Regular and timely attendance at meetings become very important at this stage and the quantum of weekly saving is decided upon. Each member is expected to contribute and participate. The initial contribution is made either by an NGO, or a funding agency or the government. Owing to the credit programme, the women have access to money. They decide on their own which issues are of concern. Some women may start a home based business from the loan availed. SHGs are directly helping women increase their income by providing loans for productive enterprises. The interest rate of money-lenders is avoided and women are equipped to face possible loss of assets like cattle and goats through insurance. However, self-help groups cannot be considered as a credit or savings group alone, mobilization and organization of women into groups is equally important because these groups form the basis for solidarity, strength and collective action. Organizing such groups needs to go further in addressing not only economic but also other social and political issues. Such groups were first organized in many places as a savings group to overcome the lack of access to credit for women for entrepreneurial activities. Uneducated rural women belonging to the lower strata find it almost impossible to initiate any such entrepreneurial work without adequate capital, proper training and on-site support. Such support is made available to women SHG members through various schemes. The SHG’s involvement in self-employment activities certainly contribute to group entrepreneurship at the grass root level. Group entrepreneurship offers an opportunity for instilling basic managerial skills and values amongst the rural poor. It would not only help the poor but the society as a whole. Hence, group entrepreneurship through SHGs is an investment in the poor and an engine of development, and an idea, which could be given a serious thought in future.

Keywords: Entrepreneurship, SHG, Capacity building, Self dependent
3.29

Impact of ICM Project on Redgram Yield in Yadgir District of Karnataka

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The major crops grown include Tur, Ground nut, Cotton, Green gram in Kharif and Bengal gram and jowar in rabi. There is a high incidence of migration-both distress and un-distress, 60% of the population between the age group of 15-45 years migrate to Mumbai, Mangalore and Bangalore in search of employment. Thus migration has been an accepted phenomenon among the members of the community. The Integrated Crop Management (ICM) is a part of RKVY project introduced by the University of Agricultural Sciences, Raichur, through its research and extension centres across Karnataka. The integrated crop management programme hopes to cover about 300 farm families and landless labourers of blackgram and redgram growers of Yadgir district. The ICM was introduced in the yadgir district in the year 2011. A study was conducted to find out the impact of ICM project. In the recent past the production of redgram is not predictable or to the extent expected due to, either heavy rains or other stress factors. In such situation, there is a need to have contingent production technologies under constraint situations and agronomic trials were conducted at different places of Yadgir district. UAS, Raichur under government sponsored RKVY project distributed critical inputs free of cost to the farmers for improving their socio-economic condition. Therefore, there is a need to assess the performance of ICM programme and to ascertain the opinion of the beneficiaries with respect to yield levels, critical inputs distributed and utilized and improved cultivation practices adopted by farmers. The results of this study revealed that majority (61.25%) of the redgram growers belonged to middle aged group, nearly three fourth of the respondents had small farm land holding (<10 acres) and only 25% of the respondents had big holdings (>20 acres) and remaining 12% medium level of land holding. Only 14% of the redgram growers were found to be literates. Only two percent yield increase was found due to IFSD project implementation (Before implementation of project average yield level was 4.5 q/acre and after implementation of project average yield level was 4.60 q/acre). The farmers expressed that the quality of critical inputs distributed (seeds, PSB and ZnSO4) by project scientists was found to be good with respect to seeds. However, nearly half of the beneficiaries did not apply inputs namely; PSB and ZnSO4, as it was not given in time. This programme is good with respect to seed distribution only (100%). Majority (62.00%) of redgram growers expressed the problems of market, transport and lack of technical guidance about redgram crop.

Keywords: ICM, Impact, Redgram
Integrated Farming System- A Livelihood Security Tool for Rural Small and Marginal Farm Families

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Integrated Farming System (IFS) is a complex interrelated matrix of soil, plants, animals, implements, power, labour, capital and other inputs controlled in part by farming families and influence to varying degree by political, economic, institutional and rest factors that operate at farm level. Under the existing agrarian structure, most of the rural farm families are of small and marginal in nature who are living below the poverty line with the continued threats to their livelihood security characterized by low in food and income securities, unemployment, health problems, education etc. Due to this reason, these categories of farmers, poorly adopted to the changed farming scenario especially in rainfed areas. Further, this section of farming community is very much susceptible to the natural vagaries (drought & flood) thus resulting in large scale migration to urban areas for seeking livelihood opportunities. IFS acts as a better tool to address these problems as it ensures the consolidation of natural resource base at farm level and provides an opportunity to arrive at appropriate combination of the enterprise through interlinking of different farm enterprise for the effective use of natural resources and recycling of nutrients on the farm. To educate the farming community on large scale and to organize the IFS activities on the farmer’s field the ToT centre of Northern dry zone of Karnataka demonstrated IFS activities on 182 farm families in 2010 and 2011. The results revealed that, food grain productivity level raised from 19.04 q/ha to 26.07 q/ha which was 37 percent higher over bench mark year. The productivity level of vegetables during the bench mark year was only 9.3 q/ha and was enhanced to 82.7 q/ha. With respect to dairy farming the milk yield of sample farmers was stabilized at 84,500 liters/annum. By recycling of farm wastes these farm families had produced 5930 q of vermin compost per annum. These activities greatly helped in creation of on farm employment opportunities to the extent of 109 (benchmark year) days to 134 man days (2011). With respect to food consumption pattern, it was found that the milk consumption was increased to 270 per cent while cereals and fruits increased to 26 and 23 per cent respectively. The average of 182 farmers net returns showed 96 per cent increase which was Rs.60, 157 before intervention and was increased to Rs.1, 17,942 per farmer during 2011-12. The enhanced net returns with agriculture, horticulture and animal husbandry components were 106.1, 87.3 and 87.8 per cent. The enhanced net returns showed greater economic security.

Keywords: IFS, Livelihood security, Small and marginal landholding
Integrated Farming System Approach for Efficient Resource Management to Achieve Food and Livelihood Security

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Integrated farming systems interact with soil, water, plant, animal and environment and enable the system more viable and profitable over the arable farming system. Integration of various farm enterprises generates additional income. The enhancement of the income is due to the increase in the productivity, cost reduction and employment generation which provide livelihood security. Hence, to achieve this goal, demonstrations on integrated farming system activities were taken on farmers farms of zone 1 and 2 which comprises Bidar, Gulbarga and Raichur districts of Northern Karnataka during the year 2010 and 2011. The study revealed that, the bench mark (BM) productivity (4.5 q/ha) of food grains was raised and stabilized at 5.67 q/ha. With this, for 2010-11 and 2011-12 the farmers had realized 29 and 51% productivities for food grain over BM year respectively. In addition to the field crops and to provide the cushioning effect for the diversification of the farm activities cultivation of commercial crop (cotton & sugarcane) and vegetables (brinjal, onion and cucumber) were encouraged. This had resulted in generation of income at regular intervals and helped in meeting the day to day's farm expenditure. To support the agricultural activities and to create on farm additional opportunities, farmers were educated on animal husbandry activities consisting of dairy farming and backyard poultry keeping. With this intervention for 80 farmers, the total milk yield level was increased from 18,000 liters to 31,450 liters per annum. Similarly with the introduction of backyard poultry farmers had realized 18,440 egg/annum which had helped in increasing the farm income and also nutritional security of family. This intensification of farm enterprises created additional employment opportunity which rose from 7,287 man days to 7,974 man days in the year 2011. For recycling of the farm wastes the vermicompost production units were included by which in a year the farmers had consistently produced 2640 q. of vermicompost and used in the crop production system. This clearly indicated about the reduction in the expenditure towards the supply of plant nutrients and improved the productivity level of the farms through the improvement of soil health. With the IFS interventions on farm sites, the average net returns of 80 farmers were enhanced from Rs. 22,322 to Rs. 49,510 (2011-12) which is 121 per cent gain over benchmark year 2009-10.

Keywords: IFS, Resource management, IFS demonstration
3.32

Integrated Farming System for Sustainable Rural Livelihood of Small and Marginal Farmers of Hilly Zone of Northern Karnataka-
An UAS Dharwad Approach

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The farming system research done in India and elsewhere helped to understand the problems of small and marginal holding farmers and their environment. The vertical integration of enterprises and introduction of science & technology innovations in a cropping pattern with optimum utilization of on farm resources enhanced the overall production and productivity of the farms. Keeping in view, blend of enterprises was taken up through the Government of Karnataka funded project “Integrated Farming System (IFS) for Sustainable Livelihood –An UAS Dharwad Approach” operated in transition zone (comprising hilly areas) of Northern Karnataka during the year 2010-11 and 2011-12. A total number of 83 farm families were identified by following PRA technique. The information on the farm situations was analyzed and documented for redesigning the farming activities to develop tailor made IFS modules. The accomplishments with quantified and tangible benefits are: The mean productivity was increased by 19 percent in cereals, 27 percent in pulses, 15 percent oil seeds; 14 percent in commercial crops. The interventions depicted higher Sustainable Yield Index (SYI) with maize (0.80) compared to other field crops while ridge gourd realized higher SYI (0.85) among vegetable crops. The incremental B:C was higher with introduction of IFS across farm families of 83 and was 3.46 indicating greater economic security. Sustainable Value Index (SVI) with integration of enterprise was significantly higher when compared to individual enterprises. Drudgery reducing equipments like saral kurupi, improved sickle, cycle weeder and rake resulted in 27.62, 47.16, 25.41 and 40.11 percent drudgery reduction respectively, resulted in saving of labour cost ranged from Rs. 1095 to Rs. 1799 per ha. The whole farm net returns were enhanced from Rs. 92,701 to 1,48,884 during 2009-10 base year to 2011-12 assessment year by adopting the IFS. The incremental benefit cost ratio 3.46 indicated the impact of technologies and showed greater economic security among farm families. The food consumption pattern depicted an increase in the consumption of milk, cereals, vegetables and eggs with greater nutritional security. The additional man days per farm generated were 29 and helped in addressing the employment security. Hence, the accomplishments of this project addressed the food, income and livelihood security of farm families of the zone 8 comprising hilly area of northern Karnataka.

Keywords: IFS, Sustainable rural livelihood, Small and marginal farmers
Integrated Farming Systems for Sustainable Livelihood for Small and Marginal Farmers of High Altitude Areas

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The concept of farming system is integration of components which are interdependent and interact among themselves. It takes into account the components of soil, water, crop, livestock and other sources with the farm family at the centre and managing agriculture and related activities. Small and marginal farmers of high altitude and tribal area zone of Andhra Pradesh are economically poor; cultivate crops in diverse and risk prone environments. The income from agriculture meagerly fulfils the subsistence needs of farm families. Though, integration of crops with cattle, goat, sheep and apiary and recycling of organic manure is being practiced since olden days, ignorance in their practical utility and adopting non-scientific combination of enterprises results in lower yields. Hence, integrated farming system studies comprising enterprises like field (rice, ragi, rajmash) and horticultural crops (banana), poultry (rajasree breed, 150/batch), fishery (0.20 ha) and apiary (5 bee hive boxes) were evaluated in 0.6 ha area at Regional Agricultural Research Station, Chintapalli from the year 2009 to 2012 with a view to generate sustainable production and profitability for small and marginal farmers. Among the above mentioned enterprises, poultry produced the highest net returns of Rs.20,910 with B:C ratio of 2.08. Crop + poultry + fishery + horticulture system recorded profitable integrated farming system with net income of Rs.29,102 and B:C ratio of 1.83 with productivity of 14.40 (tones/ha) over arable cropping returns (Rs. 14500/ha) and B:C ratio (1.47) with lower productivity (7.5 tonnes/ha). Integrated farming system offers viable solution to meet the increasing food demand, diversification of food habits, besides recycling the residues within the farm to improve the soil health and productivity over a longer period.

Keywords: Integrated farming system, Small and marginal farmers, B:C ratio
3.34

Knowledge Domain of Respondents about ICM based IFS Programmes in Yadgir District of Karnataka- Analytical Study

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A comparative study on integrated crop management (ICM) based integrated farming system (IFS) programmes in Yadgir district of Karnataka district was carried out during the year 2013-14. The purposive random sampling was used, which constitutes the total sample size of 120 respondents. The expost-facto research design was used for the study. The data was elicited through personnel interview method and analyzed using mean, standard deviation, frequency, percentage and correlation. The major findings of the study were that; major proportion of the farmers before implementing IFS programme were identified in low to medium knowledge category (78.33%), whereas in case of the farmers after implementing IFS programme major proportion of the farmers belonged to medium to high knowledge level category (81.67%). Majority of farmers before implementing IFS programme had knowledge about the inter cultivation practices (74.17%) and proper time for FYM application (70.00%) followed by summer ploughing (68.33%), suitable month for redgram sowing (56.67%), recommended seed rate (54.17%), important pests in redgram cultivation (54.17%) and its management (51.67%). Whereas majority of the farmers after implementing IFS programme had knowledge about summer ploughing, intercultivation practices (79.17%) and recommended seed rate (76.67%) followed by recommended variety (74.17%), proper time of FYM application (74.17%), management of pests (67.50%), suitable month for redgram sowing (61.67%) and nipping practices (56.66%). Independent variable of farmers before implementing IFS programme and after implementing IFS programme viz., education, farming experience, risk orientation, achievement motivation and innovative proneness exhibited positive and significant relationship with their knowledge status about ICM based IFS programmes.

Keywords: Knowledge domain, ICM based programme, Relationship with SES status
Marketing Behaviour of Organic Redgram Cultivators in Gulbarga District of Karnataka State

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A study on “Marketing behaviour of organic redgram cultivators” was conducted in Gulbarga district of Karnataka state. Two taluks namely, Gulbarga and Jewargi were selected based on higher area under organic redgram cultivation. One hundred twenty respondents were selected with simple random sampling procedure, to know the marketing behavior and post harvest operations carried out by the organic redgram growers. With regard to post harvest operations, hundred percent of respondents graded the produce manually and jute bags were used to store the produce, whereas, 71.67 percent of the respondents sold when price was suitable in regulated market (90%) through commission agents (77.50%) and got price information by personnel visit/phone call to regulated market (81.67%) and others who visited the market (68.33%). But no farmer certified the produce and sold at a premium price. The study revealed that farmers lacked knowledge regarding post harvest operations and marketing of organically grown redgram at premium price. Developmental departments need to organize training, exhibitions, awareness programmes and educational trips to create awareness and increase the adoption of organic redgram cultivation. There is need for an agency or consortium of farmers, scientists, NGOs, government and marketing agency to solve the problems and make organic redgram farming as a profitable cultivation practice.

Keywords: Market, Post harvest, Organic, Cultivation practices
Marketing Paradigms for Rural India

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In India there are just 5,161 towns as compared to 6,38,365 villages in India. This in itself is an indicator where the real India resides. The Indian rural market generates about 50 per cent of the country’s gross domestic product (GDP). Rural India comprises around 840 million people, and growing income levels and greater ambitions are progressively driving demand there. The size of rural market itself speaks of its potential. Rural India is still a mystery, with perspectives varying with the researchers. The large share of population residing in these areas with diverse cultures, aspirations and needs make it a challenging proposition for both academics and industrialists. But this has not taken the charm off this fast evolving market. Marketers have already made inroads into rural India with their diverse offers. While the going was tough earlier, the recent revolution in technology and communication has made it more accessible though at the same time, more discerning and, therefore, more distant in terms of approachability and targeting. The once successful marketing strategies need to be re-tuned to suit the new requirements. Earlier paradigms in marketing need a changed focus so as to make a genuine entry and ensure long-term survival. This paper looks at the scenario and explores opportunities for the corporate to take advantage of a market that holds almost three-fourths of all Indians. The Indian rural market has a huge demand base and offers great opportunities to marketers. Two-thirds of Indian people as well prospect consumers live in rural areas, approx 30% GNP generated from rural business. If we cast a glance over demographically at global perspective that Indian rural population contribute approx 12.2% of total global population which is a huge and unorganized market. Rural management also helps to enhance living standard rural people. Since independence, the Government has initiated certain plans for the betterment of rural people. Upgrading rural market is one way to improve access to marketing opportunities.

**Keywords:** Marketing, Rural India
Progression of an Agri-preneur

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Agro-industries play a significant role in employment generation. Processing of agricultural produce is carried out mainly in urban areas and the farmers market their produce in the unprocessed form. The farmer could increase the market value of their produce provided the processing is done at farmers level. An innovative farmer, Sh. Kawal Singh of Sonipat district of Haryana tried to shift his traditional farming system to agri-preneur and achieved a great success. He was content with the traditional farming of rice-wheat on 7.2 ha of his family land and further fragmentation of land left him with only 1.8 ha. His farm land is of good quality with assured irrigation facilities and having easy connectivity with nearby market of Delhi and Sonipat. His enterprising mind started exploring the idea of enhanced farm income from his small holding and turned towards vegetable cultivation. He opted the high value low volume vegetable crops having high market demands. He earned his name particularly in baby corn and sweet corn cultivation. He is not only successful grower of these vegetables but started marketing and value addition of crops along with mushroom and tomato by starting a Agro-processing plant in his native village with an initial investment of Rs. 50 lakh and afterwards expanded it with modern machineries and achieved a turnover of Rs. 2.5 crores. In 2012 Sh. Kawal Singh established a vegetable and mushroom packaging unit in food park at Rai, Sonipat with an investment of Rs. 1.35 crore by forming vegetable farmers Co-operative Production and Marketing Society and got a turnover of Rs. 1.60 crore in the year 2013. He is a smart agri-preneur, who does packaging of farm produce and provides employment to many farm worker especially women farmers and puts an example for other farmers also. He is recipient of ICAR’s N.G. Ranga best farmer award.

Keywords: Case study, Innovative farmer, Agri-preneur
Organic milk can avoid risk of cardiovascular disease, cancer, depression, rheumatoid arthritis and diabetes like health problems associated with modern lifestyle. The increasing awareness among consumers about health benefits of organic milk and the increased purchasing power of new generation have increased the prospects of organic dairy production. Organic livestock production requires that animals are fed organic feed, have access to pasture or outside with restricted use of antibiotics and hormones. Organic feed is produced without the use of synthetic fertilizers or pesticides for at least three years prior to harvest. Some feed additives such as vitamins, minerals and probiotics can be added to feed as long as they are approved by a certifying organic authority. A proper herd health program should include strategies for disease prevention, parasitic control and disease treatment. All vaccines for endemic disease are approved. Herbal, naturopathic and homeopathic treatments are approved for use on organic animals. Producers of organic animal products need to maintain full records (which can be checked by a certifying authority at any time) and must only market healthy animals and animal products. Changing to organic dairy production requires commitment and awareness of what's involved. Becoming organic can lower cost of production for grassroot people (smallholder dairy farmers) while at the same time raise their profits. However financial returns shall depend greatly on the demand generated. Due to rich heritage of dairy farming traditions suitable for organic production systems with good returns, India is in a unique position to utilize this opportunity. However for this purpose, a number of policy issues require immediate attention. Creating awareness among farmers and their training through dairy field functionaries, capacity building through participatory research network and incentives for interested farmers (like subsidized inputs and supply of market information) shall be the priorities.

**Keywords:** Organic dairy production, Health benefits, Grass root people, Awareness, Capacity building
Prospects of Agritourism in Bikaner District of Rajasthan

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Agritourism is emerging as an important instrument for sustainable human development including poverty alleviation, employment generation, environmental regeneration and development of remote areas, advancement of woman and other disadvantaged groups in the country apart from promoting social integration and international understanding. Agritourism does not require any huge changes in the agricultural landscape; it is easily built on the existing resources on the farm. The study attempts to analyze the potential of agritourism in Bikaner district of Rajasthan. Foreign tourist and domestic tourist were interviewed on the basis of convenience, and judgmental sampling was used to select experts and agripreneurs in the study area for the assessment of potential for agritourism in the area. This study examined to find out the need and scope of agritourism, suitable framework for the agritourism centres and to identify the challenges of the agritourism and make suggestions for its establishment and operations in Bikaner. Researcher analyzed first objective through various ways like assessment of agritourism potential of Bikaner region, motivational factors behind farm enterprise diversification in Bikaner, and tourist’s expectations regarding agritourism in Bikaner. Identification of different destinations and development of agritourism centres was also studied on the basis of Ministry of Tourism, Art and Culture-Government of India (MoTAC)-Department of Tourism, Final report on 20 years perspective plan for sustainable tourism in Rajasthan, and on the basis of opinion of experts. The Kaiser-Meyer-Olkin (K-M-O) and Bartlett Sphericity test to understand adequacy of the data for factor analysis. A principle competent analysis method was used to identify the major problems. Garrett’s ranking technique was used and strategic measures are suggested. The study concluded that Bikaner has agritourism potential but we need efforts towards site, infrastructure, marketing, innovative ways of displaying agritourism products and services.

Keywords: Agritourism, Potential, Agri preneur
Psychological Motivations and Compulsive Buying: A Study of Consumers in Gwalior of Madhya Pradesh State

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Compulsive buying behavior is an important area of research in consumer behavior research. The importance of studying this behavior lies in its nature as a negative aspect of consumer behavior. Negative aspects of consumer behavior are necessary to study since they may provide guidelines to policy makers to combat and reduce their impact. Such studies can also contribute to the society’s well being. The study examines the psychological motivations that lead to consumers’ compulsive buying behavior. Responses of 200 respondents from Gwalior were collected by using a structured questionnaire. Convenience sampling was used to reach out to the respondents. Both primary and secondary sources were used to achieve the objectives of the study. ANOVA, factor analysis, and correlation analysis were applied on the collected data to draw significant results. The present study confirms that consumers are strongly influenced by their role models and indulged in compulsive buying behaviour. Individuals who are high in public self-consciousness are quite aware about their public image and use luxury goods to enhance their stature in the society. Materialistic individuals often relate possessions of goods to happiness and thus indulge in compulsive buying behavior. It was also found that there is no relationship between gender and compulsive buying.

Keywords: Psychological motivations, Buying behavior
Rural Tourism: A Sustainable Enterprise for Small Farmers in Jaisalmer District of Rajasthan

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Tourism industry today is one of the largest service industries in India which contributes 6.57 percent to national GDP & providing 8.81 percent of the total employment. Agriculture is the backbone of economy where two-third of the population is directly or indirectly dependent on agriculture & 14 percent GDP comes from agriculture alone. The sector’s contribution towards GDP is decreasing & it is becoming difficult for farmers, specially of the western Rajasthan namely Barmer, Jaisalmer, Jodhpur, Pali & Bikaner to survive due to the continuous draught, erratic rainfall, small land holdings, low socio economic status etc. Rajasthan located in the north west of India, is the country’s largest state covering 10.4 percent of the total area. It is one of the most vibrant states with its rich culture, heritage, art, folk tradition, cuisine and varied wildlife. The land is endowed with invincible forts, magnificent palaces, havelis and abundant natural resources. The rural tourism here is an appropriate tool to revitalize the declining rural areas and to ensure their sustainable future by job creation, increased job diversity, farm support, broadened cultural provision, landscape, maintenance of rural art and craft as tourist attractions. Many rural communities have the potential resources and the opportunity to exploit the growing tourism industry. Here the development of a strong platform around agriculture tourism is definitely useful for the state and the country as a whole. Rajasthan tourism has laid a great emphasis on organizing, preserving the historic heritage sites, emphasizing art, craft & unique handicraft items, number of important temples and places of worship, the natural scenic climate is a great asset which can bring a boom in the declining sector of agriculture. Alongside the stresses of urban lifestyle have led to counter urbanization creating great interest in farm houses and peaceful lifestyle of the rural areas. Agriculture tourism can provide solution to these problems. Agriculture tourism in the state will lead to various benefit namely farming, lifestyle and natural environment, provide peace and tranquility, rural recreation, educational value of agriculture tourism, preserve culture and heritage. The scope of rural tourism in Jaisalmer, Rajasthan is endless; there is all fresh and pure environment that one cannot get in fast and polluted city life. The dusty path, unmetalled roads, green fields, herds of cattle, rugged tree thickets and innocent people, there is so much uniqueness to see and feel in rural India. Rajasthan government is also taking major steps to promote village tourism so that tourists can be a part of rural life and enjoy the village life of India.

**Keywords:** Rural tourism, Sustainable enterprise, Smallholding farmers
Sheep Marketing Practices Followed in Sub-tropical Zone of Jammu and Kashmir

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Sheep marketing involves two components: activities associated with the physical movement and transportation of sheep and pricing or placing a value. The profitability of sheep farming depends upon the effective marketing of the products. But, in India, marketing of sheep is unorganized and involves various middlemen, unnecessary transportation and death of animals during transportation. Study to examine the sheep marketing system followed in sub-tropical zone of Jammu and Kashmir in India was undertaken. Multistage random sampling technique was used to select 120 sheep farmers from two districts namely Rajouri and Poonch of Jammu and Kashmir State. The data was collected from selected sheep farmers through a structured interview schedule after pre-testing. The results of the study revealed that marketing of sheep is haphazard in the study areas. Majority (45.83%) of the respondents sold their animals to middlemen followed by (41.70%), who sold their animals to the people of Muslim community for Qurbani on occasion of Bakra Eid as it fetches better price. Majority of the respondents (62.50%) sold their animal when they needed cash for their daily needs, followed by (20.83%) when they need money to pay children’s school fees. Important marketing channels were middlemen, people of Muslim community (relatives and friends) and local markets. Study also revealed that injured animals fetch less value than the healthy animals. Hundred percent of the respondents reported that credit and insurance facility was not available to them. Small ruminant producers may need to consider developing a marketing plan in order to ensure success at targeting marketing opportunities.

Keywords: Sub-tropical zone, Sheep marketing channels and practices, Sheep, Jammu and Kashmir
Study on Tribal Farm Women of Mandla District with Special Reference to Health Hazards in Operations of Different Agricultural Activities

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Farm women are the backbone of Indian agriculture. Tribal women are discriminated, though they make enormous contribution to the agriculture and allied sectors inspite of working for about 12 to 15 hours per day in agriculture and allied activities. Results reveal that the work participation rate and role performance of tribal women in agriculture and allied sectors is high as compared to their male counterparts and contribute lion’s share to the family income. While referring to hazards in relation to occupational safety and health the most commonly used definition is, ‘A hazard is a potential source of harm or adverse health effect on a person or persons’. In its strict sense, a hazard is simply something which could potentially be harmful to a person’s life or well-being. This type of consideration tends to indicate protective action when the probability of an adverse effect is high or its impact is high (even if the probability is low) or both. Therefore, a study entitled, “Study on tribal farm women of Mandla district with special reference to health hazards in operations of different agricultural activities” was conducted to study the extent of health hazards among the tribal farm women in operation of different agricultural activities, to explore the relationship between extents of health hazards among the tribal farm women in operation of different agricultural activities and their selected attributes and to suggest the strategies for reducing the health hazards among the tribal farm women in operation of different agricultural activities. The data was collected through pre-tested personal interview schedule. The sum of scores on these attributes was taken to find overall extent of health hazards. Majority 56.67 percent respondents had medium health hazards. Majority of farm women 65 percent needed to use of agricultural equipments and machineries should be increased.

Keywords: Tribal farm women, Agricultural activities, Health hazards
Women Empowerment in Agricultural Decision Making and Extension Work in District Poonch of Jammu Division and Constraints

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Empowerment implies intellectual enlightenment, economic enrichment and social emancipation of women. The core strength of empowerment lies in the ability of a woman to control her own destiny. An empowered, a woman must have equal opportunities, equal capabilities and equal access to resources. Furthermore, she should be enabled to use those rights, capabilities, resources and opportunities to make strategic choices and decisions in her life. The concept of women empowerment is associated with gender equality. In India, research conducted indicates that sex ratio is grossly un-favorable for females. Wide disparity exists between male and female literacy rates. Employment and work participation rates are also poor for women. The research also indicate that this discrimination against females is borne out of cultural and religious values that spring from the patriarchal ethos dominant in most parts of our country. In the food security, the rural women play a major role in agricultural production and in the stability of the rural areas but women face a number of constraints in approaching agricultural extension sources especially in developing countries. Rural women along with men play an important role in the agriculture sector like crop production, livestock production as well as cottage industry. But they have an incomplete access resources agricultural extension education services and newest technical knowledge and information sources.

Keywords: Women empowerment, Role of women in agriculture
Yield Performance of Wheat Genotype under Conservation Agriculture Technology in Gurgaon District of Haryana

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Conservation agriculture technologies involve minimum soil disturbance, permanent soil cover through crop residues and crop rotations for achieving higher productivity. An area of 120 mha is covered under conservation agriculture globally and is increasing. Efforts to develop, refine and disseminate conservation agriculture based technologies is going on for nearly two decades in India and has made significant progress. However the major efforts have been on no tillage in wheat under rice-wheat rotation of Indo-Gangetic plains. Conservation agriculture based management practices have demonstrated potential role in arresting land degradation, soil health, improve diversity, improving resource use efficiency, farm profitability and adaptation & mitigation to climate change effect with different production system and farmer agro-ecology. A suitable crop diversification with non rice-wheat cropping system is being investigated. The crops like Maize, cotton, pigeon pea and pearl millet are suitable alternative crops to rice during Kharif season in North Western India due to their relatively low water requirement. Conservation agriculture based practices for these non rice crops under wheat based cropping system are scanty and need to be investigated. Accordingly this study was designed to demonstrate and refinement of Conservation agriculture technology in wheat based cropping system (Pearl millet-wheat system) and to evaluate suitable genotype of wheat under zero tillage system. The results showed that grain yield was 18 percent higher in wheat varieties HD 2967 as compared to PBW 550 genotype and total biomass was 37 percent & 27 percent higher in wheat varieties CSW-1 & CSW-18 respectively, as compared to other six genotype of wheat under raised bed zero tillage conditions.

Keywords: Conservation agriculture, Kharif season, Rice-wheat rotation, Crop diversification
Improving Rural Livelihood Security in Resource Poor Kandi Belt of Jammu through Alternate Landuse System

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Rainfed areas of Jammu region commonly known as kandi belt are characterized by resource poor soils, erratic rainfall, small landholdings and devoid of farm mechanization which makes farming a risky endeavour. Realizing the sustainable productivity, nutritional security and improving socio-economic status of the farming community by improved technological interventions are key challenges for scientific community. Keeping the risks of crop failure due to natural vagaries in mind there is a need to develop/implement such technologies that enable farmers of the area to get some returns even during adverse conditions of low rainfall. On-farm experiments under National Initiative on Climate Resilient Agriculture-All India Coordinated Research Project on Dryland Agriculture (NICRA-AICRPDA) of Dryland Research Substation, Rakh Dhiansar comprising Aonla based alternate landuse systems were conducted with objective to supplement the farm income by resource management adopting technology demonstrations in a participatory demonstration mode. The results evinced the superiority of Aonla based landuse system (Aonla+maize) in comparison to farmer’s practice (sole maize). The average maize yield under Aonla + Maize (100% NPK) system on farmers fields was 24.88 q/ha with mean RWUE of 2.50 kg/ha/mm and recorded the net returns per hectare to the tune of Rs 24911/ha with B:C ratio of 2.32 whereas farmer’s practice obtained maize 19.49 q/ha with RWUE of 1.94 kg/ha/mm. The farmer’s practice recorded net returns of Rs 13973/ha with B:C ratio of 1.68. The findings confirmed the importance of Aonla based landuse systems with the scope to extend the intervention to farming community and integrate these systems with recent art of technology management for resource optimization.

Keywords: Kandi, Resource poor, NICRA, Land use system
Session 4
Capacity Development and Community Mobilization for Group Action
Lead Paper 4.1

Functioning Model of Self Help Groups for Rural Development
Based on the Study of Western Australia and India

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Abstract

Farmer led participatory strategy have contributed the emergence of farmers based organizations that have a critical role in the promotion of more sustainable agriculture and rural systems. While farmer organizations such as marketing cooperatives and credit union have a long history, rarely were they actively engaged in grass root level extension, research and development. They also tended to focus on relatively specialized component of agriculture and did not tackle issues on a system wide basis. Self-help groups are organizations formed by people with a common problem or situation, for the purpose of pooling resources, gathering information, and offering mutual support, service and care with the membership of more than 10. Case studies on self help groups of Punjab, Northern India and Western Australia were conducted to determine the functioning of self-help groups in both countries. Two self help groups from Punjab, viz. Global Self Help Group, village Khurd Ayali and Confederation of Potato Seed farmers, POSCON, Jalandhar and two self help groups from Western Australia, namely Western Australian No Till Farmers Association (WANTFA) and Liebe Group were studied by using participant observation and focus group technique. The results of the study found that besides contributing towards economic development, these groups are important for their networking. Active participation ensures cooperative involvement of members. Important facilitating factors for effective functioning of the group were increased income, knowledge gain of advanced technical information and transparency in functioning. Economic liberty and education is the base for human resource development. Group involvement helps to establish appropriate marketing relationship and to minimize input cost. There is need to motivate the members for effective functioning of the group by development organizations and NGOs.

Keywords: Self-help group, Development activities, Case study, Participation

1. Introduction

Self-Help groups engaged in development activities have the potential to empower their members through the provision of knowledge, skills, motivation and competencies that underpin sustainable agriculture. Self-help groups are organizations formed by people with a common problem or situation, for the purpose of pooling resources, gathering information, and offering mutual support, service and care with the membership of more than 10. Group approach proved to be more effective and efficient than individual and mass approaches (Kalra and Hansra; Aman et al.; Kalra et al., 2012; Bhardwaj, 1981; Kavita and Kalra, 2003; Peshin and Kalra, 2000). Many social scientists suggested that SHG approach is the best option for social and economic development of the people. Self Help groups in Australia are working independently, self directed and mainly comprised of growers and livestock groups. “These constitute about 40 per cent of the Western Australian Farmers”. The main aim of these groups is to increase production and profitability of farm business through adaptation of new technologies while minimizing their impact on the environment. In Australia the different groups are linked among themselves for their specific purposes and needs. Network of organizations focus on bringing new products, new forms of organization and the policies that affect their behavior and performance (World Bank, 2006). In case of India where around 70 per cent of the population lives in rural areas, the development of more sustainable agricultural systems is a major policy concern. As in many other
parts of the developing world, farmers are facing a range of challenges associated with cost-price pressures, climate change, knowledge and skill deficits and difficulties assessing the latest technologies (Siddique, 2011; Siddique, 2011). In India, SHGs have varied origins, mostly as part of integrated development programmes run by Non Government Organizations (NGOs) with donor support. However the major programmes involving financial intermediation by the SHGs is the SHG-bank linkage programme which was launched by the National Bank for Agriculture and Rural Development (NABARD) in 1992 (Tankha, 2002; Kalra et al., 2012).

2. Materials and Methods

Case studies on self help groups of Punjab, Northern India and Western Australia were conducted. Two self help groups from Punjab, viz. Global Self Help Group, village Khurd Ayali and Confederation of Potato Seed farmers, POSCON, Jalandhar and two self help groups from Western Australia, namely Western Australian No Till Farmers Association (WANTFA) and Liebe Group were studied by using participant observation and focus group technique. The results of the studies already conducted in Australia and India were also reviewed to further authenticate the obtained results of the study. The study is limited to four selected groups. There is need of intensive study and suggested model may also be further tested specially by the agencies engaged in organizing Self Help Groups.

Suggested model:

Based on the findings of the research the following model has been suggested for sustainability of Self Help Group especially for resource poor farmers.

![Fig. 1: Suggestive Model for the Effective Functioning of SHGs](image)

3. Results

A brief profile of each studied group is given below:

3.1. Western Australian No Till Farmers Association (WANTFA)

This group was established in 1992 with the aim to provide, promote and disseminate no till information and undertake participatory research on no till farming. The group comprised of 620 members. The major activities undertaken by the WANTFA group were conducting a number of field trials, Organization and agri-business satellite and demonstrations sites, Annual Conference,
Post seeding field walk, Pre-harvest field walk and published quarterly journals. No till farmers arose from 20 per cent in the year 1983 to 88 per cent in 2008. This group had been the champions in conservation agriculture, residue retention and management, diverse crop rotation, cover crops and developing soil science knowledge of the complex physical, chemical and biological process.

3.2. Liebe Group

The Liebe group was established in 1997. The group constitute of a memberships of 120 farmers-business. The group mainly focused on research, education and training. It also tried to strengthen communication between growers, industries and community. In Australia research organizations, industries and extension agencies join hands to conduct various activities of the groups. Thus, giving emphasis on organizing field trials, annual conferences and trainings and focusing on research works were the main reasons for the success of the two groups.

3.3. Global Self Help Group

Global Self Help Group started in 2008 with 16 members with an aim to socialize and achieve economic self sufficiency. The group has been financed with small monetary contribution from members and a loan from the cooperative society. Group members are involved in producing organic seasonal vegetables, honey and value added products such as pickles, jam, jell, etc. The group has the ability to build constructive partnerships with public and private sectors which are the main attribute of successful farmer-driven groups. A unique feature of the group is that even though only a few members play an active role in the organization's development and promotion, all members take part in all events. It was found that the role played by the group leaders is crucial to the success of the group, with those people who took the initiative to form the group possessing vision, good motivational skills, creativity and capacity to encourage participation and project leadership and management capacity. This is consisted with the findings on the role of farmer groups in promoting extension, micro-credit and rural development (Byerlee et al., 2009). The 9th five year plan (1997-2002) of the government of India provided increased recognition of the importance and the relevance of the self-help group method to achieve development. Consequently various government agencies, banks and non government organizations are now actively involved in promoting the self help concept.

3.4. Confederation of potato seed farmers (POSCON)

POSCON was formed in 2007 following intensive efforts of the president, general secretary and other office bearers to bring together all potato seed producers in Punjab under one umbrella with 160 members. It has increased to 250 in 2010-11. In 2008, the group was registered as a society within the state and started functioning. It is the only potato crop organization affiliated with the Government of Punjab. The group’s primary objective is to promote, develop, build and propagate seed potato cultivation in Punjab for the benefit of seed potato growers in the state by adopting and applying the most advanced and modern technologies. It aims to produce and market the best quality potato seed in order to compete with the best seed potato growers in the world. A number of initiatives were put forward by the group in potato cultivation, marketing, developing linkages with relevant agencies such as agri-business dealers as well as the promotion of exchange programmes for members.

The group has links with financial institutions, farm equipment manufacturers and other agencies supplying various farm inputs. Field trials conducted on members’ farms and the results shared with other group members. Every effort is made to arrange farm inputs at below market price. Members of the association sell their produce in an individual capacity. A leader of an innovative farmer group in Punjab reported that Punjab farmers can only survive and earn more through innovative techniques (Bhaskar, 2011; Bhaskar, 2011).

The main characteristics leading to the successful functioning of both the groups were participating in group activities. Access to the latest information and research allows group
members to make the best possible decisions for their farming business. Economic and social benefits were pointed out as the outcome of group participation. The group member claimed that besides sustained efforts and hard work linkages with government, NGOs and their institutions were the factors affecting successful functioning of the group. Easy access to loans was the common factor stated by members of both groups as the main advantage of being in the group. Evolving an action-oriented participatory approach has been central for empowering group members.

**Table 1. Differences between Western Australia and Punjab, India**

<table>
<thead>
<tr>
<th>Western Australia</th>
<th>Punjab India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research organizations are involved e.g: GGA is funded by</td>
<td>Research organizations are not involved</td>
</tr>
<tr>
<td>grain Research and Development Organization</td>
<td></td>
</tr>
<tr>
<td>Strong Net working with other groups</td>
<td>No Networking</td>
</tr>
<tr>
<td>Most of the group form with self initiative, independence</td>
<td>Most of the group are formed by various</td>
</tr>
<tr>
<td>and are self driven</td>
<td>departments of Government</td>
</tr>
<tr>
<td>Focus on participation research and extension education</td>
<td>Focus on income generating activities</td>
</tr>
<tr>
<td>Strong partnership with the council, Agribusiness</td>
<td>No or weak links.</td>
</tr>
<tr>
<td>companies, local and state Government agencies</td>
<td></td>
</tr>
<tr>
<td>Capable of generation own research and development funds</td>
<td>Some protects are funded by Government</td>
</tr>
</tbody>
</table>

4. Conclusion

This study has provided valuable insight into the working of self-help collaborative ambiance. Sustainability is the key challenge for such groups wherein the principle of equality and visibility of success encourages wider participation and confidence among members. Sharing common values and visions, and taking responsibilities within the group including leadership, are important to group development and effectiveness. Active participation ensures cooperative involvement of members. Important facilitating factors for effective functioning of the group were increased income, knowledge gain of advanced technical information and transparency in functioning. Thus, for developing the human resource it is important to make the poor realize that life without economic liberty is like a body without spirit. Economic liberty and education is the base for human resource development. The best way to predict the future is to create it. Sincere efforts always result in success. Let them have courage either to find a way or make one. Team work helps in enhancing risk bearing capacity but team work is less ‘me’ and more ‘we’. Development agencies and NGOs have to motivate them for action because the journey of a thousand miles begins with one step. We are not to make them beggars but the creators of wealth.

REFERENCES


Lead Paper 4.2

Capacity Development and Community Mobilization for Group Action

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1. Introduction

India has been witnessing various schemes, programmes and initiatives to ameliorate the pressing problems it faces. These problems basically emerge in the areas of health, hygiene, education, employment, education and like. The Government has been trying their level best to augment such initiatives that would help to curb this situation. The lessons learnt from the past developmental efforts and experiences have forced the planners and policy makers to evolve the right strategies that would show its result in positive manner and also guarantee sustainability. One such line of action that is much being discussed and talked about is capacity development and community mobilization. These two phenomenon’s go hand in hand when we talk of development in totality and sustainability as the ultimate goal.

2. Capacity Development

Capacity development is the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives overtime.

Capacity is about growth of the individual in knowledge, skills and experience. Growth of the group that surrounds this individual as these skills and knowledge are passed on. And from this individual and group, growth of a society and nation.

Capacity development is about supporting growth-within individuals, groups and across societies as a whole.

From the development community worldwide agreement is emerging that capacity cannot be separated from sustainable human development: capacity is development. There is also growing understanding that capacity must be viewed from three distinct but related perspectives:

1. Individual: the skills and knowledge vested in individuals, communities and groups.
2. Organizational: the internal policies, systems and strategies that enable an organization to operate and to achieve its goals.
3. Enabling environment: the wider society within which individuals and organizations function.

2.1. Capacity Development in Practice

While we now recognize capacity development as critical to overall human development, how capacity emerges, how we develop and evaluate it, and (most importantly) how we sustain it is much less clear. Our support may require a mix of interventions and must recognize what individuals or organizations are already good at; such recognition will ensure any new development will build upon existing capacity.

Within the disaster risk reduction community, experience of how to support a country’s own efforts to develop capacity already exists, but needs to be shared more widely. Capacity for disaster reduction initiative plays an important part in spreading this knowledge. We map initiatives, develop materials and bring people together to encourage the exchange of skills and information.
Five Steps to Further Develop Capacity in Practice have been Identified:

1. **Engage stakeholders in capacity development**: Local participation is essential—who has the necessary resources, expertise and influence?
2. **Assess capacity assets and needs**: Who needs what and why? Ask these questions before putting any development plan into action.
3. **Formulate a capacity development response**: Whoever took part in the original assessment should be actively involved—at a group, community, regional or national level.
4. **Implement a capacity development response**: This must be an integral part of programme planning, and is best delivered via already established systems.
5. **Evaluate capacity development**: To support effective “learning from doing”, implementation must be flexible and needs to be monitored.

2.2. **Capacity Development must be Locally Driven**

The Hyogo Framework for Action (HFA) encourages countries to develop their own Disaster Risk Reduction strategies to mobilize political support, set priorities, and locate necessary resources nationally and internationally. Such national strategies offer a blueprint to develop regional, local and community plans that will translate broad objectives into specification on the ground.

2.3. **Capacity Development Involves Whole Society**

Developing Disaster Risk Reduction capacity demands that a whole society-political institutions, civil society, academia and the private sector-work together towards a common goal. Many different perspectives are needed to determine capacity and meet needs: from those affected by or vulnerable to disaster, as well as from those with the expertise to help them.

2.4. **An Enabling Environment is Essential**

Countries are more likely to use and develop existing capacity where there is a strong political commitment to do so. Organizations supported by policy and law are more likely to deliver to expected standards. Communities supported by their local authorities are better able to become self-reliant.

2.5. **Capacity Development Goes Beyond the Classroom**

Training and learning will continue to be integral to capacity development, whether alone or (better) as part of a broader strategy. On the job training, mentoring, and simulations all build technical skills, expand critical thinking and sharpen problem solving. And learning can take place via informal networks and communities of practice, as well as in the traditional workshop or classroom.

2.6. **An Evolving Approach to Development**

There is now emerging agreement in the development community that capacity development is the engine of human development. In the face of the current economic, climate and food crises, developing state and societal capacities to design and implement strategies that minimize the impact posed by these crises will remain critical for sustaining progress towards achieving development objectives including the Millennium Development Goals (MDGs) 1. Capacity development starts from the principle that people are best empowered to realize their full potential when the means of development are sustainable/home-grown, long-term, and generated and managed collectively by those who stand to benefit.

But what exactly do we mean by capacity development? Confusion around the term seems to have grown along with its popularity. For some, capacity development can be any effort to teach someone to do something, or to do it better. For others, it may be about creating new institutions or strengthening old ones. Some see capacity development as a focus on education and training, while others take a broad view of it as improving individual rights, access or freedoms.
3. Capacity Development

3.1. The Evolution of UNDP’s Capacity Development Approach

![Figure 1: Evolution of UNDP’s Capacity Development Approach]

3.2. The Ways to the Means

For UNDP, capacity development contains elements of all of the above. UNDP sees capacity development as the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives overtime. Simply put, if capacity is the means to plan and achieve, then capacity development describes the ways to those means. An essential ingredient in the UNDP capacity development approach is transformation. For an activity to meet the standard of capacity development as practiced and promoted by UNDP, it must bring about transformation that is generated and sustained over time from within. Transformation of this kind goes beyond performing tasks; instead, it is more a matter of changing mindsets and attitudes.
3.3. An Integrated System

What are the barometers of capacity development? UNDP identifies three points where capacity is grown and nurtured: in an enabling environment, in organizations and within individuals. These three levels influence each other in a fluid way- the strength of each depends on, and determines, the strength of the others.

The Enabling Environment: is the broad social system within which people and organizations function. It includes all the rules, laws, policies, power relations and social norms that govern civic engagement. It is the enabling environment that sets the overall scope for capacity development.

The Organizational Level: refers to the internal structure, policies and procedures that determine an organizations effectiveness. It is here that the benefits of the enabling environment are put into action and a collection of individuals come together. The better resourced and aligned these elements are, the greater the potential for growing capacity.

At the Individual Level: are the skills, experience and knowledge that allow each person to perform. Some of these are acquired formally, through education and training, while others come informally, through doing and observing.

Access to resources and experiences that can develop individual capacity are largely shaped by the organizational and environmental factors described above, which in turn are influenced by the degree of capacity development in each individual.

4. A Look Inside the Engine

There are four core issues that seem to have the greatest influence on capacity development at the different levels described above. These core issues are picked up from empirical evidence and UNDP’s first-hand experience and it is in these four domains that the bulk of the change in capacity happens. They cover many contexts, and much of the work of UNDP and its partners fits naturally into one or more of these categories.

4.1. The four core issues are:

1. Institutional arrangements: The policies, practices and systems that allow for effective functioning of an organization or group. These may include, “hard” rules such as laws or the terms of a contract, or “soft” rules like codes of conductor generally accepted values. To better understand institutional arrangements, think of the rules that govern a sports game. These tend to be a combination of formal written rules, for example on what constitutes a goal, and unwritten codes of conduct, such as good sportsmanship.

2. Leadership: Leadership is the ability to influence, inspire and motivate others to achieve or even go beyond their goals. It is also the ability to anticipate and respond to change. Leadership is not necessarily synonymous with a position of authority; it can also be informal and be held at many levels. Although leadership is most commonly associated with an individual leader, from a village elder to a country’s prime minister, it also exists within the enabling environment and at the organizational level. Think of a government unit that takes the lead in pushing for public administration reform, or of large social movements that bring about change at the more systemic level.

3. Knowledge: Knowledge or “literally” what people know, underpins their capacities and hence capacity development. Seen from the perspective of our three levels (identified above), knowledge has traditionally been fostered at the individual level, mostly through education. But it can also be created and shared within an organization, such as through on-the-job training or even outside a formal organizational setting through general life experience, and supported through an enabling environment of effective educational systems and policies.

4. Accountability: Accountability exists when rights holders are able to make duty bearers deliver on their obligations. From a capacity development perspective, the focus is on the
interface between public service providers and its clients or service providers and oversight bodies. More specifically, it is about the willingness and abilities of public institutions to put in place systems and mechanisms to engage citizen groups, capture and utilize their feedback as well as the capacities of the latter to make use of such platforms.

Imagine a water company providing a town with clean drinking water. By signing up for its services, clients promise to pay the company for the water they consume. The company, in turn, agrees to service the needs of its clients, meaning that it will provide water that is clean and available when needed. By entering into this agreement, the water company and its clients become accountable to each other.

The effectiveness (in terms of responsiveness and client orientation) of the water company is determined by its capacity to obtain information on the performance, coverage and quality of water being provided, plan and implement corrective actions to improve services and communicate them with its clients.

Why is accountability important? It allows organizations and systems to monitor, learn, self-regulate and adjust their behaviour in interaction with those to whom they are accountable. It provides legitimacy to decision-making, increases transparency and responsiveness, and helps reduce the influence of vested interests.

5. Elements of the Approach to Capacity Development

5.1. Asking the Right Questions

Capacity is not developed in a vacuum. To be of use, it must be rooted in a broader development objective-in a national development strategy, a plan for economic or social empowerment, or an initiative with a particular theme.

For effective capacity development responses begin with three fundamental questions. It is the answers to these questions that shape the design of each capacity response according to the specific priorities and issues at stake.

The Questions are:

- To what end do we need to develop this capacity? What will be its purpose?
- Whose capacities need to be developed?
- Which groups or individuals need to be empowered?
- What kinds of capacities need to be developed to achieve the broader development objectives?
- Is there a specific moment in time when “capacity” can be said to have “developed” with respect to a given situation?
- When does, say, an engineering student actually become an engineer? Is it when she first understands the principles of engineering? When she passes the final exams? When she graduates? When she builds her own project? Or does she become an engineer at some point in between?
- Perhaps inconveniently for our era of precision measurements, capacity development rarely produces such a photo finish. Instead, capacity development is a perpetually evolving process of growth and positive change.
- At the heart of this transformation, driving the process, is a set of skills known as functional capacities. These are the essential management skills that allow for planning, implementing and monitoring and evaluating initiatives for growth.

5.2. The Five Steps of the Capacity Development Cycle

Step 1: Engage Stakeholders

- Capacity development begins with people talking and listening to each other. The first step is to get a dialogue going among all those who stand to benefit from the enhanced capacity.
The aim should be to get everyone committed to the process, and personally invested in its success. This is what we mean when we speak of ownership.

- Ownership is best achieved when it comes about organically, rather than when it is imposed from an outside source. Using local methods of consultation and decision-making from the start, and allowing everyone to contribute to the design and content of the process, help to situate an initiative within national development priorities.
- It is also important early on to establish accountability: who will do what, who will ensure that it gets done, and what will the consequences be if it doesn’t? Accountability should flow both upward and downward through clearly stated goals and responsibilities. External partners should avoid creating parallel systems that undermine or compete with the local systems.

**Step 2: Assess capacity**

- The UNDP methodology for capacity assessments is the result of years of experience from around the world. It is not a “one size fits all” blueprint—it is meant to be adapted to suit various situations. However, in every case, its ultimate goal is to move from analysis to action, with clear indicators for measuring progress. This step should help establish the baseline from which that progress should be measured, through identifying existing capacity assets as well as the desired level of capacity anticipated to achieve development or organizational objectives.

**Why Assess Capacity**

- Develop a comprehensive view of issues that could be addressed
- Bring rigor and a systematic method to determining future capacity needs and assessing existing capacity assets
- Create a common language of discussion among potentially disparate parties
- Provide a structure for discussion about the scale and scope of the capacity assessment exercise and about expectations of the capacity development effort more generally
- Provide a method for generating quantitative as well as qualitative data to support the development of a capacity development action plan
- Make sense of complex development situations, when it is not always obvious where best to intervene to promote capacity development action plan
- Improve consistency, coherence and impact
- Increase the ability to share experiences

**Step 3: Formulate a Capacity Development Response**

- A good capacity development response builds on existing capacity assets to address the gaps identified in a capacity assessment. Most stakeholders prefer to play to their strengths—their capacity assets—and use what they are doing right to do other things better.
- Because the four core issues reinforce each other and are highly contextual, the effectiveness of the response will increase if it combines actions across core issues and levels of capacity based on the local situation. For instance, an assessment of the procurement office of a ministry of health (organizational level) may need to be complemented by a vision of the government’s procurement guidelines (enabling environment). Similarly, procurement officers may need to be trained in applying these guidelines and an incentive system put in place to encourage procurement officers to use the new system and guidelines.
- Sometimes it may be important to define quick win/short-term activities to help shore up support while the foundation is being laid for longer-term capacity development initiatives. The design of a capacity development response should therefore contain a combination of quick-impact initiatives (less than one year) and short- to medium-term (one year or longer) initiatives. This is particularly critical in post-crisis and transition situations.
Step 4: Implement a Capacity Development Response

- The implementation phase is where the real action occurs. This is the point where all the thinking, planning, assessing, analyzing and designing is tested in the real world. For the most sustainable long-term results, implementation should be managed through national systems and processes rather than through the parallel systems of external partners. The very fact of using national systems can help strengthen essential capacities such as project management and procurement. Partner countries feel a strong sense of ownership of initiatives when their own systems and procedures are used for implementing programmes and projects. It is therefore important to help strengthen these systems.
- The importance of investing in and using national systems cannot be exaggerated. National systems, for UNDP, ranges from systems of planning and strategy development, all the way to delivery and evaluation. Every initiative should include an “exit strategy” that allows external partners to effectively hand over management of the programme or project to national counterparts.
- There are instances where this is easier said than done. For instance, when countries are in transition, donors often respond to political pressure on new governments to deliver quickly by bringing in external organizations and consultants to carry out urgent tasks that could and should be done by national organizations. External expertise may be absolutely necessary and appropriate in some cases. However, if there is no clear exit strategy, the external presence may become counter-productive: not only might it compromise the accountability of government to the public it serves, since the externals may be seen-for better or worse-as the real change agents; but it might also cause valuable opportunities to be missed for enhancing local capacities in such areas as governance and basic service delivery.

Step 5: Evaluate Capacity Development

- Measurement of capacity development success cannot be reduced to an increase in input resources such as human, financial, or physical resources. Availability of input resources does not guarantee their contribution to development objectives.
Progress and results are reflected by changes in performance, which can be measured in terms of improved efficiency and effectiveness. But all these outcomes are less easy to capture than outputs, which is why it can be tempting to focus on such elements as funds disbursed, no. of workshops conducted or no. of people trained. The link between capacity development and impact is also challenging to evaluate because it depends on the dynamics at work among several factors over time of which a change in capacity may be only one.

In the end, an evaluation framework is only useful to the extent that its findings are absorbed and applied. The challenge is in designing a framework that is comprehensive enough to capture the key issues, but that continues to be manageable.

5.3. Measuring Capacity Development

One of the pertinent challenges in the field of capacity development is measuring change and results in concrete terms. Viewing capacity development in a “system” or “institution” context helps to understand complex interventions involved in transforming incentive systems, leadership, knowledge, accountability systems, value systems, and other levers of change. Formal and informal entities perform functions and produce products and services that make development possible. All institutions in the public sector, civil society and private sector have a purpose. They use inputs such as human, financial and physical resources to convert inputs to outputs such as policies, public service delivery, enforcement of regulations, or knowledge products in order to achieve outcomes such as improvements in public health or increase employment. Hence, capacity development can be measured by changes in the performance (efficiency and effectiveness), stability (risk mitigation and institutionalization) and adaptability (investment for growth and change and contentious improvement) of a given institution (see the framework below).
The objectives of capacity development programmes should be based on a clear vision of success, rather than vague language such as “improve, enhance, strengthen, or increase capacity”. Likewise the measurement of success should be based on clear evidence of actual changes relevant to the development agenda rather than anecdotes or measures of the completion of training activities, procuring tools or augmenting staff.

6. Move from Capacity Development to Community Mobilization

6.1. Community Mobilization

Community mobilization is the process of engaging communities to identify community priorities, resources, needs, and solutions in such away as to promote representative participation, good governance, accountability, and peaceful change. Sustained mobilization takes place when communities remain active and empowered after the program ends.

6.2. Defining Community

Community can mean different things in different contexts. Teams doing mobilization activities should take time at the beginning of a program to create a definition that is helpful where they work. Some common elements of how to define community are:

- Individuals or groups who share a common geographic location;
- Individuals or groups who have common language, culture or values;
- How the groups or individuals interact or have relationships with each other; and
- How members of the community use common resources and make decisions.

Community mobilization promotes the following conditions within a community:

- Sustainable use of natural resources;
- Access to information for all members of the community;
- Opportunities for economic advancement;
- Healthy practices and well-being for each community member; and
- Knowledge by community members of their own rights and the ability to advocate for themselves.

Table 1: Benefits of Community Mobilization

<table>
<thead>
<tr>
<th>Community mobilization....</th>
<th>And the long-term benefits can be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increases participatory decision-making processes by bringing diverse stakeholders into a common process</td>
<td>• Communities reduce their dependence on outside aid, as they become adept at identifying and solving their own problems</td>
</tr>
<tr>
<td>• Expands inclusion of often marginalized populations, such as women, youth, persons with disabilities, the elderly, and religious or ethnic minorities</td>
<td>• Communities can better prepare for or respond to disasters and crises because they have relationships with decision-makers and experience in quickly identifying communal needs and priorities</td>
</tr>
<tr>
<td>• Depends on local resources, both human and material</td>
<td>• Local governments gain greater credibility with their own constituencies and can better lobby national level decision-makers because they are truly aware of local needs and have local support</td>
</tr>
<tr>
<td>• Fosters stronger relationships between local government, businesses, community members and CBO/NGOs</td>
<td>• A more stable foundation for breaking cycles of inter-group tension and achieving lasting stability</td>
</tr>
<tr>
<td>• Ensures local ownership of development</td>
<td>• Promotes a more active and informed citizenry</td>
</tr>
</tbody>
</table>

Some programs define themselves as “community mobilization programs” in their title, goals, objectives, activities, and indicators. Many others make use of mobilization methodologies in order to accomplish program objectives in a more participatory and empowering manner. Whether implementing targeted community mobilization program, or applying community
mobilization methods to a program with different overall goals, there are tools and approaches that are common and proven.

6.3. The Mobilization Framework

Between start-up and handover, there are a number of components to community mobilization. Figure illustrates the relationship among these components, which create an overall framework. Each of the components can inform any program using mobilization methodology. The arrows represent the general sequence of activities, with room for great variety in implementation given the objectives of programs and priorities of communities. The spiral at the center indicates the multiple cycles of programming-from planning to agreements to implementation, capacity building, and monitoring and then repositioning for the next cycle and new community-led projects.

Figure 3: Community Mobilization Framework

7. Levels of Mobilization

Like levels of participation, there are levels of mobilization. Knowing where a community is starting from and progressing toward is helpful for program staff to work appropriately with the community, while always challenging them to take their responsibilities to the next level. Table identifies seven levels of mobilization and includes some sample elements of a mobilization program. This diagram has evolved over several years and has been applied in many countries. Before every mobilization stage or major activity, it is helpful for teams to discuss the progress of mobilization efforts and the evidence that contributes to the assessment using this matrix or another process. Remember to think about what factors in the larger context may be helping or hindering the level of community mobilization, such as changes in the local economy.
should check their conclusions with the community and use them to inform upcoming activities or setting new targets with CAGs.

**Table 2: Levels of Community Mobilization**

<table>
<thead>
<tr>
<th>Elements of Mobilization</th>
<th>Assessing Levels of Mobilization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level 1-3</td>
</tr>
<tr>
<td></td>
<td>Community focuses on project implementation rather than on overall goal. Community has little or no comprehension of mobilization principles.</td>
</tr>
<tr>
<td>Project</td>
<td>No appropriate priorities are identified or consensus reached. If implemented, project quality is poor. No participation in social campaigns.</td>
</tr>
<tr>
<td>Process</td>
<td>Nothing happens despite frequent meetings facilitated by Mercy Corps.</td>
</tr>
<tr>
<td>Maintenance</td>
<td>No community ownership of infrastructure and other long-term projects. Maintenance is poor.</td>
</tr>
<tr>
<td>Community Action Group (CAG)</td>
<td>CAG is unable to unite the community. No natural leaders (or too many leaders competing) emerge within the community.</td>
</tr>
<tr>
<td>Community Contribution</td>
<td>CAG finds it difficult to raise community contribution.</td>
</tr>
<tr>
<td>Advocacy</td>
<td>Advocacy does not take place.</td>
</tr>
<tr>
<td>Future</td>
<td>Nothing happens without Mercy Corps driving the process.</td>
</tr>
<tr>
<td>Action Steps</td>
<td>Mercy Corps will usually make the decision not to work with the community after preliminary meetings.</td>
</tr>
</tbody>
</table>
7.1. Mobilizers’ Tips on Community Mobilization

- Maintain a sense of humor and be patient. You might have a deadline to keep, but others may have other priorities.
- Open your mind and heart and you will receive warm welcome; a mutually beneficial relationship will develop.
- Build upon the positive aspects of the local culture, religion, knowledge, and tradition; brick by brick, work with the people to build up their lives with dignity and honor.
- Initiate but do not lead. You are a catalyst of inspiring development activities, not the boss.
- Listen, listen and listen again. Learn from the men and women: the what’s, the why’s, the when’s, and the how’s of their situation.
- Identify the people’s needs, or rather facilitate them to identify their needs. Remember awareness-raising is the first step towards mobilization.
- Sit together, share ideas and experiences - this is a two-way process.
- Avoid talking in terms of money, rather talk in terms of working together as the value of a project. Do not be authoritative.
- Talk simply. Do not use complex language; your task is to communicate effectively.
- Involve the community from the very beginning; do not start a project, and then start to bring in community participation mid-way through.
- Organize the people to draw up their own plans for their development; simple activities which can easily be understood and realistically carried out.
- Never assume that you are right and they are wrong; in most cases you will discover that they are in fact right but you had failed to listen!

Therefore for the overall holistic and sustainable development there is a need to understand how the community must be developed in terms of their capacity and further the underlying process of community mobilization to make the entire process of development a success.

References
Lead Paper 4.3

Developing Farm Women as Agripreneurs: Institutional Convergence of Synergistic Strengths

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1. Introduction

Agriculture still plays a vital role in the Indian economy. Over 70 per cent of the rural households depend on agriculture. Agriculture is an important sector of Indian economy as it contributes significantly to GDP and provides employment to more than 60% of our population. Indian agriculture has registered impressive growth over last few decades. The food grain production has increased from 51 million tonnes (MT) in 1950-51 to 250MT during 2011-12 highest ever since independence.

Role of Agriculture in Indian economy and International Trade

- Significant share in national income
- Largest employment providing sector
- Contribution to capital formation
- Providing raw material to industries
- Market for industrial products
- Importance of agriculture in
- Share in national income
- Source of employment
- Provision of food security of population
- Supply of raw materials to industrial sector.
- Market for industrial product.
- Earner of foreign exchange.

Shrinking Land for Cultivation

There is continuous fragmentation of land due to ownership multiplication and division of joint families into smaller nuclear families, resulting in low per capita availability of land. The land man ratio in our country is becoming very narrow. Due to low land man ratio, more and more farmers and their children are finding themselves out of work.

Increasing influence of education has also created a higher need for job amongst the rural masses. After finishing their education, rural youth line up in front of employment exchange for seeking jobs. Although they have an option of starting their own enterprise but this option is usually ignored by them and they join the long queue for rural youth in the villages itself; thus reducing the pulling factors for migration to nearby towns.

Another serious problem we have in our hand is rampant unemployment specially in our rural areas. The main cause of unemployment is the rapid growth of population due to which our youth are not finding employment despite their best efforts. As a consequence, they are getting frustrated and migrate to nearby towns and cities in search of petty jobs. The migration presents the cities with challenges and pressure is created on their meager resources.
Rampant Unemployment

Source: www.tradingeconomics.com/india/unemployment-rate

2. Why Entrepreneurship in Agriculture?

In view of shrinking land base and rampant unemployment, there is need to commercialise and diversify Indian Agriculture in such a way that one can generate more income per unit of area and time and create agro-based employment opportunities. For this to happen we need to convert agriculture into agri business. Another issue is that with liberalisation, privatisation and globalisation, the whole world has become like a local market where our farmers and their products will have to compete with multinationals in terms of quality and price.

Farming as a profession looks dismal and grim. The youth of farm families are pushed by these towards seeking employment in cities and migrating. Entrepreneurship Development in Agriculture is an important way out to bring a transformation in our rural areas. Developing Agri-enterprises and making our farmers entrepreneurial is needed urgently to pave the way for evergreen revolution. In this context, it is imperative to focus on human domain in developing entrepreneurship efforts. The neglect of this aspect is proving detrimental to all other efforts directed at setting up agri-enterprises and fuelling entrepreneurial zeal among farmers.
2.1 Agripreneurship-Paradigm Shift Needed

In this scenario, a shift in extension approach is demanded. Unlike crop production, developing entrepreneurship is not an activity but a chain of events and require functional linkages with various support systems. New commodities are perishable in nature and a farmer had to look for marketing channels unlike the established channels as in case of traditional crops of wheat, rice etc.

![Fig. 1: Paradigm shift towards Agripreneurship](image)

Agriculture has to move from subsistence culture to Agripreneurship for higher profits. Agri based enterprises are the need of the hour. Agri based micro enterprises can help in poverty reduction, employment generation, empowerment and enterprise development as an end in itself. Regardless of the stage of economic development among the Asia-Pacific countries, small and medium enterprises (SMEs) are generally considered as major sources of employment generation. Promotion of such enterprises, therefore, is generally regarded as part of an employment intensive industrialization strategy.

Entrepreneurs as the human capital can translate rural economic development. For converting a farm into an enterprise or business, the identity of the person managing it must change from a farmer to that of farm business operator or an agripreneur. There is a great need to make our farmers entrepreneurial. Physical, natural and economic resources are important for facilitating development of any nation but the most important ones are the human resources. Capable, efficient and motivated human resources can bring about tremendous positive changes towards progress. No doubt it is equally true that inefficient people can wither away a whole empire and squander away its precious wealth and abundance. Several empirical studies have shown that the entrepreneurs as the human capital have made a large contribution to economic development than non human capital. Theodore (1970) after comparing the economies of several nations found that it is the quality of human resources which brings about transformation in a society. He contrasted small land area nations like Japan with large land area countries and concluded that it is the entrepreneurial spirit which makes all the difference in the output from the farmers.

2.2. Developing Agricultural Entrepreneurs: Inculcating Entrepreneurial Competencies

The dimensions of entrepreneurial spirit inculcation include risk taking ability, hope of success, feedback usage, persistence, confidence, knowledge-manageability, achievement motivation, persuasibility and innovativeness. Crop planning all the year around as per the market demand is visualized to be critical in getting higher profits from the same piece of land. Value addition and primary processing are add ons for the farm incomes. Further, well developed inter
linkages between agriculture and rural industry will be an effective mechanism of promoting rural transformation. While on one hand farmers get just a few rupees in the exchange of their produce, it is multinationals who are grabbing the major chunk of profits after selling it to the ultimate users. Whether it is potatoes, tomatoes and other perishable commodities, farmers are forced to sell their produce for very less amount while the ultimate consumer pays huge amount when it is processed and packaged after grading. Cases of Farukkabad and Ratnagiri are still fresh in our minds. Thus farmer led value addition ventures and marketing are needed for which entrepreneurial competencies must be inculcated among farmers.

Developing motivated, entrepreneurial and efficient farmers requires focus on the human domain, which is the prerequisite to bring about rural transformation. The characteristics of entrepreneurs can be developed through systematic motivational training. Many farmers who have been entrepreneurial have attained success and are able to maximize profits from their lands. There are cases of farmers who have also earned Rs 9 lakhs from an acre!!

A developing economy needs entrepreneurs who are competent to perceive new opportunities and are willing to incur the necessary risks in exploiting them. Entrepreneurship is usually described as the whole process of finding opportunities, mobilizing and acquiring resources, managing the production process and marketing the products. Entrepreneurs are architects of every conceivable material project and are motivated force behind development of any nation. Developing competent human force is of paramount importance in the present context and entrepreneurial zeal development is the first and foremost step to attain this goal. Increase in population, which is considered a liability can also contribute positively towards overall national development if entrepreneurial qualities are inculcated among the masses.

Entrepreneurship among farmers should be developed through systematic awareness spread programme. Awareness about market potential has to be systematically spread among the rural masses especially the farming community. Then comes the second step of motivation development. Prior to it, an environment of awareness and need has to be prepared. This awareness and motivation has to be developed not only in the farmers but also in the field level extension workers. Once they become aware about entrepreneurship and convinced about its need in agriculture, they will be able to provide some thrust towards commercializing agriculture, as they are the ones who are implementing government sponsored schemes.

3. Food Processing and Value Addition

3.1. Food Processing and Value Addition of Agricultural Produce

India has made impressive growth on food production front, commonly referred to as primary agriculture. However, the area of secondary agriculture and its derivatives inter-alia food processing and value addition has not been addressed adequately. Under traditional system, the post harvest losses are quite high i.e. 25-30 per cent is lost before reaching ultimate consumers (Sinha, 2010). The estimated losses are 5-15 per cent in non-perishable, 20-30 per cent in semi-perishable and 30-50 per cent in perishable. Post-harvest activities have assumed significant importance as an integral part of the food production system, which aim at promoting best practices for post-harvest handling and management along the entire food supply chain, focusing on a broad spectrum of operations and stakeholders in traditional and modern marketing systems.

The proposition of food processing and value addition stands to offer the advantages such as maintaining quality (appearance, texture, flavor, and nutritive value); protecting food safety; reducing post harvest losses; enhancing the self life and providing high quality and nutritive finished food products to the consumers. Another important issues is how to increase the income of the share of farmers in comparing rupee which is average 20-25 per cent at present. This issue may be addressed considerably through processing and value addition of cereals, fruits, vegetables, milk, fish, meat, poultry, flowers etc.
The strategic approach for a dynamic and remunerative food processing and value addition system calls for developing adequate infrastructure including storage facilities; creating awareness; imparting knowledge and sharpening skills of farmers and other stakeholders about safety standards; improving capacity utilization; developing appropriate and specific technology for proper handling and grading, packaging etc; developing effective and trained human resources for technology dissemination; and implementing capacity building initiatives for farmers, farm women and rural youth; promoting group and collecting mechanism involving producer’s societies, farmers interest groups & self help groups; and developing efficient market linkages etc.

3.2. Farm Women Entrepreneurship

Women play a significant role in agriculture, the world over. About 70% of the agricultural workers, 80% of food producers, and 10% of those who process basic foodstuffs are women and they also undertake 60 to 90% of the rural marketing; thus making up more than two-third of the workforce in agricultural production (FAO, 1985). Women’s average contribution in over all farm production is estimated at 55% to 66%. In the Indian Himalayas, a pair of bullocks works 1064 hours, a man 1212 hours and a woman 3485 hours in a year on a once hectare farm, a figure that illustrates women’s significant contribution to agricultural production (Shiva FAO, 1991).

But despite this extent of contribution, women’s ownership of assets and earnings are still not proportionate. A study by ILO has found that new techniques in agriculture, particularly those involving commercialization, “often shift economic control, employment and profit from women to men”. The diversion of income from women causes increased suffering for families because studies have found that, in general, income controlled by women benefits families more than income controlled by men. Women entrepreneurship development has been given priority in all our national plans since it was systematically initiated in 1979. At present, women entrepreneurs comprised about eleven per cent of the total entrepreneurs. It was expected that 2530 per cent of the entrepreneurial force in India would be women by 2020. Though women have long been associated with most of agri based ventures, their contribution is largely not recorded. It is essential to have in depth understanding of the process of entrepreneurship development among women to have a holistic view of the subject.

4. Case Studies of Successful Women Entrepreneurs

**Bhuira Jams:** A group of women led by an enterprising woman Smt Linnet Mushran have created a famous brand of Bhuira Jams, a value addition agri-enterprise set in a tiny remote village, Bhuira near Raigarh in Himachal Pradesh state of Northern India. The entrepreneurial journey started as a small kitchen operation in BHUIRA village which today spans two registered units, employing over 100 women, sourcing fruits directly from local small farmers. Not only do their products clear all quality standards prescribed by the law, they are the only brand in the Indian market with over 27 varieties and addictive recipes and have won many hearts in India and around the world!

**Krishna Pickles:** Smt. Krishna Yadav at present is a successful food processing entrepreneur based in Nazafgarh, Delhi. A native of Bulandshahar, U.P., she migrated along with her three kids to Delhi in search of livelihood after her husband lost his job in 1996. Motivational interventions and mentoring of scientists of Indian Agricultural Research Institute enabled her to establish her famed food processing enterprise Krishna Pickles which is not only a means of earning her family a livelihood but she is also managing a business of more than a crore turnover annually in a span of last twelve years (2002-2014). From the starting days of karonda pickle and candy preparation, she is now manufacturing 87 types of products like various chutneys, pickles, preserves, murabbas etc. At present, approximately 500 quintals of fruits and vegetables are processed generating a turnover of more than Rs. 1 crore from the factory and providing employment to others. The products are manufactured as per FPO guidelines utilizing traditional recipes and innovative ideas aimed at niche commercial clientele. The products are aimed not only as tasty food treats but also for certain medicinal and cosmetic usages. From a roadside vendor to an
owner of a factory, she has come a long way. The group of women employed gain livelihood and are also feeling empowered.

**Convergence of Synergistic Networking for Farmer based Agri Enterprise Development: Experiences of Action Research**

An action research study conducted in Hapur district by IARI during last five years has revealed that it is possible to build entrepreneurial competencies of our farm women through appropriate training interventions, mentoring and linking them with other agencies. As per the action interventions undertaken training course were organized, follow up and mentoring of the trained youth was done and linkages initiated with supportive institutions and agencies. Farm Women who have been trained earlier and have launched their pickle making, dalia making, wheat flour mill and grinding of spices enterprise named “Sunhara Lalpur” and “Neelraj”. Handholding and mentoring activities were undertaken to establish their enterprises on a strong footing. Linkages with other agencies were established for finance requirements, marketing and certification purposes.

Under collaborative training course by IARI and RUDSET Institute, twenty eight women entrepreneurs from three project villages of Hapur were trained in Baby corn cultivation & its processing, Post-Harvest Processing of soyabean, bajra puffs, crackers etc., Value Addition of Vegetables/Fruits and Floriculture and dry flower technology for enterprise uptake. Convergence of Synergistic efforts of all stakeholders for farmer based agri enterprise development was taken up. Farm women entrepreneurs of Hapur villages were linked with all stakeholders in the process-IARI for mobilizing and mentoring, RUDSETI for training, Agricultural Systems India Ltd (ASI) and Bharati Walmart for marketing, NGO Laxmi Jan Kalyan Sewa Sansthan for grassroots mobilization and logistics and NABARD for financial support. The initiative resulted in three marketing outlets under the name of Sunhara Fresh in Hapur, Two outlets for Agri-inputs, Fair price shop as a non farm venture launched by the rural women of project village Shyampur.

**Fig. 2:** Institutional Convergence of Synergistic Strengths for Developing Agripreneurs
5. Partnerships and Group Action

The cases have illustrated well established partnerships of women manufacturers of these value added products with established dealers and up-market channels. Farmers who have taken up entrepreneurial activities are often found facing problems in marketing of their products. Well developed effective linkages among all the stakeholders usually results in higher profits for producers and consolidated production sites for marketing and supply chain agencies.

The group approach involving common interest groups, farmers’ societies/ cooperative societies, self-help groups etc. should be encouraged to capitalize the optimum resource utilization and maximization of food processing and value addition to address the multi faced issues underlying socio-economic development of farm households.

The analysis revealed that besides impacts in terms of income enhancement and economic empowerment, there were also visible impact in form of social assets development and process of value addition ventures. Social assets are taken to be the social resources that people can use to pursue their livelihood objectives: networks and connections, membership of formalized groups, relationships of trust, reciprocity and exchange. The concept of livelihoods defined as the “capabilities, assets (including both material and social resources) and activities required for a means of living” (Chambers and Conway 1992: 7) provides the desired viewpoint for this research: that of the individual as an actor, in these cases: the entrepreneur. Livelihoods in this sense are holistic, encompassing not only income, the narrow meaning of the term often used in economic research and also in common speech, but all assets that can form the means to making a living, and assets that give a person the capability to act and to use resources.

5.1. Institutional Convergence: Way Ahead for Developing Agripreneurship

What do we mean by convergence? Convergence literally refers to the alignment of issues, interests and therefore solutions across all institutions engaged in development of Agripreneurship. Thus convergence is not just collectivization, it is not referring to cooperation only and it is definitely more than collaboration. In fact, rather than just being episodic and event-driven, convergence actually implies constant shared commitment with recognized “wins” for all partners involved. Internationally, organizations such as Barclays, Care and Plan are working together on a large-scale local community finance project which aims to reach 300,000 to 500,000 people across Africa, Asia and South America in development sector. Similar mechanisms can be emulated nationally for Agripreneurship Development.

The emergence of multistakeholder alliances between profit oriented companies, social enterprises, non-governmental organizations (NGOs) and government institutions collaborating in totality is an important solution to many of our problems plaguing agriculture sector. These trends are still at a relatively early stage. This structure calls for new ways of thinking crossing traditional organizational, functional and sectoral boundaries of various institutions. Also the most important thing being able to develop mechanisms for increased dialogues, shared learning and joint monitoring of outcomes as well as processes.

In past most of the time the term ‘partnership’ was theoretical and rhetorical. It didn’t actually work in reality. But now is the time for action when institutional convergent solutions may be responsible for creating appropriate entrepreneurial climate and facilitating farm women entrepreneurs to take up group ventures for enhancing livelihood opportunities. Though it cannot be denied that in this perspective, there will not be clear lines around the institutions, and definite organizational and sector boundaries. It will be an opportunity for more complex forms of collaboration that involve multi-stakeholder coalitions and that seek to affect systemic change on wide-ranging issues.

Sociologically also, it is a new pragmatic trend toward shared value in capitalism as a whole. The convergent development models will resemble conventional social enterprises but they may or may not be profit-making; however, they are very unlikely to be profit-maximizing. They will
combine a market orientation with a broader social impact. Social businesses launched by Muhammad Yunus’s Grameen organization in conjunction with multinationals “Grameen Danone Foods” are the best examples of convergence business models. Its dairy product aimed at combating infant malnutrition in Bangladesh was launched in 2006. Similar efforts by Mercy Corps recently spearheaded the launch of a fair trade raisin-growing and export business in Afghanistan. The Parwan Raisin Producers Cooperative (PRPC), a network of farmers formed by Mercy Corps, has begun working with Fulwell Mill- a niche food supplier based in the UK- to provide Fairtrade-labeled raisins to British consumers.

6. Conclusion

The food processing and value addition is an integral component of agriculture and contributes significantly economical and social development of the country. However, its potential has largely been in underutilized and as such there is a huge opportunity and scope to develop and promote this sector. Farm women individually or in group can tap this immense opportunity and potential of food processing and value addition. There is a pertinent need for developing an effective and efficient strategy incorporating the issues like development of appropriate, location specific & need based production and processing technologies; strengthening infrastructural facilities; dissemination of technologies to the farmers; implementing capacity building and entrepreneurial interventions; developing effective and meaningful marketing linkages etc. to tackle the multi-dimensional problems of rural poverty, increasing farmers’ share in profit, creating employment and income generation opportunities and serve the interest of the consumers. Building entrepreneurial competencies of farm women and mobilizing women for group action to take up food processing and value addition agri-ventures for maximising farm profits. Experiences of institutional convergence of synergistic strengths in Hapur by the author herself and examples of international agencies quoted in the paper have illustrated that there is need for all working together in spirit and action for translating maximum benefits and sustainable growth.

References
A Study on Job Satisfaction of Automobile Industry Workers

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Job satisfaction is the employee’s sense of accomplishment and success on the job. It is usually perceived to be directly associated to the personal well-being as well as to the productivity of an employee and motivation of an employee is also linked with the job satisfaction. Indian automobile sector is one of the important areas where huge amount of human resource is involved. Hence, the need was felt to assess the level of job satisfaction of employees of an automobile industry. Total 300 employees were selected for the present study. For the investigation, Minnesota Job Satisfaction Questionnaire was used. From this study, it is concluded that regarding various facilities and aspects of the organization, majority of the employees were satisfied but in some aspects there is dire need of further improvements to create healthy, safe and more productive working environment in the organization.

Keywords: Job satisfaction, Organizational commitment, Socio-economic status, Working environment.
Aquaculture as an Enterprise for Sustainable Rural Development

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It’s a recognized fact that aquaculture plays an important role in rural development and that aquaculture’s potential for contributing to rural development has not been fully realized in many parts of the world. Effective rural development comes through good governance. With participation at all levels, sustainable development will be people-oriented, integrated, and have a multi-sectoral agenda. Much greater emphasis is required to increase awareness of the role of aquaculture in rural development. Special attention is required to empower and link stakeholders to policy decisions. Experience does not yield a universal model for integrating aquaculture into rural development. This article emphasizes significant challenges in developing holistic, people-centred rural development plans where the role for aquaculture is determined by an understanding of people’s livelihoods.

Keywords: Aquaculture, Aquaculture enterprise.
4.03

Attitude of Farmers Regarding Training Programme Organized by Mega Seed Project (NAU) on Seed Production Technology of Paddy in Navsari District of South Gujarat

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Indian Council of Agricultural Research (ICAR) has sanctioned a new AICRP (All India Co-ordinated Research Project) centre at Navsari Agricultural University, Navsari to evaluate and develop varieties/hybrids and their production technologies to cater national and local needs. The need for such knowledge has become apparent with concern exhibited by the policy maker of Mega Seed Project to know better ways and means for developing positivism towards training programme organized by Mega Seed Project on seed production technology of paddy. The present study was conducted in Navsari district of South Gujarat region. One hundred respondents were selected by purposive random sampling. Ex-post-facto research design was used in the present investigation. The finding revealed that half of respondents had moderately favourable attitude towards training programme organized by Mega Seed Project (NAU) on seed production technology of paddy, followed by less favourable and highly favourable. The degree of attitude of respondents was observed significant with education, size of family, extension contact and economic motivation, while it was highly significant with scientific orientation and family occupation. It was found non-significant with land holding, farming experience, social participation, source of information and economic motivation.

Keywords: Mega Seed Project, Seed production, Attitude
Awareness of Rural Women Functionaries towards Environment Degradation: Finding Causes and Losses

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The present study was conducted in two districts of Haryana state namely, Hisar and Kaithal to assess awareness among Rural Women Functionaries towards environment degradation and causes & losses occurred due to environment degradation. A total number of one hundred twenty women Functionaries working in rural areas were selected and interviewed with the help of well-structured schedule. The studies revealed that majority of the women were of middle age group (36-50 years), educated up to higher education, and performed government, private jobs and self-employment. The findings further revealed that women awareness towards environment degradation (86.66%) and types of pollution (48.33%) were found fully aware as per their responses received. Major causes of environment degradation were found ‘bursting of crackers and burning of garbage in open, exhaustive pumping up of ground water for irrigation (2.91)’, ‘high use of synthetic fertilizers/chemicals’ (2.90), ‘waste disposal (2.88), ‘industrial activities’ (2.60) and automobiles’ (2.51) with their weighted mean scores. Very serious losses were found as ‘air pollutant effect on human health, animals and plants’ (1.47) followed by ‘noise disturbs sleep’ (1.00), while, ‘deeper level of ground water table leads to irrigation scarcity’ (1.35), ‘quality deterioration of crop produce’ and ‘fertilizers cause toxicity in food products’ (1.23), ‘lost of biodiversity’ and tropical forest’, ‘extinction of plant and animal species’ (0.41) based on their ‘Z’ score. Results pertaining to adoption of alternative measures to mitigate or minimizing the environment degradation was found medium. Suitable remedial measures were found as ‘least smoky trees should be planted and used, Baival, Neem, Pipal, Bargad, Shisham, Aam, Jamun’ (94.16%), ‘Installing chimneys to rent smoke from indoor stoves’ (90.83%), ‘Storage and disposal of farm wastes properly’ (79.16%), ‘Campaigning for healthy environment’ (74.16%), ‘enhancing the area under agro and social forestry’ (69.16), ‘empowerment of women for different development programs’ (66.66%) were found very effective among the women to making the environment healthy and clean.

**Keywords:** Awareness, Climate change causes, Deforestation, Greenhouse gases, Healthy environment and Women empowerment.
Capacity Building in Rural Farming Communities

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Capacity building is a process of unlocking the potential of an individual, organization and community to enhance their ability to achieve the desired goals, making the effective use of their resources over time. It is very crucial to broaden the horizon of people to analyse their situations and formulating the relevant solutions to bring change in the quality of their life. The rapid extension in agriculture demands the farmers to adopt the innovations in their life to make best use of their resources, increasing production per unit of land and income, and the whole position of the farming community. Development of rural communities at a grass-root level is the key for the flourishing the growth and enabling them to compete with the modern advancements in agriculture. This is feasible by the enhancing the ability of farmers by imparting training in agriculture and allied fields. The training programmes needs to be designed for the enhancing the knowledge, skill, bringing attitudinal changes and selection of the contact farmers is important factor accelerating the process of change. The key aspects are need of contact farmers, selection, training, implementation and results review should be done, there is need to train the contact farmers to reduce the gap between agricultural innovations and their end users. The concerted efforts of extension will strengthen the picturesque of farming communities

Keywords: Capacity building, Rural farming, Rural communities
Capacity Building Skills: Promotion of Women Entrepreneurship through Training Programmes to Initiate an Enterprise at Household Level for Income Generation

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Promotion of women entrepreneurship is a dependable path to economic stability of women and her family. It leads to more spending on education and health, increased decision making power and reduced gender discrimination. Besides, there are certain other reasons for spread of women entrepreneurship namely its close link to social, cultural, religious and psychological variables; the flexible nature of work that combines gainful employment with domestic responsibilities; economic demands specially in rural women, and above all the modernization that snatches bread and butter of an increasing number and proportion of women. This attracted the attention of policymakers and planners towards the significance of women’s productive activities and their need of income generation through entrepreneurship. Keeping in view the above facts, All India Coordinated Research Project on Home Science (AICRP-HS), FRM component under the objective “Empowerment of Women through Capacity Building” conducted intensive training programmes in three adopted villages of Ludhiana district to improve the knowledge of women for better living and to empower them for undertaking income generating projects so that they can contribute towards family income and improve the financial status of their families. Different training programmes were conducted to impart knowledge to total 80 participants (at Bhata Dhua village) Further, impact analysis of the training programmes was done and the results show that almost all the respondents gained full knowledge of all the aspects of training programmes. But most of them used the knowledge gained through different trainings for making articles to fulfill their household needs or to give these items to their friends and relatives. There were only few respondents who use the knowledge of candle making for earning money for their families.

Keywords: Women entrepreneurship, Capacity building, Knowledge
4.07

Capacity Building Strategies for Sustainable Livelihood Options among Farm Women of SHGs in Karnataka

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A study was carried out in ten sub watersheds of five districts in Karnataka with the specific objective to evolve capacity building strategies to induce sustainable development in SHGs operating. A comprehensive methodology was designed using the extension participatory approaches such as Intensive Workshops with L-NGOs, F-NGOs, P-NGOs, SHG groups and Project Staff at different levels, Focused Group Discussions (FGD) with SHG members, PRA techniques, and personal interview method through structured and semi-structured schedules. The study revealed that the present livelihood activities followed by the SHG members were Dairy, the top prioritized activity followed by petty shop and sheep rearing in almost all the districts. The study further revealed that there is a need to strengthen the traditional livelihood activities such as dairying, sheep & goat rearing and poultry. Horticulture, bio-fertilizers, bio-pesticides and other agro-based activities that have a great potential and need to be introduced in a phased manner. The major capacity building strategies to induce sustainable development as found by the study include; stress on educating members to make investment on livelihood activities and reducing investments on domestic chores, inculcating orientation towards developing business plan and expand the scale of operation of business activity, encouraging federation of SHGs, establishment of single window information-cum-counseling centers, creating brand loyalty and niche market, encouraging farmer oriented marketing system, creating a regulatory body at federation level, low cost infrastructure facility and effective linkages with various institutions and organizations bringing convergence for effective implementation of livelihood activities.

Keywords: Capacity building, SHG’s, Sustainable development
Capacity Development by Technical Empowerment of Farmers through Sustainable Approach of Farmers Field School

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Sustainable farming requires an enhanced capacity of farmers to adopt in the face of unexpected changes and emerging uncertainties, rather than mere continuation of practice forever. Helping farmers to enhance their abilities to understand and analyze their situations enabling good decision making is very important. Farmers Field School (FFS) is one of the established participatory methods of effective learning. The FFS was designed originally as a way to introduce Integrated Pest Management (IPM) practices to irrigated rice farmers in Asia. It was introduced in Indonesia on a pilot basis in the year 1989. Special features of FFS are learning is field based, FFS is a group activity, decision based on the analysis of problem and results, promotes healthy and quality decisions, farmers conduct their own field studies, learning by doing and seeing is believing, facilitates farmer to farmer communication, extension staff serves as a facilitators. The persons involved in FFS are Farmers Field School participant, collaborators and facilitator. Steps in organizing FFS includes (1) Collection of basic information (2) Sensitizing the villagers (3) Selection of participants and collaborators (4) Development of norms (5) Approval of village assembly (6) Planning (7) Developing memorandum of understanding (8) Execution of FFS (9) Withdrawal. Further, FFS approach is considered the most successful among various agricultural extension methods. However, the adoption of the technologies disseminated through FFS largely depends on the initiative and interest shown by the individual farmers. FFS to be able to sustain and spread on its own, the processes need to be institutionalized with the group. Till that time, regular follow up for FFS trained groups is necessary. If facilitated in a meaningful way, the FFS approach will enable improving livelihoods of farmers in a relatively short time.

Keywords: Farmers field school, Empowerment of farmers, Capacity development, Sustainable farming
Capacity Development of Rural Women for Self Employment through Training on Five Star Film Coated Screen Printing Technique

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The strategic development of an economy requires equal participation and equal opportunities to all sects and genders. Women have tremendous potential to contribute in harnessing technology for human and social development. Through proper training, along with their contribution to the family, women may also provide their input for the overall development of the society. Training forms the core for change through acquisition of skills and knowledge, and act as a backbone for improved performance. Training helps in maintaining, upgrading and updating the skills and knowledge throughout the working life. The Indian, handicrafts sector provides employment to millions of artisans which include a large number of women and artisans belonging to weaker section of the society. Screen printing is such an art with basic skills and limited investment. It is the process of using a mesh based stencil to apply colour onto a substrate. It is used for making textiles aesthetically appealing. Hence, a training programme on printing of textile materials with five star film coated screen was organized in the Department of Clothing and Textiles, College of Home Science, G. B. Pant University of Agriculture & Technology, Pantnagar, for six days. The focus was to equip rural women/adolescent girls of nearby areas of Pantnagar with knowledge and skills required for efficiency enhancement in a particular occupation i.e. in the field of textile printing. A total of fifteen trainees participated in the training programme. There are various methods to create a stencil but the method taught to the trainees was creating a photographic stencil using five star film coating. This method allows reusability of the screen and also most complicated designs can be printed with ease. Trainees learned the technique with keen interest and also printed designs of their own choice on household and apparel textile articles under the directions of the training team.

Keywords: Screen printing, Stencil development, Five star film coating, Training
Constraints Faced by the Self Help Promoting Institution and Other Stakeholders in Livelihood Promotion through SHGs in Villages of Bikaner District

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Women participation in economically productive activities is not new. It is believed that their share of labour hours has increased disproportionately to that of men. Women constitutes almost half of the agricultural labour force and contribute more towards family farm income. Self help group (SHG) enhances the status of women as participant, decision makers and beneficiaries in democratic, economic, social and cultural sphere of life. It not only provides the opportunity of economic activities to the members but also discusses and analyzes their social economic situations to arrive at the root cause of their problems and strive to find and implement solutions. The study was undertaken in Bikaner district of Rajasthan with 20 officials of SHGs, four from each block having a minimum of three years of working experience with SHGs of different agencies. Establishment of SHGs and running it efficiently is a challenging task. The officials/facilitators working for this purpose have faced some problems. Thus, this aspect was studied and the constraints were recorded as perceived by the officials in establishing and running the SHGs. 100 percent officials considered “illiteracy among members” and “establishment of SHGs” is a time consuming process (95%) as important constraint and hence both the constraints were ranked I and II. However, “delay in repayments of loans by SHG members (10%) was the least a constraint perceived by the officials in establishing and running the SHGs. It seems that the problem faced by officials were interlinked. Since majority of the respondents were illiterate, therefore it required more time to establish SHGs. Obviously, they would be less interested in paper work. The SHGs are being viewed as prelude to this change in socio-economic scenario in rural sector of semi-arid Rajasthan.

Keywords: Self help group, Constraints, Socio economic conditions
Empowerment of Rural Women through Self Help Groups

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The Self-Help Group (SHG) movement in India has reached poor and marginalized women and is becoming a vehicle of change for them. SHG is a method to organize the poor and the marginalized in the form of voluntary association to come together to solve their problems. Realizing that SHG is a promising tool in capacity building of rural poor for their empowerment, government has vigorously supported the SHG-centric models of development in India. It is increasingly being employed in development initiatives by government, commercial banks and civil society, and they depend heavily on such groups to take the development efforts forward. SHG is built on mutual trust and mutual support, where every member is equal, responsible and committed to the cause of the group. Savings is the foundation to build the group and decisions are based on the principles of consensus. In India, majority of SHGs are strong collectives of poor women. These women collect their savings and save it in banks as common fund in the name of the group. In return they receive easy access to loans with a small rate of interest to start their microenterprise. Banks accept the peer pressure within the group as a substitute for collateral securities. Usually, the number of members in one SHG does not exceed twenty. The groups of women SHGs can be further linked with each other through the SHG promoting organizations for creating federation of SGHs. This SHG development strategy has been found effective as a means to empower women with an aim to make them self-reliant. The tremendous impact on the economic empowerment of the poor rural women through the instrument of SHGs has been reported by many studies. Women empowerment may be further accelerated through facilitated establishment of SHGs, empowering them economically and organizing into pressure groups and involving them in raising awareness and participating in various social and development activities.

Keywords: Rural women, Self help groups, Women empowerment
4.12

Empowerment of Rural Youth through Skill Development Activities by KVK

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India is a country with a prominent agrarian economy. More than 65 percent population resides in the rural areas. Unfortunately our rural areas are marked by enormous problems like under developed infrastructural facilities and unemployment among rural youth which leads to rural migration to urban areas. If the youth in rural areas are trained, having employable skills, their capacities enhanced and are empowered; they can contribute tremendously to the nation’s economic, social and cultural advancement. The vibrant energetic power of Indian youth needs to be utilized for shaping the destiny of the country. The youth need to be empowered educationally, technically, socially, psychologically and economically to develop themselves and contribute to the effective development of the country. In this direction Krishi Vigyan Kendra, Gurgaon started the skill development programme to empower the rural youth of the district. Since 2000, the KVK organized 179 such programmes belonging to different entrepreneurial trades viz. Dairy, Beekeeping, Nursery management, Protective cultivation of vegetables, integrated farming, Value addition, Stitching and tailoring etc. A total of 3220 rural youth were trained. A case study was conducted on successful agri-entrepreneurs of KVK in Gurgaon to know the impact of such activities and the present status of the socio-economic condition of the farm entrepreneurs. The outcome emerged that on an average 47.7 per cent enterprises have sustained itself and the entrepreneurs are happy with their enterprises. The study revealed that most of the entrepreneurs are self reliance and their level of knowledge, earning, self confidence, social participation and socio-economic status was much higher than other youths.

Keywords: Empowerment, Rural youths, agri-entrepreneurs, Krishi Vigyan Kendra
4.13
Entrepreneurship Development for Sustainable Agricultural Development

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India is among the developing countries of the world where agriculture sector is of prime importance. Agriculture is considered to be the back bone of our economy and the agrarian sector contributes substantially to the GDP i.e. 13.7 percent while it provides employment to 58 percent of the population. Agriculture has achieved commercial importance and has changed from subsistence farming to commercial farming, import oriented to export oriented sector and supply driven technology to demand driven technology. Today India is dominated by marginal farmers (64%) and peasantry can’t sustain on crop cultivation alone Entrepreneurship development in agriculture i.e. agripreneurship can be a way to revive the jeopardy which Indian agriculture is facing including the challenges of fragmentation of land, decreasing productivity of land, urbanization, the ever increasing population, decreasing profitability etc. due to which 40 percent of farmers are willing to leave agriculture for some other career option. (NSSO-2005) Entrepreneurship in agriculture has gained importance in lieu of the changing scenario of agriculture in India.. Entrepreneurship is a process through which an entrepreneur recognises and seize opportunities, converts those opportunities into workable/ marketable ideas, and takes the risk of setting up an enterprise to produce a product or service which satisfies consumer’s needs. India is second among all nations in Total Entrepreneurship Activity as per the Global Entrepreneurship Monitor Report 2002. Entrepreneurship development in agriculture can be a way to help meet the challenge of economic viability in agriculture so as to attain sustainable agriculture development. Sustainable agriculture consists of increasing the efficiency and diversifying the activities on a small piece of land so as to gain economic, social and environmental sustainability. An agri-preneur can invest in various enterprises related to agriculture and allied sectors like mushroom cultivation, poultry farming, bee keeping, vegetable cultivation, nursery raising etc. and can integrate them on his farm so as to gain maximum income. The agricultural technology thus needs to move from production oriented to profit oriented sustainable farming and the adoption of agripreneurship will help to improve the livelihood of rural poor through highly remunerative and income generating enterprises. Today the main aim of the Government is not only food security, but the aim is food as well as nutritional security with the efficient use of natural resources i.e. sustainable agriculture development has become the need of the hour. The need is to develop the farmers in such a way so as to inculcate in them the skills required to be an entrepreneur.

Keywords: Agriculture, Entrepreneurship, Agripreneurship, Agripreneur, Sustainable agriculture.
Empowering women is an indispensable tool for advancing development and reducing poverty. Empowered women contribute to the health and productivity of whole family & communities and to improve prospects for the next generation. In view of the above, an attempt is being made in the present study to improve the condition of women through skill development to make them self-employed as this will help in increasing their self-confidence. The earning capacity lessens their dependence on family heads and enables to spend for desired expenses. It provides them certain freedom as individuals; enables them to contribute to family affairs financially, which creates an environment in the family in favour of the women, to accept her views and to let her participate in the family matters like education etc. Therefore, researcher selected surface development of textile articles with traditional designs of Uttarakhand i.e. Aipan. Hand painting trainings were organized in the Department of Clothing & Textiles, College of Home Sciences. Total 6 trainings were organized for a group of 10 trainees in each case; the duration of each training was of 8 days. In order to assess the knowledge/understanding of trainees pre and post test was conducted and analysis was done by comparing the results of both tests. Aipan is a very popular folk art practiced by the women in Uttarakhand. Aipan designs are created for many auspicious occasions for decoration of wall, stool (chauki) etc in all parts of Uttarakhand state since generations. Various traditional Aipan designs of Uttarakhand were made by hand painting to check their suitability for adaptation on cotton and silk fabrics. Adaptation of Aipan designs to be used for wall hanging, table mats, other household items & suitable apparels was done on computer by using designing softwares. These textile items painted with aipan designs were highly acceptable and have wide market potential.

Keywords: Traditional designs, Aipan, adaptation, motifs, women empowerment.
4.15

Extent of Knowledge of Mango Growers Regarding Plant Protection Measures

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Total mango production in India is 18.0 million tonnes (MT) with 22.1 percent share in total fruit production. In India, mango is grown on 2.5 million hectare (ha) which contributes 35.8 per cent share in total area under fruit crops. Irrespective to the reality that India is having a comparative advantage over other mango producing countries in terms of total production still the productivity (7.2 tonnes/ha) continues to be low. Maharashtra is one of the major states in case of area under mango (0.48 million ha) but, total mango production of the state is low as compared to other states (0.63 million tonnes). Hence, productivity of mango in Maharashtra tends to be very low (1.3 tonnes/ha). The present study was undertaken in Kolhapur district of western Maharashtra region which is adjacent to the leading region in mango production i.e. South Konkan. Two tehsils namely Chandgad and Gadginglaj from Kolhapur district with the highest area under mango crop were selected for the research study. Information regarding the progressive mango growers was obtained from the Taluka Agriculture Officer and then 105 respondents from two tehsils were selected purposively. The findings of the study indicates that two- third (65.71%) of the mango growers had ‘medium’ level of knowledge regarding recommended plant protection measures for control of diseases. It also revealed that overall knowledge level of the mango growers was medium. Hence, it is necessary to impart proper scientific and technical knowledge regarding recommended plant protection measures of mango through trainings and demonstrations. Taking into consideration all these facts, it is necessary that mango growers should have knowledge about the appropriate plant protection measures to keep their mango crop free from insect pest and disease infestations so that they can increase production and productivity of mango.

Keywords: Mango growers, Plant protection, Knowledge level
Farm Women Participation in Decision Making in Vegetable Cultivation

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Rural Indian women are extensively involved in agricultural activities and play a significant and crucial role in decision making. However, the nature and extent of their involvement differs with the variations in agro-production systems. The mode of female participation in agricultural production varies with the land-owning status of farm households. Their roles range from managers to landless labourers. Women perform a variety of tasks both in cultivation as well as marketing. However, their involvement as decision makers related to vegetable operations is questionable. Hence the present study was conducted to determine the contribution of farm women in decision making in vegetable cultivation. The study was conducted in six villages of two blocks of Tikamgarh district of Madhya Pradesh, out of which a sample of 120 farm women were selected randomly. The result shows that the contribution of farm women in decision making process in vegetable cultivation is of medium level. It may be because of the constraints faced by farm women in decision making on vegetable cultivation as male dominance, no knowledge about improved technology and lack of education were the top most constraints reported by majority of the farm women. The findings also indicates that education, land holding, social participation, farm power, economic motivation, scientific orientation, market orientation, mass-media exposure had significant relationship with decision making of farm women in vegetable cultivation.

Keywords: Vegetable Cultivation, Farm women, Decision making, Socio-economic factors and decision making.
4.17

Group Extension Approach- Agricultural Development

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With the increase in number of small and marginal landholding farmers due to one or the other reasons which results in poor economic status of the farmers. To uplift the economic status of the farmers, group extension approach is needed. Group extension approach mean when 8-10 farmers join together and form a group and then extension services are provided only to those groups. Then the group is in the beginning and extension on by snow ball rolling effect joins the remaining farmers. So the whole farming community can be operationalized by this approach. For this, we have to do the group formation of the farmers on first stage. We will take 8-10 farmers with the characteristics like credibility, fidelity, homogeneity and cooperation, homogeneous in occupation like integrated farming system etc. second step in this is extension approaches as we all know that today’s world is driven by mouse. Present extension services must focus on use of internet, mobile and other traditional extension services like demonstrations etc. To implement these at ground level the extension service providers like Govt. departments (Agriculture, Horticulture, Dairy etc.), Banks, Private Sector (Seed agencies, pesticide agency, fertilizer agencies) and Semi Govt. agencies like (IFFCO, KRIBHCO, MARKFED, MILKFED etc.) has to be grouped under one umbrella. The outcome of this process results in increase in productivity with quality of the product, better processing and tremendous change in the market pattern.

Keywords: Small and marginal farmers, Group extension approach, Credibility, fidelity
4.18

Harnessing Demographic Dividend for Sustainable Agricultural Growth

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India is entering in phase of demographic dividend. Presently, India has more than 50 per cent of its population within the age group of 15 years to 59 years and 28 percent of population in age group of 15-29 years. Furthermore, by 2020, more than 65 percent of Indian population will be under working age group. Interestingly, 70 percent of Indians working age group lives in rural India. This demographic dividend may become an asset as well as liability for Indian agriculture, depending upon the role of this working age group in shaping India’s future. Indian agriculture is facing mighty challenges of ensuring food and nutritional security and increasing productivity with decreasing landholdings. Above all, retaining youths in agriculture has emerged as the greatest challenge of the country. The member of cultivators in India decreased from 110 million in 1991 to 103 million in 2001 and further reduced to 95.8 million in 2011 (census 2011). Census 2011 has shown that population of main cultivators in India has reduced from 110 million in 1991 to 103 million in 2001 and further reduced to 95.8 million in 2011). To cope up with these challenges, India have to harness demographic dividend by imparting appropriate farming skills to working age group which can create employment opportunities as well as provide self dignity to rural youths. This paper evaluates the challenges which demographic dividend is posing in front of Indian agriculture. Authors have suggested strategies about how India can harness demographic dividend in agriculture for sustainable agricultural growth.

Keywords: Demographic dividend, Working age group
Impact Assessment and Effectiveness of Farm Women Training Programmes under ATMA Project in district Tikamgarh of Madhya Pradesh

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This study was carried out to investigate the impact of farm women training programmes under Agricultural Technology Management Agency (ATMA) Project conducted by Krishi Vigyan Kendra (KVK) in district Tikamgarh of Madhya Pradesh. The purpose of this study was to increase the understanding, knowledge and attitude of women who are running group businesses, engage in farm activities with the emphasis on “understanding” their experiences. Capacity building of farmers and farmwomen through organization of training is one of the most important strategies for implementation of ATMA. The researcher has made an attempt to have better qualitative information and quantitative data to profile women engaged in group ventures (socio, agro-economic, demographic information, benefits and sustainability). This would also assist in promoting awareness of the role of group entrepreneurship in the economy. Four villages adopted by KVK Tikamgarh during the year 2012-2013 were selected purposively. The sample consisted of 80 women trainees. Hypothesis was tested using percentage, rank order and association to determine the relationship between combination training aspects. The study revealed that the training programmes conducted on nursery management, animal husbandry and organic farming had been highly effective in inducing desirable changes in the attitude and knowledge level of woman trainees. The study suggests that the attributes namely family size, annual income, education, size of land holding, contact with extension agencies, scientific orientation, social participation and mass media exposure should be taken in to consideration while conduction any farm women training programme.

Keywords: ATMA, KVK training, Attitude, Knowledge level
4.20

Impact on Knowledge and Adoption Level of Participants of Farmer Field School Regarding Zero Tillage Wheat Cultivation in District Koderma of Jharkhand

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Farmer field school (FFS) is participatory platform for improving decision-making capacity and stimulating local innovation for sustainable agriculture. FFS offer community-based, non-formal education to group of 20–25 farmers. FFS is a group-based learning process. The activities involve simple experiments, regular field observations and group analysis. The knowledge gained from these activities enables participants to make their own locally specific decisions about crop management practices. That means the farmers can develop solutions to their own problems and developed as an alternative to the conventional top-down extension approaches. The present study was conducted at Jainagar block in Koderma district Jharkhand, India. A total of 60 respondents were selected purposively from these three F.F.S villages, and for comparison 60 non-trainees of these villages were selected randomly for the study. Therefore, 120 respondents were covered in the sample. The data were collected through a well-structured and pre-tested interview schedule. The majority of respondents had low level of adoption in respect of zero tillage wheat production technology followed by medium and high level of adoption of zero tillage wheat production technology on their field respectively.

Keywords: Farmer field school, Zero tillage wheat production technology, Adoption of production technology
4.21

Increasing the Productivity and Profitability of Pulse Crops through Front Line Demonstrations

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Pulses are important for our agricultural production system through biological nitrogen fixation in soil and nutritional security of large number of vegetarians and weaker sections of the society who could not afford other sources of protein. India produces around 17.21 million tons of pulses from an area of 24.78 million hectares. The average productivity in the country is about 689 kg/ha against the average global productivity of 857 kg/ha. Madhya Pradesh being the major pulse growing state in India with total area under pulses at around 52.07 lakh hectares with a production of 30.29 lakh tons. To boost the production and productivity of pulse crops, krishi Vigyan Kendra, Sagar are conducting front line demonstration (FLD) on pulse crops. The main objectives of FLD’s on pulses is to demonstrate and popularize the improved package of practices on farmers’ fields for effective transfer of generated technology and make them belief to fill the gap between recommended technology and traditional farming practices. Front line demonstrations were conducted pigeon pea (2011-12 to 2012-13) and urdbean (2010-11, 2012-12) during kharif season and in chickpea (2008-09, 2012-13), and lentil (2009-10, 2011-12 to 2012-13) during rabi season in Sagar district of Vindhyan Pleatue of Madhya Pradesh. Increased yield in demonstration plots ranged between 10.00 to 35.16 per cent with adoption of improved packages as compared to traditional farming practices. Technology gap of different pulse crops under front line demonstration was 3.25 to 8.84q/ha where as extension gap of different pulse crops range was 0.5 to 3.20 q/ha and technology index was varied from 20.05 to 60.71 per cent. Variations in the technology gap and index percentage were observed due to variation in agro-climatic parameters, soil fertility, biotic stresses, and socio-economic status and management practices. This variation can be narrowed down by encourage the farmers to adopt economical viable technologies for increasing production and productivity of pulse crops.

Keywords: HYVs, Technological intervention, Yield gap, Pulses
Management Practices Followed by the Polyhouse Owners from Pune District of Maharashtra

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Polyhouse farming is an alternative new technique in agriculture gaining foothold in rural India. It reduces dependency on rainfall and makes the optimum use of land and water resources. A typical, traditional farm of 500 square meters would generate an estimated annual income between Rs. 10,000 to 20,000, compared to estimated annual income from similar sized polyhouse of Rs. 45,000 to 50,000. Potentially, polyhouse farming can help the farmer generate income around the year growing multiple crops. This also helps them spread their risks. Polyhouse farming enables cultivation of crops that can give maximum yield on specific days (e.g. roses on Valentine’s day) and exotic crops that cannot be normally grown in Indian conditions. It is observed that majority (61.11%) of the respondents possessed medium level of knowledge about gerbera polyhouse technology. About 22.22 percent of the respondents had low knowledge and only 16.67 percent respondents had high level of knowledge about Gerbera polyhouse technology. The results regarding overall adoption of Gerbera polyhouse technology more than half of the respondents (66.67 percent) had medium level of adoption, followed by 33.33 percent respondents having low level of adoption. Not a single respondent had high level of adoption about Gerbera polyhouse technology. It was observed from the results that two third (66.67%) of the respondents possessed medium level of knowledge, while equal proportion of respondents i.e. 16.67 percent possessed low and high level of knowledge, respectively. Considering overall adoption about Capsicum about 66.67 percent of the respondents had medium level of adoption. Nearly 22.22 percent of the respondents highly adopted the Capsicum cultivation technology, while few percent 11.11 of respondents had low adoption. The research was conducted in the tehsils namely Baramati, Haveli and Bhor from the Pune district. Gerbera and Capsicum crop were selected and 36 respondents were selected for the research.

Keywords: Polyhouse farming, Knowledge level of farmers, Capsicum cultivation
Market Linkages through Farmers Clubs

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Farmers clubs are grass root level informal forum of farmers. The main objective of setting up of farmers clubs is to achieve prosperity for the farmers by providing credit, technology and market counseling. Farmers clubs are formed with the expectations that it will facilitate in transfer of technology and strengthens the agricultural extension services and act as an extended arm of the extension agencies. Throughout the country, there are over one lakh Farmer's Clubs. The role of Farmers Clubs is more in state like Jammu and Kashmir and in Jammu district, the land area available for cultivation is limited and is under the pressure of continuous population growth. The viability of small and marginal agricultural holdings has always been an area of concern. There are 1, 26,389 land holdings in Jammu district, out of which 1,16,360 are in marginal and small category which constitutes 92 percent of the total holdings and nearly 50 percent are less than one hectare area. To overcome the constraint of the small size of agricultural holdings, the farmers need to follow ‘a group farming approach’ at the village level. In each village, farmers who are practicing activities like vegetable cultivation, floriculture, poultry farming, fish farming, dairy, bee keeping, mushroom production etc. can form a club that can help them in accessing credit, technology, inputs and marketing services. Thus there could be a vegetable farmers club, floriculture farmers club; poultry farmers’ club etc. These clubs can reap the benefit of collective bargaining power both for procuring inputs and selling their farm produce in the market. Moreover, the farmers clubs can develop liaison with corporate input suppliers to purchase bulk inputs at a reasonable rates. There are certain benefits for the farming community like transport facility for lifting of produce provided by different departments to the farmer if they are in a group. Thus, setting up of Farmers Clubs will help the farmers in Jammu district to achieve prosperity with overall agricultural development.

Keywords: Farmers club, Market, Agriculture
4.24

Producers Groups- Ways of Achieving Selfsufficiency

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The sense of full farmer engagement in this newly integrated extension system, plus the hundreds of new FIGs/ producer groups that are establishing now a days in ATMA, gave a clear indication of the benefit of restructuring the extension system. By moving towards a group approach, with farmers being trained and empowered to take on new agro-enterprises generated considerable pride in their achievements. Hence, role of agriculture extension in identifying, developing and promoting new agro-enterprises among these producer groups has been unequivocally confirmed. It should be noted that agricultural extension systems in both developed and developing countries have successfully increased the technical, economic, and social and leadership skills and knowledge of farmers by helping them organize into producer and farmer groups. In the process, these farmers share technical and economic information about these different types of crop, livestock and other agro-enterprises. In addition, these farmer organizations become the building blocks of democratic institutions. Agricultural extension systems in both developed and developing countries have successfully increased the technical, economic, social, leadership skills and knowledge of farmers by helping them organize into producer and farmer groups. A new agricultural extension model in India which followed such a decentralized, bottom-up group approach, not only improved the quality of extension services being provided to the rural poor, but also encouraged full accountability and transparency within the extension system. Therefore, it is recommended that agricultural extension organizations worldwide give priority to helping small-scale and women farmers get organized into producer groups, both to reduce rural poverty and malnutrition, as well as to facilitate the development of democratic institutions.

Keywords: Producer groups, FIGs
Psychological Attributes of Common Interest Group Members Involved in Dairy Farming

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The main objective of this paper is to study the social participation and psychological assessment of Common Interest Group (CIG) members involved in dairy farming. The study was conducted in three districts of Gujarat state. Eighteen CIGs which are working on dairy farming were selected and 300 members of selected CIGs were taken as respondents. The information was collected by using structured interview schedule and observation. Social attributes like social participation, extension contacts and mass media contact of CIG members plays an important role among the members of society to gain knowledge and information. The results showed that, majority of respondents (58.67%) were not having any organizational membership. A large proportion of respondents had medium level of extension contact (68.00%) and mass media exposure (73.66%). The study shows that majority (78.67%) of members had medium level of aspiration, 52 percent of CIGs have high self esteem with respect to success and worthiness. The result indicates that majority of respondents (78.67%) fall in medium category of knowledge level about breeding, feeding, health care, management and fodder production followed by 8.67 percent and 12.66 percent in low and high knowledge level categories, respectively. The majority of members (69.33%) had favorable attitude and 24.67 percent members had unfavorable attitude towards SDFPs.

Keywords: Common interest group, Psychological attributes, Dairy farming
4.26

Reasons for Existence of Technological Gap in Tomato Cultivation in Maharashtra

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Tomato is a very popular vegetable grown successfully throughout India. The tomato produce is available in cities round the year. In 2008-09, the total area under tomato crop in India was 5 lakh hectares (ha) and the production was 84 lakh million tonnes with the average yield of 16.8 tonnes/ha. In the same year in Maharashtra, total area under tomato crops was 30,620 ha and production was 487565 tonnes with the average yield of 15.9 tonnes/ha. A study was carried out in Nashik and Pune districts of western Maharashtra, where maximum area is under tomato cultivation. From each district two tehsil were selected on the basis of maximum area under tomato cultivation. Accordingly, Niphad and Dindori, tehsils from Nashik district and Junner and Ambegaon tehsils from Pune district were selected for the study. Fifteen villages from each tehsil were selected as maximum area was under tomato cultivation. From each village, 5 tomato growers were selected randomly. So there were in all 2 districts, 4 tehsils, 60 villages and 300 respondent tomato growers for the study purpose. The personal interviewing method was used for data collection. To find out the reasons for existence of technological gap and the suggestions made by the tomato growers in minimizing technological gap in the cultivation of tomato crop were the two important objectives studied under this study. It was found that majority (68.66%) of the respondent tomato growers lacked knowledge about selection of proper growth regulator, followed by 60.33 percent lack of knowledge of proper application of growth regulator. The 54.66 percent of the respondent tomato growers suggested, need of market price stabilization, while 47 percent suggested supply of fertilizer within time.

Keywords: Tomato cultivation, Technology gap
Role of Self Help Groups in Empowering the Rural Community for Sustainable Livestock Production

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Promotion of equal economic opportunities, empowerment and secure livelihoods across cultures and regions have been identified as the three priority areas of action by World development report, 2001 to deal with rural poverty. Self help groups (SHGs) have emerged as a progressive tool by increasing their access to credit and productive services. Financial self sustainability helps the marginalized individuals and families in strengthening livelihoods by providing new options. Group consciousness also organizes and trains them to solve their problems by generating resources locally. The SHGs also provides them a platform to share concerns and experiences, in the process developing their capacities and competencies. This is particularly true for livestock production. With financial inclusion, the procurement of feed and fodder for animals, access to technology for better health care of cattle as well as their social contacts for obtaining better services at reasonable expenses increases considerably. The following study was conducted to judge the role of self help groups in sustenance of livestock production in two blocks of Muktsar district in Punjab. The productive livestock assets in turn are able to improve the nutrition and health status of their owners. Majority of respondents (84.5 percent) felt that a sense of community participation improves their self image and confidence. Women respondents (76 percent) were particularly satisfied with the savings they were able to make for education, clothing and other qualitative changes in the lives of their families and children in particular. For some members (36 percent) performance of socio-cultural activities like marriage ceremonies and festivals improved, promoting their social and political empowerment. However, the study also found that along with common goals and aspirations, commitment to common good of the members is must for the success of self help groups.

Keywords: Self help groups, Financial inclusion, Access to resources and technology, Productive livestock assets
Role of Women in Farm Decision Making

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Agriculture is the main occupation as far as its potential prospects in India are concerned. Progress of agriculture will help in rural reconstruction and development. From time immemorial, women played different roles in their home activities as wives in their personal lives with their husbands, as mothers in their responsibilities for the development of their children and as home makers’ in-charge of the operation of their homes. In addition, women also played a pivotal role in agriculture and livestock management. In modern agriculture too, women continued to share a number of farm operations with men. So, the present study was conducted to assess the role of women in farm decision making in Chakur and Nilanga tahsils of Latur district. The results proved that majority (60.00%) of the respondents played medium role in farm decision making while 20.83 percent and 19.17 percent of the respondents played low and high role in farm decision making, respectively.

Keywords: Role, Farm women, Decision making.
Rural Women Participation in Dairy Farming of Rajkot District

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A survey based study was carried out to ascertain the role and participation of rural women in dairy farming, using a pretested interview schedule by personal interview for a sample size of 240 rural women in Jasdan, Morbi and Maliya tehsils of Rajkot district of Gujarat state. The socio-personal study revealed that majority of the women were middle aged (55%), in joint families (65%) with 53.33 per cent being literates. Most of the respondent families were marginal farmers (33.33%) with low annual family income (60.83%) having agriculture (52.5%) as the major occupation. About thirty operations of dairy farming were selected in consultation with experts and were broadly categorized into six aspects as feeding, management, breeding, health care, processing & marketing and miscellaneous. The study revealed that women participation was maximum in caring of pregnant animals (91.66%) followed by taking animals for pregnancy diagnosis (90.83%). The study revealed that 90 percent women were involved in milking while as 89.16 percent women cared for newborn or young animals. The farmwomen actively involved in cleaning of animal sheds (89.16%), feeding the animals (87%) and disposal of cow dung (86.66%). The farm women participation was least in farm record maintenance (52.5%) and getting loans or credits from the banks (49.16%). The study concluded that women participated mostly in non-financial activities and there is a need to educate farm women about scientific management practices for increasing livestock production.

Keywords: Socio-personal profile, Participation, Rural women, Dairy farming
4.30

**Satisfaction Level of the Readers Regarding Farm Magazines of the Punjab Agricultural University**

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Two Farm Magazines i.e. Progressive Farming in English and Changi Kheti in Punjabi are brought out by the Punjab Agricultural University. These magazines provide timely and latest information to the readers who generally are practical farmers. Articles of top scientists and subject matter specialists and published in these magazines to supply timely information, to motivate farmers for adoption of recommended practices in order to enhance productivity in agriculture and allied occupations. These magazines play an important role by bridging the gap between the communication of the researchers and the farmers. The present study was conducted on the subscribers of members of monthly magazines Changi Kheti and Progressive Farming. An interview schedule was prepared for the collection of data. The satisfaction level and reaction of the respondents were recorded for bringing betterment in the magazines. It was found that at present there are more than 1 lakh subscribers of these magazines. The finds show that majority of the respondents were satisfied with the timeliness of the information and content of the magazines.

**Keywords:** Content analysis, Degree of usefulness, Reactions, Comprehension, Timelines
4.31

SHG and Rural Women Entrepreneurs

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The self help groups (SHGs) are instilling confidence in the rural women to take up income generating activities. Women are playing a key role in making choices as far as income generating activities (IGA) and credit requirements are concerned. They are more aware and concerned about financial matters related to self and family. Therefore, an effort was made in the study to explore the involvement of women members about these aspects. The present study was conducted in the purposively selected Udaipur district of Rajasthan and two organizations, one government and one non-government having maximum number of SHGs formed under them were selected for the study. Ten SHGs were selected from each organization on the basis of maximum number of years of standing. 9 members from each group were drawn on random basis. Thus, the sample size constituted of 90 women members from each government organization (GO) and non-governmental organizations (NGO). A reliable and validated interview schedule was used for data collection with the objective to study the extent of involvement of members of SHGs in decision making with respect to the selection of enterprises in farm and non-farm sectors. Out of the total of 90 women members from GOs, 18 women took up one or the other enterprise whereas in NGOs, 65 women out of 90 had been running entrepreneurial activity. Goat rearing (34.44%) and dairy (21.11%) were found to be popular entrepreneurial activities taken up by members of NGO-SHG while stitching (7.77%) and grocery shop (5.55%) were taken up by the members of GO SHGs. For selection of an enterprise, majority of the NGO respondents (76.92 to 84.61%) reported the major reasons like – demand, absence of risk, lower cost and market availability. While the reasons mentioned by GO members (83.33 to 100%) were profitability and demand. Training as a reason for taking up enterprise was mentioned by very few women members from both GO (27.77%) and NGO (12.30%).

Keywords: SHG, Women entrepreneurs, Goat and dairy enterprises
4.32

Social Empowerment of Women through Self Help Groups: An Impact Assessment in District Hamirpur, Himachal Pradesh

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Women empowerment is a process of awareness and capacity building leading to greater participation, to greater decision making, power and control, and to transformative action. The participation of women in Self Help Groups (SHGs) has made a significant impact on their empowerment. The present paper addresses women empowerment through self help groups in Hamirpur district of Himachal Pradesh. The study has attempted to examine whether women involvement in various activities of the group makes any positive change on women social empowerment. The information required for the study was collected using structured and pre-tested interview schedule targeting Self Help Group members along with focus group discussion method which facilitated the collection of qualitative data from the groups. From the assessment of various criteria of social empowerment, the study indicated a noteworthy improvement in the status of self help group members. The impact of membership in the group is commendable in courage, self-confidence, skill development, increased participation in decision making, control over family finance and significant shift in the level of communication all converging to improved social status.

Keywords: SHG, Empowerment, Self confidence, Decision making
4.33

Study on Perception of Tribal Farmers Viewing Krishi Darshan Programme of Doordarshan with Reference to Barwani District

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Television is a valuable and very effective media which can reach effectively to the rural masses. Doordarshan as an important media of communication has greater role to play in the forth coming years in order to disseminate agricultural education to the farming community. Today in the age of modern technology, television is considered to be effective in communicating the agricultural technology to needy and remote area farmers in quick time and help to bridge the gap between the scientists and farmers and also increasing the knowledge level of farmers. One of the important objectives of doordarshan is to provide essential knowledge and information in order to stimulate greater agricultural production. Agricultural information is disseminated to the farmers through krishi darshan programme. The value of any programme can only be judged through audience participation and response. It was therefore, felt necessary to study the perception and usefulness of televiewers of Krishi Darshan Programme of Doordarshan. The study was undertaken to to determine the level of perception and extent of usefulness of the tribal farmers viewing Krishi Darshan Programme of Doordarshan and to suggest the strategies for making effective the Krishi Darshan Programme of Doordarshan. It was found that majority (44.67%) of the tribal farmers had medium level of perception towards overall agricultural practices through Krishi Darshan Programme of Doordarshan. Majority (46.00%) of the tribal viewers expressed less useful level of overall agricultural practices telecasted through Krishi Darshan Programme, followed by no useful (27.33%) and most useful (26.67%) about selected agricultural practices. All the characteristics of tribal viewers were found to have positive and significant correlation with the level of perception. Majority of the viewers of Krishi Darshan Programme suggested that Programme should be telecasted twice a day so that farmers can see the programme at least once even if they are busy during the second/other time, it is telecasted.

Keywords: Perception, Tribal farmer, Doordarshan, Krishi darshan programme
The Extent of Adoption of Beneficiaries of FLDS and Non-Beneficiaries about Paddy Production Technology

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The present investigation was conducted in the Navsari district of South Gujarat. The district is being considered as rice bowel of South Gujarat and has maximum area under paddy cultivation in South Gujarat. This district was selected purposively for the present-study. A comprehensive list of beneficiary farmers was collected from the Krishi Vigyan Kendra, N.A.U., Navsari. Total numbers of paddy demonstrations were 183. A total of 60 beneficiary farmers were taken up for the study through proportionate random sampling and equal number of non-beneficiary was selected from the same village. An Ex-post-facto research design was used in the present investigation. The result of the study depicted that the majority of the beneficiaries (78.33 per cent) and the non-beneficiaries (61.66 per cent) had medium level of adoption of paddy production technology.

Keywords: Adoption, FLD, Paddy production technology
Training Needs Assessment of Self Help Group Members for Gender Empowerment

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In India, most of the women Self Help Groups promoted under different development and micro-credit programmes are involved in regular savings through periodic collection from the members with the savings corpus being used to lend among themselves for production and consumption purposes as needs arise, later by linking the groups with banks for availing credit. Many Self Help Groups have progressed further to deal with various social issues. Despite SHGs being used as means for development by a large number of programmes, very few efforts have been initiated for improving the effectiveness and sustainability of Self Help Groups. Considering the uptake of technology and entrepreneurial activities as vital elements for a vibrant and effective SHG, upgrading and enriching the knowledge and skills of SHG members about farm as well as non-farm based enterprises for self-employment and income generation is crucial requirement. SHG members also need to learn managerial, communication and other soft skills sustaining the group. In this context, a study was conducted to identifying the training needs of members of SHGs, with a sample size of 290 members drawn randomly from Coimbatore district of Tamil Nadu, Prakasham district of Andhra Pradesh, Puri district of Orissa and Nalanda district of Bihar. Based on overall mean scores across the states, the major training needs in area of enterprise uptake were food processing and seed production; while decision-making, planning, time management, team building, and accounting were the important training needs in descending order under enterprise management. Use of modern communication technology assumed first rank for Bihar while, second rank for the members of Andhra Pradesh and Orissa.

Keywords: SHG, Gender empowerment, Communication technology
Training Needs of Agricultural Input Dealers in Transfer of Agriculture Technology

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The present study was conducted in Latur and Osmanabad district of Marathwada region of Maharashtra state. For this study 120 input dealers were selected from six tehsils from each district with the help of random sampling method. The data were collected with the help of structured interview schedule. Personal interview technique was used for data collection. It was observed that majority of the agricultural input dealers were ‘middle’ aged, with ‘medium’ experience in fertilizer dealing, extension contact, information seeking behavior, risk orientation, economic motivation and cosmopoliteness. Majority of the respondents were educated upto ‘higher secondary’ and had ‘medium’ annual income. More than 55.84 percent of the agricultural input dealers had received training on various aspects related to fertilizers, seeds, insecticides, pesticides and implements. Majority of the agricultural input dealers had supplied chemical fertilizers, seeds, pesticides and implements. Most (68.33%) of the respondents from the region had fair advisory service. Majority (99.16%) of the agricultural input dealers provided the information about different improved varieties of crops, fertilizers and their doses, time and method of application, control of insect pests and diseases of crops and improved methods of irrigation, soil testing, improved technology etc. In respect of training needs, agricultural input dealers from region had expressed ‘medium’ training needs.

Keywords: Input dealers, Input supply, Training need, Input dealers and farmers
Women Empowerment through Skill Development and Networking with Textile Agencies

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Embroidery is the method used to decorate fabrics for value addition. In India, embroidery work is used throughout the country. Embroidered textile articles and apparels prepared with attractive designs, colors, materials, shapes and patterns manifest the culture of that particular area. The present study was undertaken with the objectives to inculcate textiles embellishment skills among rural women & to network the backward and forward linkages for income generation from textile entrepreneurial activities. Therefore, trainings on traditional and contemporary embroideries were imparted to create entrepreneurial skills and to empower rural women and adolescent girls of nearby areas of Pantnagar as well as some hilly areas of Uttarakhand. Along with imparting training, networking of trainees with other textile agencies which could provide them income generating work was also tried. Twenty four trainings, 15 days each was provided to a no. of groups of rural girls/ women between 2009 to 2014. Audio visual aids such as samples, displays, presentations and demonstration were also used to create interest among trainees. Demonstrations helped in concrete understanding of the skills imparted. Some women groups have been successfully linked up with govt. organization i.e. Gandhi ashram Haldwani and some private organization of U.S. Nagar & Nainital (Uttarakhand). Now these trained & skilled women have become an earning member of their families. Logistic support is still being provided to these women groups by the team members of project as it is helpful in strengthening and continuing the activities of women.

Keywords: Networking, Surface embellishment, Entrepreneurial skills, Women empowerment.
Session 5
Stressed Agriculture- Technology Options and Institutional Interventions
Empowering Farmers for Climate Change Adaptation

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1. Introduction

That the climate change is a reality, is very much perceptible with many an incidence of climate related upheavals and disasters across the nations. Policies and initiatives are already afoot for better preparedness for mitigation and adaptation. The issue of climate resilience has assumed greater significance among planners, researchers, and development agencies to find out options and pathways for sustainable livelihoods. Agriculture is vital to food security as well as nation’s economy. In India, it is still the lifeline of over 600 million people comprising 120 million farming families, engages about 52 per cent of India’s workforce, underpins our food and livelihood security and contributes significantly towards economic growth and social transformation. Therefore, there is a need of sincere pursuance of climate resilient agriculture. The farmers of India have demonstrated enough courage to rescue the country from food crisis to food surplus. However, in their strides towards agricultural growth and commercialization, they could not continue with the Indian culture and legacy of co-existing with nature. Modern technologies paid dividends but at the same time also degraded the production base. What is required at present is empowering farmers for taking up technologies for climate resilience.

2. Climate Change and its Impacts

The most obvious manifestation of climate change is the rising of average worldwide temperature, popularly termed as global warming. The best estimate for the increase above pre-industrial levels in the 1990-2000 period is 0.6°C, reflecting the best estimate for warming over the 20th century (Folland et al., 2001). Other major visible impacts of climate change are melting down of glacier, rising of sea level, changes in precipitation pattern, change in snowfall pattern, change in frequency and intensity of storm, increase in plant diseases, and a number of potential challenges for public health. The danger is real that our climate and environment systems will be altered irreversibly if the present state of affairs continues in such areas as industry, energy, agriculture, population and environment. So, scientific research based policy formulation and need based implementation are the pressing needs for sustainable global environment.

2.1. Impact of climate change in Indian Agriculture

Temperature and rainfall are the most important crucial factors which affect plant development, growth and yield. So, any changes in the climate will adversely affect the productivity of the major crops through changes in the phenological process of the crop. INCCA report of Ministry of Environment and Forestry (2010) indicated an all round warming over the Indian subcontinent with increasing GHGs concentrations. The mean temperature in India is projected to increase by 0.4° to 2°C in kharif and 1.1° to 4.5°C during rabi by 2070. Rawson (1995) reported that biomass and yield of major crops tend to decline with increasing temperature, as higher temperature shortens crop duration, enhances respiration and reduces time for radiation interception. The frequency of different climatic extreme events like drought, flood, cyclone, sea surge etc. tends to increase under changing climatic scenario. All these changes will affect our agricultural production negatively in long run. Several simulation studies also supported the same hypothesis. Chakrabarti et al. (2012) reported that high temperature reduced the duration of crop growth in both wheat and chickpea. Anand et al. (2012) reported that there is increase in rice yield with increase in temperature between narrow range of 23°C to 24°C and any subsequent increase in temperature even by 1°C or 2°C significantly reduces the rice yield. Sinha and
Swaminathan (1991) reported that a 2°C increase in mean air temperature could decrease rice yield by about 0.75 ton/hectare in the high yield area and by about 0.6 ton/hectare in the low yield coastal areas. Further, a 0.5°C increase in winter temperature would reduce wheat crop duration by seven days and reduce yield by 0.45 ton/hectare. One degree centigrade increase in temperature may reduce yields of wheat, soybean, mustard, groundnut, and potato by 3-7 per cent (Aggarwal et al., 2004). However, climate change not only affects agriculture but our faulty agriculture practices also contribute a lot to climate change. So, our farmers should have scientifically accurate information about the role of agriculture as a contributory factor to climate change and its potential to address the issues.

Similarly changes in rainfall due to global change may affect the surface moisture availability which is very important for germination and crop stand in the rainfed area. Shao (1999) carried out simulation studies of maize for climate change under irrigated and rainfed conditions and found that temperature decreases the yield under both the conditions. Lal (2001) reported a fall in rainfall by 5 to 25 per cent in winter months and an increase by 10 to 15 per cent in rainfall season (summer monsoon) across the India. The projected changes have both beneficial and adverse effects on agriculture, environment and socio-economic set-up. So, there may be frequent crop failure due to change in the onset and strength of monsoon.

Climate change will also reduce the crop productivity by affecting soil health by changing the organic matter supply, temperature regimes, hydrology and salinity. Soil carbon is expected to decrease due to decreased net primary production. Any gain by the increased plant water use efficiency, due to elevated CO₂, is likely to be outweighed by increased carbon mineralization after episodic rainfall and reduced annual and growing season rainfall. The increase in soil temperature increases N₂ mineralization but its availability may decrease due to increased gaseous losses through processes such as volatilization and denitrification (Chakrabarti et al., 2012).

According to IPCC report, the Himalayan and Arid ecosystems are highly vulnerable after Coastal ecosystem to climate change in India. PRECIS simulation model predicted an increase in mean annual temperature by the 2030s. The simulation model indicates more intense cyclonic storm in the near future. Apple production in Himachal Pradesh has decreased between 1982 and 2005 as the increase in maximum temperature has led to a reduction in total chilling hours in the region. The line of production is shifting upwards with increasing temperature. There are also changes in the time and intensity of snowfall in the Himalayan ecosystem affecting the production and productivity of temperate fruits and vegetables.

Bruderle et al. (2009) reported that now in Rajasthan due to extreme temperature coupled with erratic rainfall and intense solar radiation there is frequent crop failure. The areas are already suffering from water scarcity, increasing variability of rainfall and frequent drought. Bruderle et al. (2009) projected that the mean annual surface air temperature is expected to increase by 2-4°C by the end of 21st century. Mean annual precipitation is predicted to decrease slightly, whereas the extreme precipitation is expected to increase in frequency and intensity. These changes in climatic situation directly or indirectly affects their livelihood by changing the soil structure, drainage, oxygen availability, increased soil salinity and prolonged dry spell during crop growing period.

2.2. Socio-economic Impacts of climate change

The major climatological disasters feature in form of drought, cyclone, flood, hailstorm, etc. About 68 percent of arable land in India is vulnerable to drought. Drought is recurrent in the Rajasthan, Gujarat, Central India and some parts of Maharashtra state, and it has a widespread impact on people’s livelihood, food security, and health. In the UP part of Bundelkhand, drought became evident in 2004-05 with a 25% short fall in monsoon rains. The rainfall deficit increased further to 43% in 2006-07 and 56% in 2007-08, leading to severe (meteological) drought conditions. Crop failure and debt has driven more than 400 farmers to commit suicide in the
seven districts that make up the UP part of Bundelkhand. Starvation deaths have also been reported (Gupta et al. 2014). Climate change is also witnesses in form of erratic rainfalls which put farming and farmers in stress. A total of 30,000 villages were affected and crops over 20 lakh hectares have been destroyed because of rains and hailstorm in 28 districts of Maharashtra in 2014. The Times of India reported that Crop in more than eight lakh hectares in Maharashtra has been damaged by untimely rain. Cyclones in recent past have been recurrent. Recently Phailin and hudhud were experienced by coastal belt of Odisha and Andhra Pradesh in 2014. Livemint reported that phailin caused a loss of at least Rs. 3000 crore in only one district of Ganjam and damaged 2.4 lakh houses. In Odisha, Phailin damaged crops over 500,000 hectares of agricultural land. The most common disaster in India is flooding, which constitutes 46 percent of all disaster events and contributes the highest economic loss. About 3,000 square miles flood annually. The plains of Uttar Pradesh and Bihar are frequently affected by water overflow from major rivers. Excess rainfall over a short period can also lead to flash flooding. Heavy flood damages were experienced in the country during the monsoons of 1955, 1971, 1973, 1977, 1978, 1980, 1984, 1988, 1989, 1998, 2001 and 2004. According to the National Disaster Management Guidelines on Management of Floods (NDMA, 2008), annual average flood damage during the period 1996-2005 was Rs. 4745 crores as compared to Rs. 1805 crores, the corresponding average for the past 53 years (i.e. 1953-2005).

The impact of climate change is not only felt at bio-physical component of earth system but also on the human being and in its socio-economic system. It is agreed that climate change will affect the basic elements of life around the world like access to water, food production, health care, rural economy and communication behavior. Millions of people could suffer from hunger, water shortage, and coastal flooding. A qualitative assessment indicates that morbidity and mortality of the population in highly vulnerable region are likely to increase with changing climate. People may suffer from extreme climatic events like heat stress, cold wave, cyclone, flooding etc. both physically and psychologically. Different type of diseases like malaria, skin cancer, heat stroke, diarrhoea, allergies, sunburn etc. has increased. Climate change will also widen the gap between poor and rich as poor are more dependent on natural resources with their low adaptive capacity. It also reduces the income of farmer from agriculture. Climate change will affect our farm economy by changing farm profitability, prices, supply, demand, trade and regional comparative advantages. Kumar and Parikh (1998) showed that the loss in net revenue at farm level is estimated to be between 9 and 25 per cent for a 2 to 3.5°C rise in temperature. They calculated that a 2°C rise in mean temperature and a 7 per cent increase in mean precipitation would reduce net revenues by 12-3 per cent for the entire country. The overall costs and risks of climate change are expected to be equivalent to losing at least 5 per cent of global GDP each year, if we do not act now (Stern, 2007). Climate change may force the people to migrate from highly vulnerable to less vulnerable area leading to disequilibrium in population dynamics of social system. Sarkar and Padaria, 2014 developed social vulnerability index toward climate change and reported that the vulnerability index for Himachal Pradesh was 0.82 indicating high level of vulnerability. A little less than one-third (31%) respondents were highly vulnerable and 43 per cent respondents showed medium level of vulnerability. They also reported that high level of vulnerability was a function of different socio-economic (age, income, area, education, communication behavior) and personality dimension (achievement orientation, adaptive behavior, stress, pessimism, fatalism, knowledge and awareness) of respondents.

3. Farmers’ Empowerment: Concept and approaches

Research into the empowerment concept within agricultural systems is limited, but the notion of empowerment is particularly relevant for small-scale farmers in developing countries, as the past fifty years has been a time of marginalization or dis-empowerment for many people. The rise of multinational retailers, seed and fertilizer companies, distributors, and development agencies, and in many cases the policies of governments, have gradually eroded the power of farmers to control the way they run their farms their livelihoods. Empowerment of farmers as a
group entails that members of the farming community gain a voice and their interests are taken seriously as part of the community’s decision-making process. Past experiences indicate that this may not be an easy task. However, it is generally accepted that some form of organization of the farming community is required. Empowerment implies self-determined change. At the heart of empowerment is a process that people undertake by themselves. Central to this process are actions which both build individual and collective assets, and improve the efficiency and fairness of the organisational and institutional context which govern the use of these assets.

3.1. Farmers’ socio-psychological empowerment through collectivization and institutional arrangements

Community based extension model for climate resilient agriculture- an action research at IARI:

Community based extension model was tested and found effective in promotion of climate resilient technology (Zero-tillage, DSR, IPM, cultivation of vegetables on raised beds as well as in low and walk-in-tunnel). With sociometric analysis lines of communication identified and Pusa Chetna Krishi Club formed. Participatory need assessment, reinforcement of the social ties and natural adaptive capacities, community as change agent and sharing of resources are the main features of the model. It led to enhanced scale of adoption of technologies like Direct Seeded Rice, SRI, Zero-tillage in wheat,) Raised bed planting, mulching, IPM, cultivation of vegetables on raised beds as well as in low and walk-in-tunnel, etc.

Establishment of grassroots institutional arrangements like community seed bank and custom hiring centre have propelled the diffusion of improved varieties, zero-till wheat and direct seeded rice cultivation in project area of Mewat and Gurgaon in Haryana

3.2. Empowering farmers with information

There are several sources of information for the farmers. However, informal sources are found more credible and accessible among them. As a result, they continue with conventional knowledge and technologies. The efforts towards climate resilience need prompt information delivery, accessibility and application. The delivery of climate information with features of usability, timeliness and effectiveness is sine-qua-non for enhancing adaptation and resilience in agriculture and ensuring food and livelihood security. Agriculture continues to be the predominant ways of livelihood as about 52 per cent of the workforce pursues it as main occupation. However, the mounting risks related with climatic variability along with the factors of dwindling water resources and rising cost of production have been impediments to endeavours towards sustainable development. The pressing needs of meeting the growing food demand of over 1.2 billion people, overcoming the agrarian distress and poverty alleviation, and promoting inclusive growth in the country necessitates empowering farmers with real time weather information and adaptation technologies. There are gaps in critical areas of information delivery, which includes lack of mechanism with high-fidelity to deliver quality information, lack of contents of weather based advisory, lack of usable climate information products, and lack of dynamic mechanism of two-way dialogue between users and information providers. What matters the most is the lack of linkage among agencies for collating information related to weather, crop technology, market, credit and insurance for appropriate and timely support and advisory.

Prof. M.S. Swaminathan highlighted that climate awareness at the grassroots level could help local communities to manage better the adverse impact of climate change. He also introduced the concept of Local level Climate Risk Managers who can spread both climate and genetic literacy and create awareness about climate change among the people at grassroots level.

Information empowerment with mKRISHI: An action research at IARI: Under the NAIP-GEF Project titled, “Strategies to enhance adaptive capacity to climate change in vulnerable regions”, m-KRISHI, a unique methodology of weather based advisory through specially configured mobile hand set, was started under partnership programme with TCS, Mumbai. It was tested in the
districts of Mewat, Dhar, Ganjam and Raigad of India, which are not only affected by recurrent climate variability induced risks of heat, drought, frost and flood but are also challenged areas in terms of socio-economic vulnerability. The weather information is conveyed in graphics for easy comprehension by the farmers. The graphics help the farmers decode and understand the trend pattern of temperature and rainfall in comparison to normal better than the conventional way of communicating weather information in numerical mean value. Further, the advisories for necessary corrective and adaptive measures with respect to emerging weather scenarios are communicated as text SMS and voice mail so that illiteracy does not become a limiting factor. Besides pushing the information to users’ domain, the farmers are capacitated with mobile to communicate their field queries through pictures, text SMS and voice mail. For managing the information flow among the users, service providers and the subject matter specialists, a concept of expert console has been created. The queries raised are immediately processed with technology back-up by subject matter specialists and advisories are generated and communicated with least time-lag. The advisories for weather based crop planning, pest monitoring and management, use of suitable varieties and appropriate cultivation methods, water management, availability of market to sale produce along with market rates are continuously provided to the farmers.

3.3. Farmers’ knowledge empowerment

To enable effective processes of technology generation and access to technology, smallholders are required to seek out diverse sources of information, evaluate what they receive, and as users be able to adjust and appropriate technologies relevant to their ecosystem and production constraints. Donor agencies (IFAD, Danida, FAO, IDRC and others) have increasingly supported informal adult education approach to farmer learning to ensure farmers the ability to select, test, compare and adapt appropriate technological, service and market options. This approach to farmer empowerment assumes that farmers have a wealth of experience and knowledge, which can be improved by providing them with the basic understanding of the agro-ecological dynamics of their farming environment. Dialogue guides a discovery “learning-by-doing” process by sharpening observation and reasoning abilities. The best known proponent of knowledge empowerment is Farmer Field School (FFS), an innovative approach to farmer learning and farmer organisation. FFS builds on the assumption that empowerment of smallholders through training and education is the basis for the effective development of the agricultural sector. In the Farmer Field School approach a group of farmers with a common interest, e.g. in IPM production, establish themselves. The group follows the developments in the field through the production cycle discuss developments and identified actions to improve productivity or overcome problems. The group is assisted by a facilitator but it is the group that takes the responsibility for the learning. Farmer empowerment is the underlying principle of the FFS approach. The FFS approach empowers the farmer groups by farmers learning that they themselves have the capacity to demand services suiting their needs. Farmer Field Schools have also developed into producer groups with common arrangements for provision of inputs and marketing and sale.

Climate Farm School: an action research at IARI: Based on the concept of FFS, climate farm schools were organized for the benefit of farmers to understand the climatic risks and appropriate technologies for adaptation. Learning about cultivation of vegetables and saving from frost through protected cultivation was promoted among the farmers.

3.4. Farmers’ technological empowerment

The technologies for climate resilience need to be demonstrated with skilling up of farmers to help them apply those technologies. The farmers have to be provided both technical know-how and do-how. Often the communication of principle-knowledge does gain due attention in extension programme. For climate resilience extension, it is of utmost importance to make the
farmers understand the principle knowledge and causal linkage among risks and their management with the technology.

Technology demonstrations were laid out by IARI in 45.2 ha involving 102 farmers for promotion of System of Rice Intensification (SRI), Direct Seeded Rice (DSR) cultivation, and zero-tillage system in wheat in the districts of Gurgaon of Haryana and Bulandsahar, Aligarh and Bareilly districts of Uttar Pradesh. With cultivation of improved IARI paddy variety Pusa 2511 under SRI, the farmers secured an average yield of 53 quintals per ha as against 49.25 quintals per ha under conventional system and earned an additional income of Rs 3768/- per ha. It helped in saving the seed and seed cost by half and saving of irrigation cost by Rs 750-1000 per ha. Demonstrations and farmers’ meet instilled conviction among the paddy growers about SRI. Though the average yield secured was less under Direct Seeded Rice (DSR) cultivation (31.50 quintals per ha) as against 33 quintals per ha under conventional cultivation of variety Pusa 1121; farmers observed saving of Rs 2500- Rs 3750 per ha on cost of cultivation and thus a higher B: C ratio in case of DSR than the conventional system. Saving of about Rs 6000-Rs 9000 per ha on land preparation and the standing crops with healthy plants, better tillers and bold spikes with use of zero-tillage system in wheat, conviction among farmers has been emboldened for future adoption.

With the adoption of zero tillage technology in the Indo-Gangetic plains, the farmers have been able to save on land preparation costs and reduce diesel consumption by 50-60 litres per ha. Pusa Hydrogel, an indigenous product designed and developed to enhance the crop productivity per unit of available water and nutrients, offers opportunity for successful crop cultivation particularly in moisture stress agriculture.

Protected cultivation technologies like low-cost polyhouse for raising off-season nursery and low-cost polyhouse cultivation technology for high-value vegetable crops have been promoted through intensive training and demonstrations. With an investment of Rs. 80-100/m², shade net houses can be raised and used to reduce the temperature and radiation for successful cultivation of crops like green coriander, radish, early cauliflower, early cabbage, and early carrot and for advancing crops like lettuce and broccoli ahead of their normal season of growing for fetching high price from the market.

3.5. Empowering farmers with integration of ITKs

Traditional knowledge of communities which have stood the test of time could provide insight and viable options for climate resilience measures. Thompkins and Adger (2004) has highlighted the importance of community based resource management and social learning to enhance their capacity to adapt to the impacts of future climate change. Padaria (1989) recorded about 38 indigenous practices used by the tribal farmers of Jharkhand for absorption and conservation of rainwater, nutrient and weed management, crop production and plant protection. Their belief system helped in weather forecasting and risk adjustment in crop cultivation. Rautela (2005) observed that during the course of their habitation the indigenous people of Himalayan terrain region through experience, experimentation and accumulated knowledge devised ways of reducing their vulnerability to natural hazards. Studies showed that their understanding was fairly evolved in the areas of earthquake, landslide and drought management and had devised efficient ways of mitigating the effect of natural or climatic changes.

Realizing the importance of Indigenous technical knowledge and farmers’ innovations, several initiatives have been taken up. ICAR completed a NATP Mission Mode Project on collection, documentation and validation of indigenous technical knowledge in agriculture. A published detail of 200 validated ITKs is a significant contribution. Efforts of SRISTI, GIAN, HONEYBEE, are commendable. They have so far documented 1, 60,000 ITKs from 545 districts. However, a vast potential of farmers’ wisdom and talent remain untapped. Traditional food
system has a vital role in health management, Therefore, emphasis of documentation and validation efforts should be broadened to include functional food and value addition.

3.6. Empowering for shift in value-orientation and systems thinking

Values are the guiding forces of human behaviour. For facilitating transition to sustainable agriculture it is imperative to begin from the level of change in value-orientation as well as the perception of individuals. Brown et al. (1987) highlighted that values were the key to the evolution of a sustainable society. For augmentation of sustainable agriculture and resilience, it is imperative to learn to live in communion with nature. Wisdom, values and methods to co-exist with nature are deeply ingrained in traditional agricultural systems. We need to take some leaves out of the treasure of indigenous knowledge and integrate them with modern practices to have sustainability in the process. Documentation, validation, integration and scaling up of indigenous technologies and practices are called for standardization of sustainable agricultural practices.

3.7. Augmentation of systems thinking

Farming has to be viewed in system perspective with adequate focus upon interrelatedness and interdependence of important constituents or elements of the whole system. Generally a rural system is viewed to possess five basic assets: natural capital, social capital, human capital, physical capital and financial capital; which are transformed by processes, institutions and policies to deliver outcomes to the society in form of deliverables for existence and sustenance. A sustainable system is one, which accumulates and increases these bases overtime and one, which depletes its capital base, is called as an unsustainable system. Therefore, for sustainability and resilience to prevail, it is desired that activities are designed and performed in system perspective i.e. taking into consideration the impact and consequences of one activity upon other related activities.

4. Conclusion

Farmer’s individual capabilities are important factors but do not alone lead to development outcomes. These are also dependent upon the conditions present for engaging in production, for accessing services and resources, and for controlling assets. Such conditions are structured by the policies, rules, practices found in social and economic institutions. Empowering farmers is essential so that they could avail these opportunities. The stark realities of climate refugee, farmers’ suicide, starvation casualty, and rural exodus to swelling urban slums for livelihood underline the necessity of measures towards capacity building of farmers.

References


5.01

Adaptability and Profitability of Wheat Variety HD 2967 in Rural Delhi

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Wheat (Triticum aestivum) is an important food grain crop of India and is the second largest producer of wheat in the world, after China, with about 12% share in total world wheat production. It is the main rabi season crop grown in Delhi and the cultivated varieties are susceptible to rust which affect the wheat productivity of the area. A high yielding variety of wheat HD 2967 was developed at Indian Agricultural Research Institute (IARI), New Delhi and released by Central Sub-committee on crops standards and notifications and release of variety for agricultural crops for timely sown cultivation under and irrigated conditions of the North Western Plain Zone (NWPZ) of India in 2011 with an average yield of 50.40 q/ha with yield potential of 66 q/ha. KVK Delhi has planned the demonstrations for replacement of yellow rust susceptible varieties PBW 343 and WH 711 with the wheat variety HD 2967, with or without seed inoculation with biofertilizers Azotobacter and Phosphorus Solubilizing Bacteria (PSB) during 2012-13 and 2013-14. Twenty five and fourteen farmers were selected randomly for demonstrating the technology in the year 2012-13 and 2013-14 respectively. The soil of the demonstrated field was sandy loam with low in nitrogen and medium in phosphorus and potash and the major crop rotation was bajra-wheat and rice-wheat. The crop was sown in first fortnight of November. Wheat variety HD 2967 and biofertilizer technology was popularized through kisan gosthies, field days and training on improved production technologies during both the years. The average yield and economics of demonstration and check plots were calculated. In 2012-13, the highest average yield of variety HD 2967 was observed with biofertilizers at 59.25 q/ha which was 5.46% and 11.54% more as compared to HD 2967 without biofertilizers (56.18 q/ha) and local check variety WH 711 (52.52 q/ha), respectively. The average net return of demonstrated plots under HD 2967 with biofertilizers was Rs. 63179/- and Rs. 58841/- per hectare under HD 2967 without biofertilizers which was 16% and 10.5%, respectively, higher than the local check variety. The same trend was observed during the year 2013-14. The farmers appreciated the wheat variety HD 2967 as it was yielding higher than the other variety used by farmers of the area and adopted the technology of seed inoculation with azotobacter and PSB in wheat.

Keywords: Adaptability, Field trials, HD2967, Rust resistance
Adoption of Improved Maize Production Technology among the Farmers

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The present study was conducted in purposively selected Rajouri district of Jammu and Kashmir state to find out the adoption of improved maize production technologies. There are 9 blocks in Rajouri district, out of which one block namely Rajouri was selected on the basis of maximum area under maize cultivation. From Rajouri block ten villages were selected on the basis of maximum area under maize cultivation. From each selected village 12 tribal and 12 non-tribal maize growers were selected randomly. Thus in all, 240 farmers (120 tribal and 120 non-tribal farmers) were included in the sample of the study. The analysis of information collected by personal interview method revealed that 45.83 percent of farmers had medium level of adoption, whereas 15.42 and 38.75 percent of farmers had high and low level of adoption, respectively about improved maize production technologies. The study further revealed that the extent of adoption of improved maize production technologies by the respondents was high in field preparation (91.87 MPS) followed by sowing time (86.34 MPS) and seed rate (74.27 MPS), whereas it was low in seed treatment (23.74 MPS), plant protection measures (6.04 MPS) and methods of sowing (3.74 MPS). It was further noted that among tribal farmers the extent of adoption was 3.33 to 90.83 percent, while in case of non-tribal farmers, the extent of adoption was 3.74 to 91.87 percent in all the improved maize cultivation practices. It was found that the calculated rank order correlation was statistically non-significant (rs=0.31) at 5 percent level of significance which leads to the conclusion that there was no correlation between the ranks assigned by the tribal and non-tribal farmers with respect to different aspects of maize cultivation. Further, Z value was found highly significant (Z=8.91) at 1 percent level of significance which explicitly divulges that there was a significant difference between tribal and non-tribal farmers about adoption of improved maize production technology.

Keywords: Adoption, Improved maize production technologies, Tribal, Non-tribal.
Advantages of Migration for Upliftment of Rural Livelihood

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Migration is often driven by low incomes, scarcity of natural resources and lack of employment opportunities. Rural migration and its relationship to the rural environment have attracted increasing research interest in recent decades. Rural migration constitutes a key component of human population movement, while rural areas contain most of the world’s natural resources such as land and forests. The benefits of migration for employment, economic growth and poverty reduction can be achieved and its costs minimized if regulated properly. Deliberate attention is needed to improve migration governance and to mainstream migration considerations in national development strategies. Rural-urban migration is selective by access to wealth in terms of income gained by educating children. Rural households that have invested materially in educating their children receive considerable more resources from such migrants where they remit. In fact, such households obtain sustained prosperity by investing in the schooling of their children. For this reason, the migration policies of the Rwandan government should focus on the improvement of education level of the poorest rural livelihood. The importance of livelihood diversification is accentuated by the increasing pressure on land and water resources and the increasingly unfavourable returns to agriculture leading to poverty. Urbanization is relevant to a range of disciplines including geography, sociology, economics, urban planning, and public health. The phenomenon has been closely linked to modernization, industrialization, and the sociological process of rationalization.

Keywords: Migration, Rural livelihood, Livelihood diversification
5.04

Agro-Morphological and Quality Characterization of Potato (Solanum tuberosum L.) Germplasm

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Characterization consists of recording of those characters, which are highly heritable, can be easily seen by the open eyes and are expressed in all environments. Characterization of accessions provides the information on morphological and agronomical aspects of the material which is essential for gene bank management. The present studies were carried out to characterize advance generation potato bulk population and clonal progenies of potato germplasm from IGKV, Raipur, during Rabi 2007-08 and 2008-09. These germplasm were characterized on the basis of anthocyanin pigmentation, plant habit, fruiting behavior, leaf pubescence and tuber peel, shape and depth of eyes. A great amount of variation was recorded for ten agro-morphological and four quality traits while most of clones were found with green stem colour, semi erect and branching growth habit, angular stem cross section, leaves with glabrecent & pubescent abaxial and adaxial leaf pubescence, green with white spot berry colour, white flower colour, non/ rare fruiting behaviour, tubers with rough peel, round shape, whitish cream colour and medium deep eyes. Single plant selection was made from these populations based on different agronomic characteristics and yield potential. These results have an important implication for potato germplasm characterization, improvement, agro-morphological evaluation and conservation.

Keywords: Characterization, Clonal progenies, Germplasm
Agronomical Management and Adaption in Agriculture due to Climate Change

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Agriculture which is the backbone of Indian economy is unquestionably the largest livelihood provider in India with its allied sectors, more so in the vast rural areas along with a significant contribution to the Gross Domestic Product (GDP). To meet the projected growth in human population and per capita food demand, historical increases in agricultural production will have to continue, eventually doubling current production. Climate change poses new challenges to the sustainability of agriculture and it is highly sensitive to climate variations and a changing climate will have subsequent impacts on agriculture in its different forms. The Inter Governmental Panel on Climate Change projects has predicted that atmospheric temperature will rise by 1.8-4.0°C globally by 2100. Therefore, it has become critical to identify and evaluate options for adapting to climate change in coming decades which includes the actions of adjusting practices, processes, and capital in response to the actuality or threat of climate change. For cropping systems, there are many potential ways to alter management to deal with projected climatic and atmospheric changes. The objectives of this paper is to outline the change affecting crops and suggest some management practices with adaption that can help the farmers for sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies.

Keywords: Agriculture, Climate change, Management
Analyzing Farmers’ Vulnerability to Climate Change in Himalayan Ecosystem of India

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The present study was conducted with the objective of assessing vulnerability level of farmers toward climate change in the Himalayan ecosystem of India. A sample of one hundred farmers from Himachal Pradesh was selected. Total twenty nine socio-economic and psychological variables were selected after consultation with the experts to determine the vulnerability level of farmers. Data were collected through personal interview and focused group discussion with farmers with the help of structured schedule. Data were analyzed using statistical techniques like principal component analysis, regression analysis, mean, standard deviation etc. The results of the study revealed that vulnerability level was 0.82 in Himachal Pradesh. Thirty eight per cent respondents in Himachal Pradesh belonged to highly vulnerable group. Majority of the respondents in the state were classified as moderately vulnerable (44%). Multiple linear regression analysis was carried out to identify the predictor variables of vulnerability. The findings revealed that socio-economic variables like land holding, education, income, awareness level about climate change, communication pattern and psychological variables like achievement motivation, adaptive behavior, stress and pessimism were important predictors of vulnerability. It was inferred from the finding that inclusion of socio-economic factors and personality characteristics of farmers is a pre-requisite before formulating any adaptation strategy.

Keywords: Climate change, Vulnerability, Adaptation
5.07

Analyzing the Nutrient Content of Developed Raita Premixes

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The present study entitled “Development and quality evaluation of premixes for raita preparations” was undertaken to develop micro nutrient rich premixes for raita preparations. Different types of processing and combinations were used for the development of raita premixes and overall three types of premixes were developed that is amaranths based raita premixes, carrot leaves based raita premix, knoll-khol leaves based raita premix. To find out the acceptability, raita were prepared by mixing of each premix in curd and served to the panel members for sensory characteristics on nine point hedonic ranking scale. Maximum scores were secured by amaranths based premix A2 for all attributes that is 8.5 colour, 8.3 for each appearance and texture, 8.2 for each aroma and taste. Whereas min. Mean scores were obtained by premix A6 that is 4.5, 4.6, 4.4, 4.2 and 4.3 for colour, appearance, texture, aroma and taste. Similarly, overall acceptability of remaining premixes A1, A3, A4, A6 observe in the range of 4.4 to 5.1. Carrot leaves based premix C2 scored 8.5, 8.3, 8.3, 8.2 and 8.2 and premix C5 scored 8.5, 8.3, 8.0, 8.1 and 8.2 for colour, appearance, texture, aroma and taste respectively and fell in the range of “Liked very much” to “Liked extremely”. Mean acceptability of premixes C1, C3, C4 and C6 observed lower scores and overall acceptability mean scores found in the range of 4.5 to 5.1 and fell in the category of “disliked slightly” to “neither likes nor disliked”. Overall acceptability mean scores for knol-khol leaves based premixes K1, K3,K4 and K6 found in the range of 4.5 to 5.1 and found in the category of “Dislike slightly” to “Neither liked nor disliked”. K2 and K5 secured max. Scores of colour (8.5 and 8.5), appearance (8.3 and 8.4), texture (8.2 and 8.0), aroma (8.1 and 8.3), taste (8.3 and 8.5) and overall acceptability (8.2 and 8.3) liked very much by panel members.

Keywords: Raita premixes, Nutrient contents, Processing
5.08

Appraisal of Bio Efficacy and Selectivity of Herbicides for Weed Control in Tuberose cv. Prajwal

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A field experiment was conducted at the Division of Floriculture and Landscaping, Indian Agricultural Research Institute, New Delhi during 2012-13 to study the bio-efficacy on weeds and selectivity of herbicides on growth, flowering and bulb yield of tuberose cv. Prajwal. Ten different combinations of herbicides, particularly pre-emergence tank-mix herbicides applications treatments were laid out in a randomized block design with three replications. It was observed that all herbicidal treatments significantly reduced the density, fresh and weight of weeds compared to unweeded control. Maximum bulb sprouting (98.15%) and highest plant density (35.33%) were observed with pendimethalin (1 kg/ha) + rice residue (5t/ha). Maximum average plant height (70.50cm), spike length (30.75cm), number of florets (29.56) and number of flowers opened at a time(8.79) were associated with the combination of atrazine (1.0 kg/ha)+ rice residue (5t/ha). Lowest weed fresh (12.52g/m²) and dry weight (5.76g/m²), weed density/m²(37.32) and weed control index (98.15%) were also observed with atrazine (1.0 kg/ha)+rice residue (5t/ha). Maximum bulb yield/m² (268.77) was observed with atrazine (1.0 kg/ha)+ one hand weeding 30 days after planting but atrazine (1.0 kg/ha) +rice residue (5t/ha) was at par with it. However, the effect of herbicides was not significant on bulblet yield/plant, bulb weight and diameter. Thus, the application of atrazine (1.0 kg/ha) + rice residue (5t/ha) resulted in better weed control and higher growth, flowering and bulb yield of tuberose

Keywords: Bulb yield, Cut-flower, Herbicide, Tuberose, Weed.
5.09

Assessing the Performance of Yield Enhancing Technology in Black Gram (Urdbean): A case of Madhya Pradesh

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Pulses are very important for Indian agriculture both in terms of enriching soil health and nutritional security of country’s ever growing population. Pulses being predominantly rainfed crop with multiple constraints and limiting factors in its growing environment, the increase in productivity had remained a major challenge for several decades until 2010. There was no desirable increase in area and productivity of pulses over the years. However, there are number of technological breakthroughs with promise to raise the productivity levels. Chickpea contributes highest (40-50%) of the total pulse production of the country followed by pigeonpea (15-16%), urdbean (10-12%) and lentil (9-10%). Due to the stagnant production, the net availability of pulses came down from 60 gm/day/person in 1951 to 31 gm/day/person in 2008. India is the largest producer and consumer of pulses in the world contributing around 25-28% of the total global production. Cultivation of pulses are least preferred by farmers because of high risk and uncertain returns than cereals. To meet the increased demand of pulses, about 3 million tonnes of pulses are imported by India. Technology Demonstration for Harnessing Pulses Productivity (TDHPP) programme addressed the application of selected technologies related to urdbean (blackgram). Urdbean is an important crop cultivated during kharif, and summer season in Madhya Pradesh. The crop is grown in about 5.51 lakh hectare with annual production of 1.48 lakh tonnes and productivity of 269 kg/ha. Varieties of urdbean cultivator in Madhya Pradesh are: PU-35, PU-31, JU-3, JU-86, LBG-20, TU 9814, Azad-1, RBU-38 and PDU-1. These varieties with technology package were demonstrated at 190 farmers’ fields in an area of 144.49 acres. Overall, there was 43.93 per cent yield gain in the demonstrations (9.60 q/ha) over the farmers’ practice (6.67 q/ha). Besides, incremental net gain was 72 per cent (Rs. 12279 to Rs. 19834). Variety TU 98-14 was the highest yielder (12.5 q/ha) in district Jabalpur and PU-31 lowest (6.15 q/ha) in district Satna. A comparative yield trend indicates yield gain of 172.73 per cent all over the state and 112.39 per cent over national average. The state average is lower than national average and thus, there is vast scope for yield improvement by the appropriate technological interventions and farmers’ capacity building through better knowledge enhancement and information accessibility. Various technological interventions according to the suitability to the different agro ecological situations, climatic and soil conditions can be undertaken to serve the purpose of nutritional and livelihood security of farming community.

Keywords: Blackgram, Technological intervention, TDHPP
5.10

Assessment of Integrated Disease Management Practices in Cauliflower through Farmers Participatory Approach

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Cauliflower (Brassica oleracea L.var.botrytis) is one of the most important winter vegetables in Ghazipur district. Cauliflower suffers from a number of diseases i.e. Alternaria leaf spot, downy mildew, stalk rot, black rot and black leg etc. Black rot (Co. Xanthomonas campestris pv campestris) is one of the most common disease in cauliflower and causes substantial losses in marketable yield. Considering the facts, Krishi Vigyan Kendra Ghazipur conducted on-farm trial to assess the performance of integrated management practices on black rot in cauliflower in two consecutive years 2011-12 and 2012-13. The assessed technology of integrated practices i.e. sanitary precautions, seed treatment with streptocycline @100mg/lit of water + 1 kg seed dissolved for 15 minutes, use of balanced dose of fertilizer (120:60:40::N:P:K) kg/ha, avoid overdose of nitrogen and spray streptocycline @100mg/lit of water + copper oxychloride @ 3gm/lit of water were used. The findings of the experiment revealed that the performance of integrated management technologies were found most effective to control black rot as least number of affected plants/m² as well as least per cent disease incidence and increased average yields i.e. 320q/ha and 317q/ha were recorded by application of integrated management practices in 2011-12 & 2012-13 respectively. The incidence of black rot in cauliflower were recorded 10.50% and 13.30% in demonstrated plot while it was 25.00% and 26.95% in farmer practice during both the crop season. The average marketable yield, 320.00q/ha and 317.36 qt/ha were recorded from the trial in 2011-12 and in 2012-13 respectively. In on farm trial the marketable yield were recorded 32.23 and 31.46 per cent more over farmers practice during both the crop season. The net return Rs. 104200/ha and B:C ratio 3.61 was recorded in 2011-12 and Rs 101978/ha and 3.50 in 2012-13 from demonstrated plot. The maximum yield and net returns under integrated management components is quite encouraging to partner farmers as well as neighboring farmers of cluster villages.

Keywords: IDM, Cauliflower, Participatory approach
### 5.11

**Assessment of Nipping Effect on Growth and Yield of Chickpea (Cicer arietinum L.) by Modified Shear in Jharkhand**

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Chickpea is an important crop in the cropping pattern of rainfed condition, supplying cheap protein diet especially for poor people of Jharkhand. Over the years, however, low yields are more prominent declining acceptability of this crop. Apart from other production enhancement indicators, nipping appeared to be a factor increasing yield and yield contributing parameters. To investigate the appropriate nipping technique an On Farm Trail (OFT) were conducted in two consecutive rabi season 2011-12 and 2012-13 to assess the effect of nipping on growth and yield of chickpea by modified shear at farmers’ field in Godda district of Jharkhand. Nipping the young tender shoots during the early and middle growth phases of chickpea is a normal practice to increase the number of branches and ultimately the yield. Now a days availability of labour is a problem. If the nipping is done manually which is a common practice in the area, the nipping could not be done uniformly and some of the plants are uprooted that decreases the plant population which ultimately decrease the yield. To minimize the above problem a hedge shear was modified in such a way to fulfil the purpose of nipping uniformly with more efficiency. The nipping with the help of modified shear was done at 45 DAS and 55 DAS. Among the parameters studied, number of productive branches per plants, 100-seed weight and yield quintal per hectare appeared statistically significant across nipping methods and time of nipping whereas numbers of grains per pod were found non-significant. Nipping at 45 DAS by modified shear produced average maximum yield (22.08 q/ha) whereas average minimum yield obtained (12.39q/ha) in farmers practice (nipping by hand). The findings of research indicated that nipping by modified shear is a profitable practice for chickpea growers in Jharkhand.

**Keywords:** Nipping, Chickpea, Modified shear
5.12
Case Study of a Contract Farmer

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It has been rightly said by C.S. Lewis, “Hardship often prepare ordinary people for extraordinary destiny”. This is the story of Swarn Lal who lives in Suchetgarh village of R.S.Pura block of Jammu district. Once a ordinary farmer, his life changed completely the moment he joined contract farming. Born in 1965 in Suchetgarh village and from his native place he completed his primary education, and after that he faced certain problem due to the border disturbance. He completed rest of his education from Jammu, and returned to his native place in 1980. The Government of India allotted 32 kanals of land to his family in 1975, and to other farmers of Suchetgarh. Initially, only 6 kanals of land was put under cultivation as the rest of the land was not fit for cultivation. All agricultural tasks were done manually. On 6 kanals of land his father used to cultivate desi-basmati which was used only for household consumption. In 1980 when Swarn Lal started practicing agriculture, he came in contact with Department of Agriculture and with the passage of time his interest towards agriculture deepened. Through his dedication and hard work he made one more acre of land fit for cultivation and there he started cultivating IR-8 rice variety which was introduced by Department of Agriculture, but it was failure. After the failure of IR-8, he cultivated other variety of rice named Ratna on one acre of land and simultaneously he cultivated desi-basmati on 6 kanals of land, which his father used to cultivate initially. He achieved his first success when he sold 12quantils of Ratna variety of shelled rice at the rate of Rs. 2000/quintals. Further, he brought certain modification in agriculture practices such as soaking the seeds in saline water and treating it with Trichoderma before sowing to protect it from certain diseases. In 2011, Sarveshwar Overseas Company introduced contract farming in Suchetgarh and among all the farmers Swarn Lal was the first to adopt contract farming. He harvested bumper productivity of 35q/ha that was highest among all the farmers. He sold 28quantils of produce to the company at the rate of Rs.5500/q. After adopting contract farming his life changed completely. Today he has all the assets like 3 milch animals, 2 televisions, 2 motorbikes and recently he has purchased computer for his children. He sums up his story by saying that farmers should be kept happy as they are heroes of agriculture, and government should work for the betterment of them.

Keywords: Contract farming, Case study
Changes of Techno-Economic Paradigm Vision of Beneficiaries in relation with IWMP

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The present study was conducted in IWMP-6, project of Guna block of Guna district (M.P.). Findings of the study showed that 45.50 percent of respondents belonged to category of medium techno-economic change, where as 23.25 percent belonged to category of high techno-economic change. These techno-economic changes due to watershed development program were found to be associated with education, social participation, farming experience, size of land holding, annual income, socio-economic status, extension contact, sources of information, extension participation, mass media exposure, risk preference, attitude towards watershed programme, adoption of watershed management technologies and knowledge of watershed management technologies. Hence, watershed development should be promoted for bringing visible techno-economic change on sustainable basis.

Keywords: IWMP, Innovativeness, Economic motivation, Techno-economic change, Constraints
Climate Change and its Impact on Agriculture

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Climate change is recognized as a significant man-made global environmental challenges. It is a threat to agriculture as it is weather dependent. Climate change refers to any change in climate over time due to natural variability or as a result of human activity. Changing climate increases intensity of extreme conditions like high and low temperature drought & flooding, acidity and salinity and atmospheric pollutions etc. Extreme climatic conditions have adverse impact on soil fertility as well as on crop productivity. Climate change due to green house gas emission could cause several effects on agriculture production but agriculture sector itself is responsible for global green house gas emission contributing about 25% carbon (due to deforestation) 50% methane (due to rice & livestock production) & 75% nitrous oxide (due to use of nitrogen fertilizers). There are many adaptation options available to counter act projected climate impacts on agriculture. They include use of heat/drought tolerant, salt tolerant crops. The other measures that may be considered are better farm management practices, improved farm technologies and diversification. Sustainable use of resources and land management includes technologies eg. Use of mulching increases water holding capacity, intercropping lead to more diversity within a plot thereby, reduces plots vulnerability different weather impacts, use of drip increases water use efficiency reduces run off and erosion and minimize weed growth, use of clear plastic rain shelters prevents water logging and rain impact damage on fruits. Besides these, grafting of vegetables in cucurbits, aubergine and tomato on the basis of stock & scion compatibility provides the basis for tolerance of these crops to salinity, flooding, drought & low temperature. Enhancing adaptation of temperate production system to changing climate conditions is huge undertaking. Scientific information & consolidated knowledge about these initiatives is mandatory for their effective utilization.

Keywords: Climate change, Soil fertility, Land management, Green house gas emission
5.15

Climate Change: Consequences and Restoration in Agriculture Production

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The study evaluates climate change awareness and perceptions of climate variability among the 80 Extension personnel namely Agriculture development officers, horticulture development officer (ADO and HDO) working in state agriculture department of four districts of Haryana state. Temperature, monsoon, weather forecasting, pollution that causes climate change, green house gases for climatic degradation were considered as parameters for assessing the awareness. A multi-stage sampling technique was used to select 80 Extension personnel across four districts of Haryana, namely, Karnal, Kurukhestra, Rewari and Bhiwani out of which 20 extension personnel were selected from each of four districts for the study. The data were collected through a pre-tested questionnaire specially prepared for the purpose. The study further revealed that among the 80 extension personnel, 43.75 percent of extension personnel were fully aware while 50 percent were aware and remaining 6.25 percent of the officers were not aware about ‘the climate degradation’. Regarding knowledge about monsoon, majority of the respondent (93.75%) were fully aware whereas, (5%) of respondents were aware and remaining (1.25%) were not aware about the ‘monsoon pattern in their area’. Majority of the officers (96.25%) were fully aware, (2.50%) were aware and only (1.25%) were not aware about the ‘weather forecasting services’. Ninety percent officers were fully aware while (6.25%) were aware and remaining (3.75%) were not aware about the ‘burning of crop residue is the main reason of climate pollution’. Majority of respondents (96.25%) were fully aware while, (3.75%) were aware and none of the respondent was not aware about the ‘green house gases’. Majority of respondents (61.25%) were fully aware while, (25%) were aware and only (13.75%) were not aware about the ‘visiting any institute for climate related information’. Factor analysis of age, education, experience, and training attended as having a positive significant effect on understanding climate change. The study also showed that the impact of temperature change, rainfall, moisture, sunshine, CO₂, soil pollution, water pollution, and impact of biodiversity on the different crop stage including crop growth, crop yield, crop quality, crop duration and soil health were negative. The impact of air pollution and impact of wind speed/ duration were less negative on different crop stage. The mitigation management of extension personnel based on technology, management based on natural resource was better while management based on agronomic practices and government policy/facilities were less effective.

Keywords: Awareness, Climate change, Temperature, Pollution, Greenhouse gases, and Healthy environment.
**5.16**

**Conservation Agriculture**

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Conservation agriculture (CA) is based on optimizing yields and profits to achieve a balance of agriculture, economic and environmental benefits. CA methods can improve the efficiency of input, increase farm income, improve or sustain crop yields, and protect and revitalize soil, biodiversity and the natural resource base. Zero tillage (ZT) is the “cornerstone” of CA and can be practiced in both large and small farming for low-disturbance seeding technique for application of seeds and fertilizers directly into the stubble of the previous crop. But when ZT was combined with cover crops and crop rotation, adapted to tropical conditions, and improved herbicides and special equipments, the tremendous benefits of this approach were widely appreciated and it spread faster. Thus three crucial technical principles in CA are: 1. No mechanical soil disturbance (Zero tilling)- direct seeding or planting, 2. Permanent soil covers- particularly with the use of crop residues and cover crops, 3. Judicious choice of crop rotations-multiple cropping, agro-forestry and animal integration. Zero tillage and CA is now applied on more than 95 million ha worldwide, primarily in North and South America. Approximately 47 percent of the zero tillage technology is practiced in South America, 39 percent in US and Canada, 9 percent in Australia and about 3.9 percent in rest of the world, including Europe, Africa and Asia. Understanding the need and benefits of CA, governments of the world were requested in the 4th World Congress on Conservation Agriculture to harmonize their policies in support for the adoption of CA, introduce mechanisms which provide incentives for farmers to change their production system to CA, pursue the case of Conservation Agriculture as the central mechanism for agricultural sector climate change mitigation in the international negotiations for a post Kyoto climate change agreement, include Conservation Agriculture as base concept for the adaptation of agriculture to the challenges of climate change in the National Action Plans for Adaptation, support the UN Food and Agriculture Organization in the endeavour to establish a special programme on Conservation Agriculture to facilitate this process in its member countries.

**Keywords:** Conservation agriculture, Zero tillage
5.17

Constraints Faced by Tribal Dairy Farmers in Following Animal Health Care and Management Practices in Ranchi District (Jharkhand)

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The present study was undertaken purposively in 2012 at Ranchi district of Jharkhand to identify the constraining stresses and prioritize the constraints faced by tribal dairy farmers in adopting improved animal health care and management practices. A total number of 180 tribal dairy farmers were randomly selected as respondents. The tribal respondents having at least one milch animal were considered for the study. Garret ranking was used to prioritize the constraints. The results of the study revealed that “lack of green fodder and scarcity of clean drinking water” in the study area was perceived as the most important constraint, as the health and production of dairy animals are mostly dependent on the feed, so the farmers had less profit. It was followed by “lack of knowledge about disease and improved dairy farming practices”; this constraint severely affected the production and resulted in loss of good quality animals. “Distant location of Veterinary hospital and non availability of staff” was perceived as the third important constraint in maintaining animal health followed by “timely non availability of Veterinary Assistant Surgeon and Mobile Veterinary Unit” ranked as fourth, “high cost of medicine and non availability of medicines in Veterinary Hospitals” ranked as fifth constraint; all these factors further dwindled the interest of the farmers towards acquiring knowledge and help from the Veterinary health Units. “Lack of space for isolation of sick animals” ranked as sixth and “lack of artificial insemination facilities” ranked as the seventh important constraints faced by tribal dairy farmers in the study area. In view of the fact, that, the most important constraint was found as lack of fodder and scarcity of clean drinking water, therefore steps should be taken for cultivation of fodder crops through demonstration of improved varieties and provision of clean water. As lack of knowledge about disease and improved dairy farming practices was found as one of the important constraint so awareness camps and training programmes should be arranged regarding scientific animal health care and management practices.

Keywords: Dairy farmers, Animal health care, Management practices, Tribals
5.18

Constraints in Utilization of Agricultural Technology Information Centre (ATIC) Facilities by Farm Families

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Agricultural Technology Information Centre (ATIC) is a new and innovative transfer of technology mechanism that has been conceived and put into practice since 1998-99 under National Agricultural Technology Project (NATP) sponsored by World Bank and implemented through 40 ICAR Institutes and State Agricultural Universities (SAUs) located in various parts of the country. The Centre provides information on agriculture technologies in addition to providing other inputs like seeds, plant materials, etc. including advisory services through single window system. The ATIC is intended to provide formal management mechanism between the scientists and technology users. Thus, ATIC is functioning as a repository of agricultural information. But as per the critical analysis of research studies, it was found that the approach has not been able to reach majority of the farmers who are spread across the whole country. Besides this, there is a lack of awareness among the farming community with regard to this approach. Hence, an attempt has therefore been made to identify all possible constraints faced by the farm families in utilizing the ATIC facilities. The sample of the study consisted of randomly selected 95 respondents including 80 farmers and 15 farm women from 8 villages of two panchayat samities of Udham Singh Nagar district of Uttarakhand state who were regularly in contact with the ATIC functionaries for last 5 years. Personal interview technique was used for collecting data from the respondents. The outcome of the study divulges that non availability of visual aids such as pamphlet, leaflets, folders etc. related to agriculture (76.84%), unavailability of plant materials and other products like poultry, processed products, livestock species, tools and equipment at the centre (72.63%), low quality of seeds (60.00%), less number of visits of ATIC functionaries to the field (58.94%) and distant location of testing laboratories (55.78%), non availability of need based literature (53.68%) and high cost of publications (49.47%) were some of the major constraints expressed by the respondents while utilizing the ATIC facilities.

Keywords: ATIC, NATP, Constraints, Personal interview techniques
Crop Cafeteria: An Effective Tool for Technology Evaluation and Dissemination among Farming Communities

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Crop cafeteria plays an important role of facilitator in the process of technology transfer among farming communities. It provides practical experiences based on the principle of seeing is believing and face to face views along with KVK’s technocrats for disseminating technical knowhow to the farmers, rural youths and extension functionaries. Krishi Vigyan Kendra Ghazipur has popularized and evaluated the HYVs of wheat, chick pea, mustard, Field pea and barley with recommended production technology among farming communities through crop cafeteria. Four varieties of wheat namely HD 2967, DBW 621, PBW-502 and PBW-550; eighteen varieties of chick pea viz. Pant G-186, CSJD-884, RSG-888, RSG-807, RSG-963, RSG-931, RSG-973, RSGK-6, RSG-896, RSG-945, RSG-991, RSG-902, RSG-895, CSJ-140, RSG-959, RSG-974, CSJK-21 and CSJ-313; five varieties of mustard i.e. Varuna (T-59), Urvashi, NDR-8501, KVSKM-1 and NRCHB-101; three varieties of field pea i.e. KPMR-144-1(Sapna), KPMR-522(Jai), and KPMR-400(Indra); three varieties of barley viz. K-409 (Priti), K-508 (Pragati) and Narendra barley-3 were sown in crop cafeteria at the instructional farm of the KVK, Ghazipur during rabi season 2013-14. Data were recorded on yield characters and it was found that maximum yield of wheat was obtained from PBW 621(55.11 q/ha) followed by HD 2967(52.80 q/ha) PBW-502 (52.25 q/ha) and PBW-550(50.60 q/ha). Results indicated among eighteen HYVs of chickpea that maximum yield was obtained from RSG-807 (25.55 q/ha) followed by RSG-959 (24.80 q/ha), CSJ-140, RSG-902 (24.40 q/ha), RSG-945 (23.75 q/ha), RSG-974, 888, 896 (22.66 q/ha), CSJD-884, RSG-973 (22.25 q/ha), RSGK-6, CSJ-313 (21.80 q/ha), Pant G-186 (21.55 q/ha), RSG-931(21.30 q/ha), RSG-963, 895, CSJK-21 (21.10 q/ha) and RSG-991 (20.88 q/ha) as compared to district average and local varieties. Similarly, maximum yields were recorded in mustard variety NRCHB-101 (25.50 q/ha), field pea variety KPMR-400 (24.88 q/ha) and barley cultivar Narendra barley-3 (37.35 q/ha) as compared to district average and local varieties. Demonstration of high yielding varieties of different crops with latest production technologies in crop cafeteria were found very effective in changing attitude, skills and knowledge of farming communities.

Keywords: Crop cafeteria, Technology evaluation, Technology popularization
5.20

Development of a Test to Measure Knowledge Level of Maize Farmers

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Knowledge is one of the important components of behaviour as such it plays an important role in the covert and overt behaviour of an individual. Knowledge (awareness knowledge-emphasis laid) is the first stage in the innovation-decision process by which a farmer takes decision to either adopt or reject a technology. To measure the knowledge level of maize farmers of Jammu division of J & K state about recommended maize cultivation practices, a knowledge test has been developed that cover process objective of recall and recognition with content area of maize cultivation practices. The term ‘Knowledge’ for the purpose of this test was defined as “Behaviours and test situations which emphasize the remembering either by recognition or recall, of ideas, material, or phenomena”. A preliminary test of fifty three (53) items was initially administered to twenty four (24) maize growers. Difficulty and discrimination indices of test items were calculated. Unlike in most of the cases, these were not used to discard the test items, to avoid the loss of content validity. Therefore, only few items were discarded to ensure content validity of the test. All process objectives are represented in the standardized test. However, difficulty index was used for arranging the test items in increasing order of difficulty to ensure the split of the test into two parallel halves. The reliability of the knowledge test was measured with the help of split-half method and found to be 0.727. The reliability coefficient of the total test was worked out by using Spearman-Brown prophecy formula and found to be 0.841, which indicates that knowledge test is quite reliable. Moreover, the intrinsic validity of the knowledge test was found to be 0.91, which proves that test is valid for measuring the knowledge of maize growers. The final test was consisted of forty four (44) test items which contains four(4) objective type, two(2) close ended, five(5) identification of objects from photographs and thirty three (33) open response items. We propose that for testing the knowledge of farmers about recommended practices of any crop, difficulty and discrimination indices should be used with the utmost care so as not to loose the content validity of the test.

Keywords: Maize growers, Knowledge test, Difficulty and discrimination indices, Reliability and validity.
5.21

Double Cropping Rice Fallows for Food and Nutritional Security of Eastern India

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In South Asia, more than 15 million ha of land is left fallow after rice harvest at the end of the monsoon season. The Rice fallows basically imply to those kharif sown rice lowlands which remain uncropped during rabi (winter) due to various reasons such as lack of irrigation, cultivation of long-duration rice varieties, early withdrawal of monsoon rains leading to soil moisture stress at planting time of winter crops, water logging and excessive moisture at rice harvest, lack of appropriate varieties of winter crops for late planting and socio-economic problems like stray cattle, blue bulls etc. A pilot testing for double cropping was initiated during 2010-11 in two clusters namely Charama (villages Araud, Kotela and Hatkacharama) in Kanker district and Gariyaband (villages Potiya, Amethi, Piperchhedi and Dhamna) in Gariyaband district of Chhattisgarh state, India. The methodology adopted for double cropping of rice falls in the two clusters was (i) identification of problems, prospects and possibilities, (2) awareness and skill development, (3) social problems and motivation, (4) technological interventions for kharif and rabi crops, (5) timely input supply, (6) mechanization, (7) water resource development and efficient utilization, (8) fruit, fodder and fuel plantation, (9) livelihood activities and (10) market linkages. These steps were introduced through pilot project fund and by converging ongoing schemes of agriculture and allied departments of the state in the entire areas of the villages in the two clusters. After introduction of all interventions, the progress was review by involving all the farmers of the villages in two clusters during 2013-14. Irrigated area increased from 3 to 28% in Gariyaband cluster and 9 to 26% in charama cluster due to construction of farm pond, check dam, tank, shallow well, shallow bore and tube wells through convergence. Improved technologies like direct dry line seeding, post emergence herbicide, integrated nutrient management (INM) introduced in rice. The dry direct seeding advanced maturity of rice by 15-20 days (June-September) and 20-30% yield of rice over traditional broadcast biasi method. This leads to more moisture after rice and thereby advanced sowing of rabi crops like chickpea, linseed, lentil, mustard etc. in residual soil moisture. With increased irrigated high tech vegetables were grown by the farmers in sizeable area. The major vegetables adopted by the farmers were ladyfinger, tomato, brinjal, bitter gourd, cauliflower, cabbage and chilli. The cropping intensity increased from 105 to 156% in Gariyaband cluster and 109 to 146% in charama cluster. Thus, it can be concluded that the rice fallow can be cropped with the above suggested methodology and converging the ongoing schemes of agriculture and allied departments of the Government.

Keywords: Rice fallow, Dry line seeding, Double cropping
5.22

Economic Sustainability of Cultivating Wheat under Rain-fed Conditions in Tropical Region of Jammu and Kashmir

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Wheat is one of the major cereal crops in Jammu and Kashmir (J&K) State. Wheat is cultivated in an area of 290,720 hectares with the production of 0.45 million tonnes. In Jammu region, wheat is the prominent crop followed by maize, paddy, pulses, oilseeds, fodder, vegetables and other crops. But, the productivity of wheat is low as compared to average productivity of India. The average annual productivity of wheat crop of India for the period between 2000 and 2012 was 27.86 q/ha, whereas for the same period it was 15.30 q/ha in J&K state. The low productivity can be attributed to lack of adequate irrigation facility as 58 percent of the net area sown is rain fed. The present study was conducted in four districts namely Jammu, Kathua, Samba and Udhampur of Jammu region of J&K state. The results of the study reveals that per hectare yield of wheat is 27.82, 30.63, 30.86 q in Jammu, Samba and Kathua districts which are mostly irrigated. In Udhampur district which is un-irrigated, per hectare yield is 14.13 q/ha. The net income per hectare of wheat is Rs 16,349 in Jammu district (output: input ratio of 1: 1.70) followed by Rs 21,786 per hectare in Samba district (output: input ratio of 1: 1.93) and Rs. 21,880 per ha in Kathua district (output: input ratio of 1:2.03). In case of Udhampur district, which is un-irrigated the net income from wheat is Rs. -3639 per ha (output: input ratio of 1: 0.84). The negative net income from wheat in district Udhampur indicates that cultivating wheat under rain-fed conditions is not even meeting the cultivation cost paid by the farmers from his own pocket. Therefore, research agencies have to develop those wheat varieties that can be grown under rain-fed conditions and have good yield. The extension agencies should also guide the farming community to cultivate those varieties that can tolerate biotic stress and perform better under rain-fed conditions.

Keywords: Wheat, Production, Productivity, Income
Economics of Maize Technology for Stabilizing Productivity under Rainfed Conditions of Jammu & Kashmir

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Maize is the principal crop of Poonch district of Jammu and Kashmir. The whole maize crop has been grown on rainfed area due to which the crop is exposed to high productivity variation. A number of studies already revealed that the climatic variation have high level of impact on the yield of rainfed crops. Being the principal crop of the region, all agencies involved in agricultural development have been trying to increase the productivity of the crop in the region. Front Line Demonstrations is one of the essential mandates of Krishi Vigyan Kendras (Farm Service Centres) for wider transfer of proven agricultural technology on farmers’ fields. Frontline demonstrations on hybrid maize under Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize (ISOPOM) were carried out by Krishi Vigyan Kendra Poonch in the intermediate hills of Jammu & Kashmir in kharif season of the year 2012. A study was conducted to find out the economics of these demonstrations and compared it with that of the local check farms in terms of production efficiency, crop yield index, and B.C ratio etc. Production efficiency and crop yield index of maize crop under demonstrated plots were found to be 131.48 per cent and 105.89 per cent respectively. The average yield of maize was more in demonstrated plots (28.20q/ha±2.95) compared to the local plots (22.05q/ha±4.37). However, the variation in maize productivity under demonstration plots was found to be very less (8.71) compared to productivity under local plots (19.13). An additional net return of Rs. 6707.43 per hectare was realized in case of demonstrated plots compared to local check plots. Thus, for neutralizing climate change and stabilizing productivity of maize under rainfed conditions of Jammu & Kashmir, efforts should be made to increase the adoption of newly developed hybrid varieties along with recommended doses of chemical fertilizers.

Keywords: Front line demonstration, Production efficiency, Crop yield index, Economics, B.C ratio, ISOPOM
5.24

Effect of Application of Rock Phosphate and FYM on Phosphorus Extracted by Different P Methods

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Surface soil samples were collected from the field experiment which is in progress since kharif 2006 at Research Farm, Department of Soil Science, PAU, Ludhiana, to study the influence of application of rock phosphate and FYM on phosphorus extracted by different P methods. Experimental soil was sandy loam in texture, near neutral in pH, non-saline, medium in organic carbon and Olsen P, low in nitrogen and exchangeable K. Fertilizer treatments to paddy were: control (T1), rock phosphate (P₃₀ (RP) T₂), rockphosphate + FYM (T₃), FYM @ 20 t ha⁻¹ (T₄), single superphosphate (T₅ P₃₀ (SSP)), and absolute control (T₆). In absolute control (T₆) treatment, no P was applied to wheat whereas in all other treatments to paddy, 60 kg P₂O₅ ha⁻¹ was applied to wheat crop through single super phosphate. Rock phosphate and FYM were applied to treatment (T₂, T₃ and T₄) before last ploughing whereas in SSP treatment it was applied at the time of puddling. Phosphorus extracted with Olsen, Bray, Morgan and AB-DTPA methods ranged from 9.4 to 35.0, 7.8 to 50.2, 1.4 to 13.7 and 8.7 to 54.0 kg ha⁻¹, respectively. Lowest amount of phosphorus was extracted from P₀ treatment (T₆) and highest amount of P extracted with all the four methods was observed in the plots receiving FYM along with rock phosphate during paddy and single superphosphate during wheat crop (T₃). Correlation co-efficients between P extracted by different methods and paddy yield were worked out. Grain yield had a significant high correlation with P extracted by different methods. Olsen extractable P gave highest correlation (r = 0.981) with grain yield. The correlation of P extracted by other methods with paddy grain yield varied between 0.965 to 0.976. Correlation co-efficients between P extracted by different methods and wheat yield were worked out. Wheat crop parameters and different P extraction methods showed that grain yield significantly correlated with P extracted by all P methods and the value of correlation co-efficient varied between r = 0.867 to 0.940. Highest correlation was observed with Morgan P.

Keywords: Rock phosphate, FYM, Phosphorous extraction
Effect of Balanced Dose of Fertilizer with the help of Available Compost in Maize Crop for Improving Yield (INM) in Hazaribag District of Plateau Region of North Chotanagpur

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The productivity of maize crop is less in the state, because farmers are not applying the fertilizers and adopting recommended agronomical practices. A farm trial was conducted in the farmers field to find out the effect of balance doses of fertilizer on the yield. The treatments selected were; T1 - Farmers practices, T2 - NPK (kg/ha) 60:30:20 + compost 50 q/ha, T3 - NPK (kg/ha) 80:20:20 + compost 50 q/ha. The yield was recorded as 16.43 q/ha in T3 treatment option, as in T1 treatment field yield was low (11.42q/ha). The B:C ratio was also very high in T-3 treatment as compared to T1 (farmers practice) 1.24:1. This technology has been popularize by the Krishi Vigyan Kendra, Hazaribag through FLD, training with the help of ATMA and line Department also.

Keywords: Maize, Productivity, Treatment
Effect of Different Treatments of Growth Regulators on the Pre-harvest Fruit Drop in Mango (*Mangifera indica* L.)

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The present study was conducted at PAU, Regional Research Station, Gurdaspur during the year 2011-12 and 2012-13 with the objective to control the pre-harvest fruit drop in mango. The growth regulators namely NAA, 2, 4-D and GA3 at different doses were sprayed at fruit set stage of mango cultivar Dusehri to reduce the pre-harvest fruit drop along with control treatment (without spray). It was noted that among different spray treatments of growth regulators, the four sprays of 2,4-D (2,4-Dichlorophenoxyacetic acid of sodium salt of horticulture grade) @ 20 ppm at 15 days interval starting at fruit set stage significantly reduced the pre-harvest fruit drop in mango cv. Dusehri than the control treatment.

**Keywords:** Growth regulators, Fruit drop, Mango
5.27

Effect of Lactation Order and Stage of Lactation on Protein and Non-Protein Nitrogen Content in the Milk of Phule Triveni Cow

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A comprehensive study was undertaken to ascertain the chemical properties of milk of a newly evolved genotype named ‘Phule Triveni’. The total N content of Triveni milk ranged from 0.497 to 0.597 per cent and the overall mean for total N was 0.545 per cent. The minimum mean total protein content in the milk was (3.162 per cent) in the 1st stage of lactation that increased with each further stage of lactation reaching the maximum (3.52%) in the 4th stage. The minimum casein (2.623 per cent) and maximum 2.839 per cent was observed in the milk of 1st and 4th stage of lactation, respectively. The minimum whey protein value reported was 0.467% while the maximum was 0.737 per cent.

Keywords: Phule triveni, Protein, Non protein, Lactation order, Stage of lactation
Effect of Sprinkling of Water on the Fruit Drop in Litchi (*Litchi chinensis* Sonn.)

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The present investigation was conducted at PAU, Regional Research Station, Gurdaspur during the years 2012-13 and 2013-14 with the objective to control the fruit drop in litchi. The litchi cultivar *Dehradun* trees were sprayed with water along with recommended irrigation schedule starting from the fruit set stage along with control treatment (no water spray but with recommended irrigation). It was observed that sprinkling of water on the fruit bearing trees of litchi cultivar Dehradun from fruit set to near ripening stage decreased the incidence of fruit cracking and also improved the fruit yield and quality than the trees with no water sprinkling.

**Keywords:** Fruit drop, Litchi, Sprinkling
Effect on Microbiological Quality of Mango Whey Beverage during Storage

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The mango whey beverage pasteurized at 63°C/30 min. followed by addition of sodium benzoate @ 100 ppm and stored at refrigeration temperature (5±1°C) after packing in pouches was remained in good condition for a period of 60 days. Thus this treatment was superior over all the treatments. It was seen that the microbiological spoilage was more at ambient temperature. There was development of off flavour, bitter taste, sweetish sour taste and fungal growth when the product was led to spoilage. The standard plate count, yeast and mould count and coliform count was more at ambient temperature and less for treated samples stored at refrigeration temperature.

**Keywords:** Mango whey beverage, Sodium benzoate, Microbiological spoilage, Yeast and mould, Coli form
5.30

Evaluation of Different Weed Control Methods in Basmati Rice under Sub-mountainous Conditions of Punjab

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A field experiment was conducted at Krishi Vigyan Kendra, Gurdaspur in kharif 2011-12 and 2012-13 to study the effect of different weed control methods in basmati rice. The experiment was laid out in using randomized block design (RBD) having three replications and it comprised of nine treatments namely butachlor 50 EC at the rate of 3 l/ha, Pretilachlor 50 EC at the rate of 1500 ml/ha, Pyrazosulfuron at the rate of 150 g/ha, Oxadiargyl 80 WP at the rate of 112.5 g/ha, Bispyribac at the rate of 250 g/ha, Whip super At the rate of 750 ml/ha, mechanical weeding with conoweeder (15, 30 and 45 days after transplanting (DAT)), hand weeding (15 and 30 DAT) and a weedy check. The data on weed density/ m², dry matter of weeds (g/ m²), yield attributes of basmati and grain yield were recorded at harvest. To assess the impact of different treatments, weed control efficiency was also calculated. Results revealed that all the weed control treatments recorded significant reduction in the density of weeds and biomass of weeds compared with weedy check. However, mechanical weeding with conoweeder was observed to be significantly superior over the application of butachlor for reducing the density of weeds and biomass of weeds with the highest grain yield but at par with other treatments in both the years of study. Highest weed control efficiency was recorded in mechanical weeding with conoweeder closely followed by hand weeding. This study indicated that mechanical weeding with conoweeder was more effective in decreasing weed density and dry weight and increasing basmati yield than two hand weeding. Mechanical weeding and hand weeding resulted in increased rice yield than the application of herbicides.

Keywords: Weed control, Herbicides, Mechanical weeding, Conoweeder
5.31

Evaluation of Fungicides in Bush Bean Cultivars against Major Diseases

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French bean (*Phaseolus vulgaris* L.) is very susceptible to angular leaf spot (*Phaeoisariopsis griseola*) and rust (*Uromyces appendiculatus*) under mid hill conditions of Himachal Pradesh. A field trial was laid out in randomized block design using six bush bean cultivars namely, Falguni, Chandni, Vaishnavi, Kandaghat Selection, Sun Ray and Rajguni. Six fungicides namely, hexaconazole 5% EC (Contaf), difenoconazole 25% EC (Score), propiconazole 25% EC (Tilt), flusilazole 40% EC (Punch), carbendazim 50% WP (Bavistin) and a new chemical trifloxystobin 25% w/w + tebuconazole 50% w/w (Nativo 75 WG) were sprayed on these bean cultivars at the appearance of disease symptoms at an interval of 10-12 days and evaluated for their efficacy against these diseases. In general, all the EBI fungicides were better eradicant than carbendazim and nativo. Propiconazole (17.37%) was found to be the most effective against ALS followed by flusilazole (19.95%) and difenoconazole (24.41%). All the chemicals effectively reduced severity of bean rust as compared to control. Propiconazole was found the most effective with an average disease severity of 7.79% followed by difenoconazole (10.13%) and hexaconazole (10.46%). Falguni was the highest yielder with an average yield of 21.03 kg/plot, followed by Chandani (19.06 kg). Minimum yield was recorded in Sun Ray i.e. 7.78 kg/plot.

**Keywords:** French bean, Cultivars, Angular leaf spot, Bean rust, Chemicals, Yield
Factors Affecting Adoption of Hybrid Rice by the Farmers of Jammu District of Jammu and Kashmir State

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Adoption of agricultural technologies has always been a challenge and depends on the individual development and acceptance towards attaining higher production for social stability. In this context, to achieve higher production, the crop needs to be protected from all the adverse effects of biotic stresses such as insect pests, diseases and weeds wherein, adoption of plant protection measures play an important role. A study was conducted in Jammu district of Jammu and Kashmir State to find the impact of socio-economic factors on adoption of plant protection practices by the rice growing farmers. Multi-stage proportionate sampling technique was employed for selection of villages and selection of farmers. The total sample size of the respondents was 120. Interview schedule was used for collection of the data. The results reveal that distance of village from input shop was the important variable which affected the adoption decision of different rice varieties namely Basmati 370 (p=0.00, R²=32.03), hybrid rice Arize 6444 (p= 0.00, R²=41.90), hybrid PR-71 (p=0.03, R²=15.70) and fertilizer namely urea (p= 0.00, R²=50.60). The study provides empirical feedback to plant protection scientists to reorient the research priorities and in formulating extension activities.

Keywords: Adoption, Rice, Basmati rice, Hybrid rice, Drivers
Food Security of Tribal Farmers through System of Rice Intensification (SRI) Method of Rice Cultivation in Pakur and Sahibganj District of Jharkhand

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Jharkhand is a state in eastern India, where 71 percent of population depends on agriculture. Majority of them belong to small and marginal farmer group. About 28 percent of them belong scheduled tribe category. Rice is the staple food of the rural population which is grown in rainfed condition predominantly by traditional method of cultivation. Due to monocropping of rice in about 85 percent of the cultivable area a condition of food insecurity prevails, particularly among the scheduled tribe people. Keeping in view the above background a project was undertaken to introduce integrated farming system for enhancing sustainable livelihood security in Sahibganj and Pakur Districts of Jharkhand. In each district, three community blocks were selected and in each block, 8 villages were selected for the study. As revealed under one of the interventions of the project, improved varieties of rice were introduced among the farmers. They were also trained to transplant the rice through system of rice intensification (SRI) method. The traditional rice cultivation method of farmers of broadcasting was changed to transplanting along with new varieties which influenced in increase in yield and production. Maximum productivity was reported in case of rice variety Swarna ranging from 20 q/ha to 37 q/ha, and 10 to 24 q/ha for IR-64 In case of upland rice varieties BVD-109 and BVD-110, productivity was raised from 8 q/ha to 14 q/ha. The productivity of var. Swarna through SRI technique went upto 53 q/ha, 22 q/ha for BVD-109 and BVD-110 and 42 q/ha for IR-64 as reported by the farmers. It also increased straw production due to more tillering. In the operational area of the project the average enhancement in income/ha/annum was to the time of Rs. 50,000 due to the introduction of HYV rice + SRI technology. Based on the above results, it can be concluded that change in the traditional farming practices of rice has supported the farmers in achieving food security.

Keywords: Integrated farming system, System of rice intensification, Productivity and food security.
Gender Differentials on Muscular Stress of Male and Female Dairy Workers during Preparing Food for Cattle

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Dairy farming is physically arduous occupation and exposes the dairy workers to various risks factors that have been associated with musculo-skeletal disorders. Further age and sex of dairy workers are the additional contributing risks factors responsible for muscular stress during preparing food for cattle. Hence in this study an attempt has been made to find out the risks factors involved in causing muscular stress during preparing feed for cattle as well as to find out impact of age and sex of dairy workers on muscular stress caused during preparing feed for cattle. Twenty-two females and thirty males of lower age group (30-40 years) and ten males and eight females of higher age group (40-50 years) were selected on the basis of their physical fitness. Physical fitness of the respondents was assessed through Body Mass Index (BMI), blood temperature, blood pressure and heart rate. Study was conducted in three villages of Kalayanpur block (Hirdypur, Ishwarigang and Dharmpur) of Kanpur Nagar (Uttar Pradesh), India. Overall analysis of four stages of preparing food for cattle i.e. onward journey(stage-1),fodder cutting (stage-2), preparing and carrying bundle (stage-3) and chaffing (stage-4) performed by female and male dairy workers of lower and higher age group, elicits that except onward journey, each stage of preparing food for cattle caused considerable muscular stress among dairy workers. Moreover maximum muscular stress was observed during chaffing. It may be because during chaffing a number of risk factors are prevailing as forceful body movements, whole body vibration, sustained bending posture, mechanical stress caused due to handling of chaff machine. Further, during stage-2 (fodder cutting), percentage increase in grip strength whereas in rest of stages, percentage decrease in the grip strength was observed. Percentage increase in grip strength during fodder cutting indicates warm up period of the grip muscle, due to short duration of work whereas percentage decrease in grip strength during preparing and carrying bundle of fodder, chaffing and during complete cycle signifies fatigue of grip muscle due to longer period of work initiating anaerobic oxidation resulting in accumulation of lactic acid and CO2. Percentage increase in grip muscles strength was maximum in males of lower age group and percentage decrease in grip muscles was maximum in females of higher age group. Age and sex have significant impact on grip muscles of dairy workers thus these are the personal risk factors on the part of dairy worker engaged in preparing food for cattle leaving them vulnerable to various musculoskeletal disorders.

Keywords: Age, Sex, Muscular stress, Preparing food for cattle
5.35

Identification of an Indigenous Wheat Landrace as Genetic Resource for Drought and Heat Tolerance

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Inter governmental panel on climate change (IPCC) has predicted increase in drought and heat affected areas under wheat. To combat this challenge, development of heat and drought tolerant wheat genotypes is on priority. Landraces are unexploited genetic resources for various agronomic traits contributing tolerance to abiotic stress. Twenty-one wheat genotypes were evaluated in irrigated timely, rainfed timely and irrigated late field conditions for two years for their response to drought and heat stress. Genotypes differed significantly in their response to thousand grain weight under stress conditions. Stress Susceptibility Index was used to identify drought and heat tolerant genotypes. Nine genotypes were tolerant to drought stress and eleven to heat stress. Six of these genotypes were tolerant to both stresses. SSR and allele specific markers were used to validate the results. Allelic variation for heat tolerance was observed in two genotypes IC36761A and IC41504 with gwm63. Similarly SNP marker for distinguishing drought tolerance in bread wheat was used and bi-allelic variation with this primer was observed in genotypes IC 57586, IC 30276A, IC 36761A and IC 31405B. IC 36761A is tolerant to both stresses and was differentiated using molecular markers also. This genotype can be used for breeding drought and heat tolerant cultivars.

Keywords: Drought stress, Heat stress, Land races, SSR markers, Wheat
Impact Analysis of Technological Interventions on Rapeseed Mustard Promoted through Front Line Demonstrations (FLDs) under Rainfed Conditions in Doda

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Rapeseed mustard crop is majorly grown under constrained production system characterized by rainfed conditions in District Doda of Jammu province. Present investigation was carried out to assess the impact of technological interventions promoted through Front Line Demonstrations (FLDs) on rapeseed mustard by Krishi Vigyan Kendra (KVK), SKUAST-J, Doda in the cluster villages. In all, 149 farmers on whose fields FLDs were laid out on improved varieties of rapeseed mustard, recommended seed rate, application of recommended doses of fertilizer and plant protection measures from rabi 2010-11 to rabi 2013-14 constituted the sample for the present investigation. Extension gap (ExtGp), technology gap (TecGp) and technology index (TecInx) were calculated to assess the impact of demonstrated technological interventions on rapeseed mustard. Besides, client satisfaction index (ClSatInx) was also calculated to find out the perceived degree of the satisfaction of the respondents with the outcome of the FLDs. Study revealed that a significant degree of impact of technological interventions demonstrated through FLDs has been found on the production, productivity and economic aspects of rapeseed mustard. Technology gap (TecGp) in the range of 431-499 Kg ha⁻¹ for rapeseed and 380-640 Kg ha⁻¹ for mustard, extension gap (ExtGp) in the range of 194-254 Kg ha⁻¹ for rapeseed and 107-215 Kg ha⁻¹ for mustard; and technology index (TecInx) in the range of 35.92-42.50 percent for rapeseed and 31.67-53.33 percent for mustard were found. Besides, 61.74 percent of the respondents had high degree of client satisfaction index followed by 24.16 percent having medium client satisfaction index. A fairly high degree of client satisfaction index (ClSatInx) supports the positive psychological impact of the technology demonstrated through FLDs on the farming community. A high degree of technology gap (TecGp) indicates that the interventions demonstrated needs location specific refinements for their desired impact on the production and productivity of rapeseed mustard in the study area. Besides, farmer level trainings for replication of the results of the FLDs to the similar areas have been suggested for promotion of the technologies promoted through FLDs. To minimize the extension gaps, more farmer contact programmes on the rapeseed mustard production technology need to be conducted. Technology index (TecInx) is inversely proportional to the feasibility of technology demonstrated. As such the low value of technology index depicts the feasibility under farmers' condition subject to modifications through continued research.

Keywords: Front Line Demonstration, Technology Gap, Technology Index, Technology Index, Client satisfaction Index, Impact
Impact Assessment of Various Fertilizer Doses and AM Fungi on Optimum Biomass Production of *Jatropha curcas* L. under Alkali Soil Conditions

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*Jatropha curcas* L., belongs to the family Euphorbiaceae, is a multipurpose species with many attributes and considerable potential. In India, about 40 percent of the land area comes under the category of wasteland. The species is attracting people’s attention due to production of bio-diesel and fulfilling future energy requirements. The proper utilization of wastelands for cultivation of energy crop is not clearly understood. A study was carried out at Mainpuri (India) to evaluate plant biomass production performances and changes in physico-chemical properties of wasteland under different AM fungi and fertilizer combinations.. The experiment was laid out in factorial randomized block design with 28 treatments replicated three times. The experimental field was divided into 84 equal size blocks and per block contained nine plants with distance of 4x4 meter. The results show that the supplementation of manure at germination phase had a negative impact on germination. However, the results indicated that manure has a positive impact on the growth rate after germination has initiated. The intensity of watering and temperature has a fundamental impact on germination rate. The *Jatropha* plants supplemented with urea, SSP, FYM, vermicompost, molasses and AM fungi perform better for withstanding in harsh alkali soil conditions than other combinations of treatments at plantation stage. The package for cultivation of *Jatropha curcas* in alkali wasteland, developed during the above experiment, was communicated to the society through organizing training programs.

**Keywords:** *Jatropha curcas* L., Fertilizer combinations, AM fungi, Biomass production, Wasteland reclamation
5.38

Impact of Greenhouse Gases (GHGs) in Agricultural Production and Remedial Measures

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The study was conducted in two districts of Haryana state namely, Hisar and Karnal and a total number of 120 farmers were interviewed. The result predicted that major causes of greenhouse gases were found ‘high use of inorganic farm inputs’ (2.88), ‘intensive tillage practices’ (2.75), ‘mechanization of farm practices’, (2.66), ‘non-adoption of diversified agriculture’ (2.52), ‘non-adoption of crop rotation’ (2.46), and ‘burning of crop residue in field’ (1.95) with their respective weighted mean scores. The study further revealed that very serious losses due to greenhouse gases were found ‘crop benefit ratio decreased’ (1.23), ‘crop damaged due to adverse climatic uncertainty’ (1.07), ‘crop production decreased’ (0.89), ‘sowing season change (0.86), ‘loss in biodiversity’ (0.84), ‘less income from agriculture’ (0.81), ‘soil water holding capacity decreased’ (0.68) based on their ‘Z’ scores. The other serious losses due to emissions of GHGs were ‘deeper level of ground water table’ (0.31) ‘cropping pattern and cropping system changed’ (0.28), ‘high usages of synthetic or inorganic fertilizers’ (0.23), ‘soil fertility decreases’ (0.13), ‘degradation of forests to barren lands’ (0.10), and ‘soil erosion’ (0.07). Results pertaining adoption of remedial measures for sequestration of greenhouse gases for sustainable agriculture were ‘evolution of new crops cultivars’ (2.95), ‘crop diversification’ (2.90), ‘use zero tillage practices’ (2.81) ‘integrated farming system’ (2.79) ‘adapting cultivars against drought, pests, diseases, resistance’ (2.78), ‘soil/water testing for soil status’ (2.77), ‘encouraging of rice varieties that emit less CH₄ (2.73), ‘campaigning for sequestration of GHGs (2.67)’, ‘growing intercrops/mixed cropping to compensate crop failure’, (2.62) and ‘management of natural resources soil, water and biodiversity’ (2.61) considered very effective remedial measures with their mean scores, respectively. The other remedial measures such as ‘adopting soil conservation measures’ (2.57), ‘reduce tillage practices’ (2.56), ‘use Indigenous traditional knowledge (ITK) for crop production’ (2.55), ‘water harvesting management practices’ (2.50), ‘use remote sensing technologies for analysis of vegetation and soil carbon’ (2.48), ‘application of compost/FYM/Green manuring’ (2.47), ‘enhancing the area under agro –forestry and social forestry’ (2.45), and ‘organic farming practices’ (2.42) were perceived as effective remedial measures in sequestration of GHGs.

Keywords: Climate change causes, Losses, Remedial measures, Greenhouse gases and Sustainable agriculture
Impact of Krishi Vigyan Kendra (KVK) Activities in Strengthening Livelihood Security of Resource Poor Farm Families of Jharkhand

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Krishi Vigyan Kendras were established with an aim to reduce the time lag between generation of technologies and its adoption by the farmers through various extension methodologies in the interest of farming community and nation. This study makes a comparison between adoption of various development parameters, i.e. socio-economic, occupational, technological and environmental innovations by marginal and small farm families of adopted villages of HCKVK, Hazaribag of the state of Jharkhand and its surrounding non-adopted villages. It also quantified the gap between adopted and non-adopted villages and observed significant gaps in some important indicators i.e. cropping intensity- 78%, crop diversification- 51%, avenues for agro-employment facilities- 65%, skill development- 72% and reduction in migration- 71%. In the components of environments protection towards sustainable agriculture, the steps taken by the farmers were found to be inadequate.

Keywords: Adoption, Livelihood security
5.40

Impact of Pomegranate Cultivation Technologies on Socio-economic improvement of Pomegranate Growers in Maharashtra

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Horticulture occupies an important place in the agriculture economy of India. The contribution of horticulture is estimated to about 10 percent of the total value of agriculture in the country. India is the largest fruit producing country in the world. Total production in India has been estimated up to 50.09 million tonnes (i.e. 10% of the world production) from 5.04 million hectares of area. India occupies the second position in area i.e., next to Brazil in the world. India is the largest producer of pomegranates in the world, but it has only 7% share of total world exports. Pomegranate (Punica granatum) is high value crop and its entire tree is of great economic importance. The present investigation indicated that 37.14 percent of pomegranate growers belonged to young and old age group. About 94.29 percent of pomegranate growers were literate, while only 5.71 percent of pomegranate growers were illiterate. It was observed that 28.57 percent of the pomegranate growers had small size of land holding. It is indicated that 40 percent of the pomegranate growers had medium farming experience and while 42.86 percent of the pomegranate growers had good irrigation status. It is revealed that 85.71 percent of the pomegranate growers had high adoption index. It was observed that 48.57 percent of the pomegranate growers had high educational change, 62.86 percent had high social participation, all the growers (100%) had high annual spending pattern. It was also observed that 42.86 percent of the pomegranate growers had medium change in income from selected crop, more than half (60%) pomegranate growers had high changes in housing pattern. All the pomegranate growers had low employment status. Study revealed that, 71.43 percent pomegranate growers had high change in occupation, 68.57 percent had high change in assets, and also 71.43 percent growers had high change in monthly thrift habit. 45.71 percent pomegranate growers had no change in area expansion as well as in cropping pattern. It was also observed that 51.43 percent of the pomegranate growers had medium change in land utilization pattern, 74.29 percent pomegranate growers had low changes in yield. This study revealed that, pomegranate cultivation technology had overall medium level (68.57%) of impact on improvement of socio-economic status of pomegranate growers in Maharashtra.

Keywords: Pomegranate, Socio-economic status growers
A field experiment was carried out at Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka to study the influence of stress on the total fruit yield per vine in *Luffa acutangula* during 2012-2014. Ridge gourd (*Luffa acutangula (L.) Roxb.*) is one of the important tender vegetable and having anti-biotic property and nutritive value. Proline is one of the important amino acid which get produced during stress/drought condition in positive direction. The experimental data revealed that the cultivar Arabhavi Local possessed the 66.81 µg.g⁻¹ of fresh weight of leaf of proline content at 45 days after sowing and 55.00 µg.g⁻¹ of fresh weight on 90 days after sowing (DAS). One of the experimental hybrid Arabhavi Local x Gadag Local had 67.75 µg.g⁻¹ of fresh weight of proline at 45 DAS and 58.69 µg.g⁻¹ of fresh weight during 90 DAS. The commercially cultivated variety Naga, had 43.62 µg.g⁻¹ of fresh weight during 45 DAS and 39.49 µg.g⁻¹ of fresh weight at 90 DAS. Production and productivity, the stressed cultivar, Arabhavi Local yield the 1085.82 g fruits per vine. The experimental hybrid, Arabhavi Local x Gadag Local yield the 1581.69 g fruits per vine. The commercial check Naga yield 1088.25 g fruits per vine. The yield comparison revealed that even though presence of drought condition, the cultivar Arabhavi Local and the experimental hybrid Arabhavi Local x Gadag Local are the economic yielders and having the effective Benefit: Cost ratio. Farmers get the same benefit of the yield as commercial variety with the drought condition. For an effective selection, information on the nature of component characters contributing to yield and the part played by the environment in the expression of these plant characters is essential.

**Keywords:** Stressed conditions, Cultivars, Yields
5.42

Impact on Knowledge and Adoption Level of Participants of Farmer Field School Regarding Zero Tillage Wheat Cultivation in District Koderma of Jharkhand

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Farmer field school (FFS) is participatory platform for improving decision-making capacity and stimulating local innovation for sustainable agriculture. FFS offer community-based, non-formal education to groups of 20–25 farmers. FFS is a group-based learning process. The activities involve simple experiments, regular field observations and group analysis. The knowledge gained from these activities enables participants to make their own locally specific decisions about crop management practices. That means the farmers can develop solutions to their own problems and developed as an alternative to the conventional top-down old extension approaches.

The present study was conducted at Jainagar block in Koderma district Jharkhand, India. A total of 60 respondent were selected purposively for these three FFS villages. Whereas 60 non-trainees of these villages were selected randomly for the sample of the study. Therefore, 120 respondents were covered in the sample. The data were collected through a well-structured and pre-tested interview schedule. The majority of respondents had low level of adoption in respect of zero tillage wheat production technology followed by medium and high level of adoption of zero tillage wheat production technology on their field respectively.

Keywords: Farmer Field School, Zero tillage wheat production technology, Adoption of Production Technology
Increasing the Productivity and Profitability of Pulse Crops through Front Line Demonstrations

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Pulses are important for our agricultural production system through biological nitrogen fixation in soil and nutritional security of large number of vegetarians and weaker sections of the society, who could not afford other sources of protein. India produces 17.21 million tons of pulses from an area of 24.78 million hectares which rank India as the largest producer and consumer of pulses in the world. The average productivity of pulses in the country is about 689 kg/ha against the average global productivity of 857kg/ha. Madhya Pradesh is the major pulse growing state in India and the total area under pulses is around 52.07 lakh hectares with a production of 30.29 lakh tons. To boost the production and productivity of pulse crops, Krishi Vigyan Kendra, Sagar are conducting front line demonstration (FLD) on pulse crops. The main objectives of FLD’s on pulses is to demonstrate and popularize the improved package of practices on farmers’ fields for effective transfer of generated technology and make them belief to fill the gap between recommended technology and traditional farming practices. Front line demonstrations were studied in pigeon pea (2011-12 to 2012-13) and urdbean (2010-11, 2012-12) during kharif season and in chickpea (2008-09, 2012-13), and lentil (2009-10, 2011-12 to 2012-13) during rabi season in Sagar district of Vindhyan Pleatue of Madhya Pradesh. Increased yield in demonstration plots ranged between 10.00 to 35.16 per cent with adoption of improved packages as compared to traditional farming practices. Technology gap of different pulse crops under front line demonstration was 3.25 to 8.84q/ha where as extension gap of different pulse crops range was 0.5 to 3.20 q/ha and technology index was varied from 20.05 to 60.71 per cent. Variations in the technology gap and index percentage were observed due to variation in agro-climatic parameters, soil fertility, biotic stresses, and socio-economic status and management practices. This variation can be narrowed down by encouraging the farmers to adopt economical viable technologies for increasing production and productivity of pulse crops.

Keywords: Nitrogen fixation, Productivity, Front line demonstration, Technology gap
Institutional Role on Promotion of Good Agricultural Practices (GAP) and Export of Grapes in Maharashtra

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India has the distinction of achieving the highest productivity in grapes in the world, with an average yield of 30 tonnes (t) ha⁻¹ and approximately, 2.5% (22,000 tonnes) of fresh grapes are exported to the Middle East and European countries. Good Agricultural Practices (GAP) is essential to meet the quality standards of these countries where grapes are exported in large quantity. But awareness about GAP is still low in India. Since table grapes are consumed fresh, food safety issues are even more relevant to it. Hence, dissemination of knowledge about GAP on grapes among the stakeholders including grapes growers, line department professionals, scientists and trader-exporters is essential to maintain food safety standards of international market and exploit the huge export potential of grapes. The objective of this paper is to analyze the institutional roles in promotion of GAP and export of grapes. The locale of the study is Maharashtra state. The institutional roles of the stakeholders of four major institutions namely National Research Centre for Grapes (NRCG), farmers’ cooperative, grower cum exporters and State Department of Agriculture are discussed in details in this paper by following case study method. The stakeholders were interviewed for conducting the research. It was found that these institutes play a significant role in promotion of GAP and export of grapes. The facilitative roles played by the institutions are mentioned in this paper along with related data. The findings will be useful for further studies in this regard to promote GAP and export in the major grapes growing regions of the country.

Keywords: Grapes, Export, GAP, Institutional role
5.45

Integrated Farming System Approaches for Sustainable Livelihood of Small and Marginal Farmers in Western Rajasthan, India

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The present study was carried out in Pali district of Rajasthan to identify the (i) dimensions of intensification of integrated farming system in dry land and rain fed agriculture, and (ii) to identify the intensification of integrated farming system in different districts of Pali. The dimensions of intensification of integrated farming system in dry land and rain fed agriculture on the basis of the impact of technological interventions of KVK CAZRI, Pali between 2008-09 and 2012-13 were analyzed. Four out of seven blocks namely Raipur, Sumerpur, Jaitaran and Sojat having predominant rainfed farming system were selected. In these blocks KVK has made technological interventions for development of integrated intensive farming systems. The objective of the investigation was to assess the profitability of integrated intensive farming systems over the existing farming system approaches. The data were collected and analyzed from twelve locations. Majority of the farm families are small and marginal land holders depending upon diversified farming for their livelihood. The issues of such intensive integrated farming system address rain fed agriculture/farming with integrated watershed approach, cropping system approach, multistoried farming system, livestock cum cropping system, integrated agro forestry system, organic farming system, alternate farming system, integrated fish farming, shifting cultivation system, integrated crop management etc. to combat the effects of climate change issues and challenges in rainfed agriculture with reference to small and marginal farmers to generate sustainable livelihood.

Keywords: Farming system, Sustainable, Livelihood and rainfed agriculture
Integrated Farming System Model in Rainfed Rice Ecosystem of Chhattisgarh

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Uncertainty in production due to fluctuations in rainfall and its distribution, decrease in relative productivity in rainfed lands affect the livelihoods of the poor and marginalized farmers. Integrated farming system model for 1 ha land holding i.e. diversified cropping, livestock and fish with farm pond and shallow dug well, was found most attractive and economical at research farm of Indira Gandhi Krishi Vishwa Vidalaya. Therefore the model was tested on farmers’ field under Bagbahra watershed in three villages namely Kotnpali (replication-I), Birajpali (replication- II) and in Kumharimuda (replication- III). One farmer in each village was selected. Farmers were growing number of crops on field and bunds so we introduced recommended package of practices for different crops. In replication-I, 20, 3 and 8 plants of respectively lemon, ber and guava were grown by the farmers. In replication- II & III respectively 5 and 7 plants of drumstick were grown by the farmers. All the plants were at fruiting stage during study period 2007-08. One horse power pump was used for efficient utilization of pond and dug well water. Usually farmers use to fill the pond from shallow dug well by lifting water during dry season when no watering for crops. This helped in availability of water for longer duration for fish culture. In kemharimuda, water retained round the year in the pond owing to retentive slate soil strata of in pond bed. The cows were local breed whereas goats were graded Janunapari breed. Production of crops was very good by adopting improved package of practices. In addition to crops, fruits were also available to farm families for consumption and selling in market for cash earning. Milk yield was poor due to local breed of cows. Farmers were also getting meat from goats, poultry birds and fish for home consumption as well as for cash earning. Gross and net returns were quite attractive from all the enterprises. The gross returns were Rs. 83098-107384 annually whereas net returns were Rs. 65307-74558 annually. The higher returns itself show that the model is economically viable. Since farmers themselves adopting the models hence the model is socially acceptable. The farmer may do some modification in the model for social acceptability looking to caste category. To compare the model with the traditional farming system a survey was conducted in the same villages i.e. Kotanpali, Birajpali and Kumharimuda block Bagbahra district Mahasamund (C.G.) during 2007-08 with objective to find out the data about area allotted to different crops, productivity of crops and cost of cultivation of different crops. Three categories of farmers i.e. 0.40, 0.80 and 1.0 ha land holding were purposely selected. Under each category, twenty one farmers were selected in the three villages (seven in each village) for personnel interview. Average family size of the selected respondents was six members per family, in which 2-4 were the working members. The farmer possessing 0.40, 0.80 and 1.0 ha land earned respectively Rs. 30730, 34336 and 36837 gross returns annually. Net return of Rs. 20882, 21988 and 22509 annually was obtained by the farmer possessing respectively 0.40, 0.80 and 1.0 ha land. Result clearly indicate that the Integrated Farming System model including crops, vegetables, fruit, livestock and water harvesting structure gives higher productivity, resource utilization, recycling of locally available resource, farmers income and employment as compare to the traditional farming system in rainfed rice ecosystem of Chhattisgarh.

Keywords: IFS, Rainfed
IPM Approach for Healthy Intensification of Rice Crop

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Rice is the staple food of at least half of the world’s population and is grown in approximately 148 million ha of land globally. Nearly 90 per cent of this area falls in the Asian region. Achieving high rice yields is constrained by the losses caused by insect pests. With reduced land availability and increased demand for food production, rice cultivation is being intensified through higher fertilizer inputs and cropping. Such intensifications may in turn increase pest intensities and demand for more pesticides. Pesticide application by most of the rice farmers in Asia is influenced by misperceptions and over estimations of damages. Thus, great majority of Integrated Pest Management (IPM) programs in the tropics require an “integrated” approach. Integrated pest management (IPM) is a broad ecological approach for pest management which employs all available skills, techniques and practices such as cultural, genetic, mechanical and biological methods including application of chemical pesticides as a last resort in a harmonious and compatible manner with a view to suppress pest population below economic injury level, based on regular crop pest surveillance and monitoring. It is a dynamic approach and process which varies from area to area, time to time, crop to crop and pest to pest etc., and aims at minimizing crop losses with due consideration to human and animal health besides safety to environment. Now IPM approach has been globally accepted for achieving sustainability in agriculture and has been enshrined as the important principal of plant protection in the overall crop protection programme under the national agricultural policy of the government of India since 1980. The present study deals with importance of IPM approach in healthy intensification of rice crop in different villages of Haryana district.

Keywords: Rice, Integrated pest management practices, High yield
5.48

Knowledge and Adoption Behavior of Eco-friendly Management Practices among the Farmers

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The study was carried out in Hoshangabad district of Madhya Pradesh. A total of 120 farmers were the sample of the study. The low knowledge level was found regarding eco-friendly management practices among the farmers regarding vegetable production technology. Vegetable growers have more knowledge about summer deep ploughing (Rank I), method of application of the inorganic fertilizer (Rank II), but regarding the practices like, conservation and encouraging of predators, conservation and encouraging of parasitic wasps had poor knowledge about the eco-friendly management practices. In cash of adoption, the maximum per cent of the vegetable growers had low adoption regarding eco-friendly management practices. The maximum percentage of vegetable growers had poor adoption regarding concentration seed kernel extract and use of light traps.

Keywords: Adoption behavior, Eco-friendly management, Vegetable growers
Management of Cutworm in Rajmash in the Temperate Region of Poonch

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An on field trial (OFT) was conducted on the farmer’s field in the Mandi block of Poonch district for the management of cutworm in rajmash. Three treatments (T1: Farmers practice (no chemical), T2: Seed treatment with Chloropyrophos @ 2ml/kg and T3: Soil application of Carbofuran @ 20 kg/ha) were applied at three different locations in three villages. It was observed from the data recorded that the treatment (T3) gave the best results with the minimum 9 per cent incidence of cutworm and high yield of 37 qt/ha with highest cost benefit ratio of 3.70 followed by the treatment (T2) with 13 per cent incidence of cutworm and a yield of 33 qt/ha and cost benefit ratio of 3.61, whereas, maximum 38 per cent incidence of cutworm and minimum yield of 29 qt/ha and lowest cost benefit ratio of 2.16 was recorded from treatment (T1). It was concluded from the data recorded that Soil application of Carbofuran @ 20 kg/ha was the most effective treatment and it was recommended to the farmers for the management of cutworm in rajmash.

Keywords: On field trial, Cutworm, Treatments, Rajmash, Cost benefit ratio
Management of Potato Black Scurf Disease for Better Returns to Growers

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In 2012-13, India produced 42.60 metric tonnes (mt) of potato from 1.86 million ha area. In potato production, Uttar Pradesh rank first followed by West Bengal, and contributes 31.82 percent and 25.5 percent of total potato production in the country. Potato crop is susceptible to many pathogens, some of which are wide spread and others are locally situated. *Rhizoctonia solani*, Kuhn is one of those destructive plant pathogens attacking a broad variety of hosts under diverse environmental conditions in every part of the world. The fungus causes damping off of seedlings, root rot and stem cankers of growing plant and black scurf of potato tubers. In potato, it reduces stand, yield quality and marketability of the produce. The growers fetch lesser price of affected tubers and their storability is also reduced. Attempts have been made to minimize the loss of tubers due to black scurf disease. Growing of potato varieties having resistance against black scurf is one approach which may reduce the loss of tuber quality which will leads to better returns to the growers. Studies pertaining to screening of potato varieties clearly revealed the differential reaction of potato varieties with black scurf causing pathogen *R. solani* under artificial and natural conditions of disease development. In our studies, it was also observed that in case of green top harvesting, there was no effect of date of harvesting on disease index. It might be due to the fact that their attachment to the whole plants enabled to resist the invasion by pathogen. Thus, delayed harvesting of potato employing green top harvesting method, curing of tubers in dry sand will give advantage of increased yield in addition to lesser development of disease. This fact can be utilized for integrated management of black scurf of potato. Biological control is another attractive and promising approach to control plant diseases, specially the soil-borne ones. This approach can be especially attractive for the management of *R. solani*, because it is unspecialized pathogen. Among the fungal antagonist species, *Trichoderma* and *Gliocladium* and bacterial antagonist *Pseudomonas* have received maximum attention in the past. Our results suggest that *T. harzianum* and *P. fluorescens* are potential antagonists against *R. solani*.

**Keywords:** Potato, Black scurf disease, Management
Management of Yellow Rust in Farmers Participatory Mode: A Case Study

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Yellow rust also known as stripe rust caused by *Puccinia striformis* is one of the most serious diseases of wheat, threatening its cultivation in the north western parts of India. The disease results in losses of more than 50%, if it appears at early growth stages of the crop. The pathogen survives on self sown or cultivated wheat plants grown during summer in higher hills. Spores of pathogen, with the help of air currents, become airborne and cause infection of wheat crop in the foot hills and then spreads in plains of Jammu & Kathua districts. The disease first appears as small foci of infection scattered in the field, which can be easily recognized by appearance of elongated yellow powdery stripes on the leaves. When touched with hand, dusty powder consisting of spores adheres to the fingers. During the year 2011-12, yellow rust appeared in epidemic form in Jammu & Kathua district. Losses ranging from 10 to 15 q/ha were recorded in the district. This was primarily due to high frequency of occurrence of new race of the rust pathogen 78S84. As a result, the popular wheat cultivar PBW-343 became susceptible to yellow rust. The KVK Kathua and department of agriculture formulated the strategy to contain the disease through their joint efforts by providing awareness to the farmers by first monitoring the disease, on farm trials and demonstrations were conducted to further sensitize the farmers regarding management of yellow rust. They were further advised by KVK, Kathua to abandon the cultivation of susceptible wheat cultivars like PBW-343 and PBW-550 to reduce the initial build-up of inoculum of the pathogen. The farmers were advised to cultivate rust resistant cultivars like PBW-621, DPW-62150 and HD-2967. Farmers were also advised to spray propiconazole @ 0.1% using 500 liters of spray solution per ha to save their crops and reduce losses.

**Keywords:** Yellow rust, Pathogen 78584, KVK Kathua, Rust resistant cultivars
Organic Agriculture is Creating Confusion among People

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The term organic does not refer to a health clam or a food group. Organic, simply defines a way of growing, processing and handling food. But there is a lot of confusion among people and even some experts they think that organic agricultural is safe. Vomiting, diarrhea, abdominal pain, fever chills, headache, blurred vision, weakness, dizziness etc are few of diseases that are caused by harmful bacteria, parasites and viruses present in fruits and vegetables. Farmers use so many things under organic agricultural that no doubt makes soil fertile but at the same time makes fruits and vegetables infectious because they come in contact with manure etc. Here it does not end half of natural chemicals used as organic pesticides are carcinogenic. Recently Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir organized 3rd Agricultural Sciences Congress and the theme was “Organic Agriculture Prospects in J&K”. Most of researchers agree that organic agricultural is safe. The aim of the present paper is to clear confusion about organic agricultural to some extent but there is need to inform people on a large scale and that needs co-operation of farmers, growers, NGOs, institutions, and most importantly government.

Keywords: Organic agricultural, Confusion, Infection, Co-operation
Organic Cultivation: Farmers’ Perception towards Prospects and Constraints

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The present study was undertaken in two purposively selected districts, namely Sonipat and Hisar of Haryana state. A total no. of one hundred twenty farmers were selected and interviewed to study the prospects of organic farming and to assess the constraints in the adoption of organic farming. The present study has showed that more than four third of growers of organic farming perceived it as more bright level of prospects. However, few of them perceived it as somewhat bright level prospect. Thus, to promote organic farming, government should make policies and plan training and educational modules for farmers, to ensure balanced agricultural development by adopting the technique and practices of organic farming and to improve market infrastructure for organic foods and the availability of quality bio-pesticides to farmers can help in adoption of organic farming. The finding regarding farmers’ perception about input constraints in adoption of organic farming shows that lack of knowledge and demand of bio pesticides (90.8%) was ranked first. The results regarding perception about technical constraints in adopting of organic farming reveals that non-availability of improved organic production technology and lack of knowledge about weed management practices in organic farming were ranked first (94.2 percent). Hundred percent of the respondents had perceived it as most serious constraint in organic farming, the results shows that transfer of technology constraints in adoption of organic farming namely, data bank not available about consumers and demand was ranked first with highest weight mean score (2.98), moreover 98.3 percent of the farmers had perceived it as most serious constraint in organic farming and the finding regarding farmers’ perception of certification constraints in organic farming showed that complicated process of organic certification was ranked first constraint (67.5 percent).

Keywords: Farmers’ perception organic farming, Prospects, Constraints and Sustainability.
Perceptions of Paddy Farmers towards Sustainable Agricultural Technologies in Upper Krishna Project Area of Karnataka

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Sustainable agriculture has been defined and described in many ways. Despite the diversity in conceptualizing sustainable agriculture, there is a consensus on three basic dimensions of the concept, namely, ecological soundness, economically viable and socially acceptable. The dimensions of ecological soundness refer to the preservation and improvement of the natural environment. Environmental issues emerge from the human use of natural resources. Farmer’s decisions to adopt a new agricultural technology depend on complex factors. One of the factors is farmer’s perception. The primary purpose of this study was to assess in quantitative terms farmer’s perceptions of sustainable agriculture and to determine how these factors influence different socio-economic characteristics and information-seeking behavior of the farmers. The study was conducted in Upper Krishna Project area of Yadgir district of Karnataka. The random sampling method was used for selecting 10 villages constituting 200 farmers were selected for the study. The farmers rated each of the 24 selected sustainable agricultural practices for importance on a 5-point continuum, and the total of these ratings formed the sustainable agriculture perception index. The index score was calculated for each farmer and was treated as the dependent variable in the stepwise regression analysis procedure. The independent variables were such socio-economic characteristics as the farming system, the total and irrigated area of the farmer, member of a cooperative society, participation in social institutions, age, education, income of the farmer and components of mass media utilization behaviour (newspapers, radio, and television). The results of the study showed that the higher the socioeconomic status (more frequent contact with extension services, higher education, ownership of land, etc.) and the greater the access to information, the greater the perceived importance of sustainable agricultural practices. It is concluded that if policy-makers and extension organizations concentrate on these factors, they are more likely to succeed in making farmers more favorably disposed toward sustainable agriculture.

Keywords: Perceptions, Rice farmers, Sustainable agricultural, Upper Krishna Project
Scouting Mechanization Gaps in Green Gram Cultivation in Odisha and Addressing through Institutional Convergence

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Indian agriculture is moving on the right path for transformation from subsistence to commercial agriculture. But without adequate mechanization, such mission is not feasible. Much advancement in farming techniques and tools have been manifested since agriculture’s beginnings thousands years ago. The increase in the use of human and bullock labour and rising wage rates and cost of up-keep of bullock further made the case of farm mechanization still stronger. Pulse crops are very important in Indian situation due to more vegetarian population leading to the rising demand and imports from foreign countries. In Odisha, green gram (Vigna radiata) is cultivated mostly in rabi season (70%), and only 30 percent coverage in kharif. This study was conducted in five districts of Odisha namely Angul, Dhenkanal, Jagatsinghpur, Mayurbhanj and Koraput. Mechanization gap in green gram cultivation has been estimated considering the operations used by the farmers for its cultivation. Further, the existing implements for the mechanization and its further requirement was calculated giving the percentage mechanization gap to the green gram cultivation. Analyzed data for Angul district shows that for field preparation, presently bullock drawn desi plough (0.025 ha/hr) and tractor drawn cultivator (0.20 ha/hr) which requires much time. The same area proposed for the mechanization by tractor drawn rotavator shows mechanization of 56.3 percent, though if mechanization occurs, the savings of labour, time and cost is 93.75%, 93.80% and 48.70 percent, respectively. Like-wise in sowing, manual broadcasting was practiced (0.40 ha/hr). Mechanized operation using zero till drill for sowing showed 100 percent mechanization gap. Further, weeding/intercultural operation, most of the farmers were doing manually, the operation being mechanized by power weeder (0.40 ha/hr) shows mechanization gap of 92.10 percent and if mechanization occurs, the savings of labour, time and cost is 98.75%, 98.80% and 92.2 percent, respectively. Similar results were observed in threshing, cleaning and dal making using pulse thresher, power grain cleaner and mini dal mill showed mechanization gap of 100 percent along with the savings after mechanization of labour is 84.0, 90.0 and 97.50 percent; time saving is 92.0, 95.0 and 98.80 percent and cost saving 75.0, 84.4 and 96.10 percent. Similar trend were observed for other districts in the operations of green gram cultivation. Hence, there is need for the policy intervention for promoting the mechanization in green gram cultivation for enhancing its productivity vis-à-vis its acreage in the state.

Keywords: Mechanization, Green gram, Mechanization gap
Silage as a Method of Forage Conservation

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India being a tropical monsoon dependent country with unimodal rainy season, surplus green herbage available at the flush growth periods during kharif as well as rabi (in irrigated areas). It is desirable that this is preserved/conserved with minimum loss of nutrients. This can be done as hay or silage or artificial dehydration for feeding to livestock during lean periods when availability of fresh forage is meager or negligible (mid October-mid December and mid April-June). Ensilage has many advantages over the other methods of forage conservation. There is a high-energy output in high temperature dehydration. It is fermented, high-moisture stored fodder which can be fed to ruminants. For silage, late dough stage is preferred in case of cereal fodders whereas grass should be harvested at early flowering or seeding stage. The feed value of silage is a combination of its intake potential and nutritive value, which is determined primarily by digestibility. Silage quality is determined mainly by the odour, physical state, pH, ammonical nitrogen, volatile acids and lactic acid. For desirable fermentation, the forage should be rich in water soluble sugar (more than 5% on dry-matter basis). The fodder of choice for silage making are Maize, oats, sorghum and grasses like stylo, setaria etc. A good-quality silage should have the following characteristics: pH 4.5-5.0, ammonical nitrogen of total N – less than 10% of total N, butyric acid- less than 0.2%, lactic acid -3 to 12%, and volatile acids, alcohol should be low. Silage is preferred by livestock to hay as it is more palatable and of higher food value. High quality rye grass silage has an estimated mean ME close to 11MJ/kg DM, and sustained milk production of 1284 kg/tonne silageDM or 1.28 kg/kg silage DM. Higher milk production levels can be sustained when cows are fed mixed silage/ concentrate diets. To produce high feed value silage adequate quantities of Phosphorous and Potassium should be applied to maintain soil fertility and to meet crop requirements. Inadequate quantities of phosphorous and potassium will reduce herbage yield and reduce the response to fertilizer N. There is not benefit to increasing herbage dry matter concentration above 25%. Wilting to a higher dry matter concentration may result in aerobic instability problems at the time of feed out and prolonged wilting reduces digestibility. Additives are an aid, not a remedy for poor management. Choose an additive based on it proven ability to increase animal performance. Proven bacterial inoculants under a wide range of ensiling conditions or formic acid under a difficult ensiling conditions have been shown to increase animal performance.

Keywords: Silage, Forage conservation, Artificial dehydration
5.57

Skill Development and Enhanced Livelihood Opportunities for Rural Women through Trainings by Krishi Vigyan Kendra, Jammu, J&K

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Krishi Vigyan Kendras (KVKs) proved to be one of the knowledge hubs for farming community of rural India through trainings, on farm trials, frontline demonstrations and extension activities as a mandate in improving the knowledge. KVK imparts need based and skill oriented trainings to enhance the skills of farmers/ farm women/rural youth in agriculture and allied operations. KVK have played a crucial role in transfer of technology and thereby enhancing production and generating part time employment for farming community. In the present study efforts has been made to assess different aspects of home science training courses and its impact to enhance livelihood opportunities for the rural women in the year 2013. A total of 200 women who got hands on experience during the training were interviewed and the data collected was statistically analyzed through frequency and percentages. The study revealed that majority of the respondents (86%) opined that the training programme was fully based on their needs and problems followed by 14% responding that it was partially need based. About 82.5% of the respondents felt that the training courses were balanced as per the proportion of theory and practical are concerned. Regarding the benefit realized by the respondents from the training programmes, a good number of respondents 91.5% felt that the trainings were domestically useful and 52% of them realized the part time monetary benefit from the training as some of them are making designer cushions and tie and dye dupattas at home level on demand for sale and also for personal use rather than purchase from the open market which also contribute in saving the income. Most of the respondents (79%) expressed willingness to have such type of training programmes in future also. The training provided by KVK plays an important role in developing the skills of the rural women and also benefitting for generation of additional income to some extent. Learning these skill development activities doesn’t mean to develop an enterprise but its effective use in domestic purpose also saves the family income.

Keywords: Skill development, Rural women, Vocational training, Livelihood opportunities
Standarization of Sowing Time and Seed Rate of Buckwheat in Cold Temperate Gurez Valley of District Bandipora (J&K)

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Buckwheat is a plant of hilly temperate regions and cultivated on marginal land under rain-fed conditions where limited crops grow. It is one of the quickest growing green manure crops, taking only 4–5 weeks from seeding to flowering. Keeping in view the nutritional quality of its grain and early maturity and suitability of the crop for marginal and degraded lands, this annual grain has much potential for use in sustainable cropping systems. However due to the non availability of package of practices, the production and productivity of buckwheat is very low. In this study, an attempt was made to standardize the seed rate and time of sowing of buckwheat in cold temperate Gurez valley and it was seen that among the three dates of sowing (1\textsuperscript{st}, 16\textsuperscript{th} and 1\textsuperscript{st} July) 16\textsuperscript{th} June date of sowing was found to be the best to increase the grain yields. Among the seed rates of 45, 60, 75 and 90 kg ha\textsuperscript{-1}, seed rate of 75 kg ha\textsuperscript{-1} was found to be superior to other seed rates in enhancing grain yields on all the three dates of sowing however highest grain yield was observed on 16\textsuperscript{th} of June sowing date with seed rate of 75 kg ha\textsuperscript{-1}.

Keywords: Buckwheat, Rain-fed, Cultivation practices
5.59

Status and Problems of Paddy Straw Management in West Bengal

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India produced a record of 257.4 million tonnes of food grains in 2011-12; a significant step towards rendering the nation self-sufficient and food-secured. Paddy being the major cereal crop of India covers an area of more than 42.8 million hectares with a production of 104.32 million tonnes in 2011-2012. West Bengal is the highest rice producing state in India with the estimated total production of rice in the year 2012-2013 as 153.72 Lakh metric tonnes. In India more than 100 million tonnes of paddy straw is generated annually and 35.93 million tonnes of paddy straw is solely generated in West Bengal. Open field burning is the most common paddy straw disposal practice in North India. Burning of paddy straw has negative effects including local air pollution, increase in black carbon and contributions to regional and global climate change. On the contrary, there is no burning of paddy straw in West Bengal and it is used for various other purposes. This study elucidated the status, awareness and problems faced by the farmers regarding various methods of paddy straw management in West Bengal. The result revealed that 100 percent farmers were aware about the use of paddy straw as animal feed, cooking and packing purpose whereas very few farmers were aware about its use as material for paper mill industry, ethanol production, etc. The results also revealed various problems faced by the farmers such as non-availability of suitable straw management technologies, high cost involved in removing straw from the field, non-availability of labour etc. Henceforth, it is important to create awareness among the farming community about various profitable alternatives of paddy straw management and formulate strategies to solve farmers’ problems regarding the same.

Keywords: Status, Awareness, Alternatives, Problems, Paddy straw management
Stressed Agriculture: Climate Change

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Agriculture and climate change are inextricably linked. Climate change, population growth, increasing water demand, over exploitation of natural resources and environmental degradation has significantly degraded the world’s freshwater resources. Agriculture is part of the climate change problem contributing about 13.5 percent of annual greenhouse gas emissions (with forestry contributing an additional 19 percent), compared to 13.1 percent from transportation. Agriculture is, however, also part of the solution, offering promising opportunities for mitigating emissions through carbon sequestration, soil and land use management and biomass production. Climate change threatens agricultural production through higher and more variable temperatures, changes in precipitation patterns and increased occurrences of extreme events like droughts and floods. Norman Borlaug Nobel Peace Prize Laureate 1970 stated, ‘Humankind in the 21st century will need to bring about a Blue Revolution to complement the Asian Green Revolution of the 20th century. New science and technology must lead the way.’ A key challenge for decision makers, policy makers, and development partners is to understand the strategies adopted by farmers and other stakeholders in their efforts to address climate change-induced water stress. Smallholder farmers are the most vulnerable to climate change, and they have no alternative but to adapt their livelihood systems to changing climatic conditions. Fortunately, several practical options for adaptation exist. All efforts should therefore be made to refine, augment and deploy them appropriately and urgently. Water resources management strategy is thus key to ensuring that agricultural production can withstand the stresses caused by climate change. Agricultural water management (AWM) is the one of the ‘best bets’ for adapting agricultural production to climate change and variability. The current poor performance in terms of water-use efficiency, plus competition over diminishing water resources, suggests the need for investment in better water management systems. Also, where access to irrigation is limited, smallholder farmers need to develop water conservation and rainwater harvesting systems to maximize on-farm water management. Rainwater harvesting systems include two broad categories: In-situ soil moisture conservation-technologies that increase rainwater infiltration and storage in the soil for crop use. Run-off storage for supplemental irrigation using storage structures such as farm ponds, earth dams, water pans and underground tanks.

Keywords: Stressed agriculture, Climate change
Studies on Changes in Chemical Composition of Mango Whey Beverage during Storage

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Studies on changes in chemical composition of mango whey beverage during storage” revealed that the mango whey beverage pasteurized at 63°C for 30 min. followed by addition of sodium benzoate (0.1 per cent) stored at 5±1°C was only sensorily acceptable. It had acidity, total sugar, reducing sugar, non-reducing sugar 0.80, 14.60, 4.39, 10.22 per cent and pH 4.14 respectively, when tested on 60th day. From the study, it was revealed that there was reduction in pH, total sugar and non-reducing sugar of the product during the storage period, while an increasing trend was noted in acidity and reducing sugar content of the product.

Keywords: Mango whey beverage, Reducing sugar, Non-reducing sugar.
Studies on Preservation of Mango Whey Beverage

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The Mango Whey beverage having 0.75 per cent acidity, 10 per cent pulp and 14 per cent sugar was prepared. The research was conducted in two phases. In first phase, preliminary trials were taken to assess suitability of different preservative treatments to be given to Mango whey beverage. In second phase most acceptable treatments were given. The mango whey beverage pasteurized at 63°C for 30 minute added with sodium benzoate (0.1 per cent) and stored at refrigeration temperature (5±1°C) after packing in pouches was superior and statistically significant over all other treatments and had maximum shelf of 60 days. It’s sensory score was highest and overall acceptability score was 7.77 for fresh samples and it reduced to 6.76 on 60th day which was greater than the score of other treatments. It was seen that as the storage period increased there was decrease in the score of the sensory parameters. The flavour score, consistency, acidity, colour and appearance and overall acceptability score was highest for sample pasteurized at 63°C for 30 min added with sodium benzoate (0.1 per cent) and stored at refrigeration temperature (5±1°C) after packing in pouches throughout the storage.

Keywords: Mango whey beverage, Pasteurization, Sensory qualities.
5.63
Studies on Recovery of Total Solids, Fat, Proteins, Ash and Organoleptic Quality of Paneer Prepared from Cow and Soy Mix Milk

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The paneer prepared by using cow milk and soy mix milk in proportions of 100:00; 75:25; 50:50; 25:75 and 00:100 respectively were studied. The recovery of total solids revealed that paneer with 25% soy milk (56.18%) was higher than other samples. Type of milk had significant (P< 0.05) effect on fat recovery and had non-significant effect on recovery of proteins. Type of milk had a significant effect on recovery of ash. The sensory evaluation revealed that cow milk paneer, paneer prepared from 25 and 50 per cent soy milk blend was liked by judges. Therefore, good quality paneer can be prepared by using cow milk and soy milk in proportion of 50:50 with 1% citric acid as a coagulant at 75°C at the lower cost compared to 100:00 and 75:25 proportions.

Keywords: Cow milk, Soymilk, Paneer, Sensory evaluation
5.64

Study of Irrigation and Fertilizer Management in Late Sown Wheat (*Triticum aestivus*)

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A field experiment was conducted to study the effect of irrigation and fertilizer management in late sown wheat. On the basis of the experimental findings, it can be concluded that a favorable effect on the yield attributes was observed with improving irrigation. The grain yield, in general, increased with increasing level of irrigation. The crop receiving irrigation at 15 days interval produced maximum gain yield (26.8 q/ha.) which was significantly higher in comparison to 20 days interval schedule of irrigation. Biological yield and straw yield were also influenced significantly with irrigation schedule. Maximum biological and straw yields were recorded under the schedule involving irrigation at 10 days interval, which was at par with 15 days interval schedule of irrigation and 20 days interval schedule of irrigation. The grain yield was significantly influenced by the schedule of fertilizer management. The higher dose of fertilizer involving N120 P60 K40 kg/ha under very late sown condition had no added advantage with respect to grain yield over recommended proactive (N80 P40 K30 kg/ha) of fertilizer application. Maximum grain yield was recorded under N80 P40 K30 kg/ha after that slight decrease in grain yield was observed with increase in the fertilizer levels. Biological and straw yields were also significantly influenced with fertilizer schedule.

**Keywords:** Late sown Wheat, Irrigation, Fertilizer management
Study on the Effect of Organic and Inorganic Fertilizers on the Growth and Seed Yield of Okra (*Abelmoschus esculentus* (L.) Moench) under Sub-tropical Areas

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The present investigation was carried out to find out the impact of organic and inorganic fertilizers on the growth and seed yield of okra under sub-tropical areas during the spring-summer seasons. The experiment was laid out in split plot design with four levels of organic fertilizers by soil application methods namely one control and three soil application by *Azospirillum*, farmyard manure (FYM) and vermicompost and five levels of inorganic fertilizers at the rate of 0%, 25%, 50%, 75% and 100% of recommended dose of fertilizers (60:30:30:: N: P: K). The treatments C₄ 100% recommended dose 60:30:30 kg NPK per ha significantly increased plant height (55.29 cm), stem diameter (5.71 cm), number of branches per plant (5.77), average fruit weight (15.55 g), marketable yield per plant (1.73 kg) and seed yield per plot per hectare (12.78 kg) except than internodal length as compared to other treatments. Inorganic fertilizer application methods T₃ (soil application with *Azospirillum*) significantly recorded highest plant height (54.16), stem diameter (4.83 cm), number of branches per plant (5.44), average fruit weight (14.75 g), marketable yield per plant (1.67 kg) and seed yield quintal per hectare (12.46 kg) except internodal length as compared to other treatments. The interaction between organic x inorganic fertilizers was found some significant and non significant growth attributes and seed yield.

**Keywords:** FYM, Vermicompost, Biofertilizer, *Azospirillum* seed yield, Okra
5.66

To Assess Changes over a Decade in Ground Water Quality for its Fitness in Gurdaspur District, Punjab

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Water is the most essential natural resource for sustenance of life and is critical input for crop production. Irrigation practices play a key role in alleviating rural poverty. In Punjab, availability of water from rainfall is highly uneven. Nearly 73 percent area is tubewell irrigated and the water quality used for irrigation is essential for the yield, maintenance of soil productivity, and protection of the environment. Over-exploitation of groundwater for agriculture has resulted in continuous decline of water table in most parts of the state. The present study is an attempt to assess the groundwater quality of Gurdaspur district using ten years data (2005 to 2014). Five hundred and eighty one tubewell water samples received at soil & water testing laboratory, Punjab Agricultural University, Regional Research Station, Gurdaspur were analysed and assessed for the possible changes in water quality parameters over a period of time. The irrigation water samples have been classified into fit, marginal and unfit categories. Water quality parameters carbonate (CO$_3^{2-}$), bicarbonate (HCO$_3^{-}$), chloride (Cl$^-$), residual sodium carbonate (RSC) & electrical conductivity (EC) were taken into consideration for this assessment. The most influential water quality is the water salinity hazard as measured by electrical conductivity. On the basis of criteria laid down by soil & water testing laboratory, Department of Soil Science, PAU, Ludhiana, EC of 95%, 2.9% and 1.9% tubewell water samples were found to be safe, marginal and unsafe. RSC is an index of sodicity hazard and its value indicates the tendency of Ca and Mg to precipitate in the irrigation water. Water having RSC values less than 2.5(safe), 2.5 to 5.0 (marginal), 5.0 to 7.5(unsafe) and more than 7.5 meq$L^{-1}$(unsafe), respectively. 92%, 7.4% and 0.5% of the sample tested for RSC parameter were safe, marginal and unsafe. Thus, on the basis of two important parameters of water quality, it can be concluded that majority (94%) of the samples of irrigation water analysed were fit for irrigation only 5 percent were marginal and 1 percent samples were unsafe for irrigation purpose. At the end, it is concluded that underground tubewell water must be got tested to know the changes in groundwater quality over a period of time.

Keywords: Ground water quality, Gurdaspur, Punjab
Yield Gap Analysis of Gobhi Sarson (Brassica napus) through Front Line Demonstrations in Hamirpur District of Himachal Pradesh

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Acreage and productivity of oilseed crops is declining in Himachal Pradesh in general and Hamirpur district in particular. To boost the production and productivity of oilseed crops Krishi Vigyan Kendras (KVKs) are conducting front line demonstrations (FLDs) on oilseed crops. The main objective of FLDs on oilseeds is to demonstrate and popularize the improved technologies on farmers’ fields for effective transfer of generated technology and fill the gap between recommended technology and indigenous technology. Frontline demonstrations in gobhi sarson (Brassica napus) during rabi season were studied for five years (2008-09 to 2012-13) in Hamirpur district of Himachal Pradesh. There was a wide yield gap between the potential and demonstration yields in gobhi sarson mainly due to technology and extension gaps. The demonstrations on gobhi sarson crop indicated that percent increase in yield over farmers practice was from 36 to 73.8 percent over five years. It was further observed that in terms of economics gobhi sarson crop recorded higher net returns per hectare compared to farmers practice during all the years. The benefit cost ratio raised from 0.83 to 1.86 in demonstration plots of gobhi sarson. The technology index varied from 33 to 63 percent indicating urgent need to motivate the farmers to adopt economical viable technologies for increasing production, productivity and profitability of pulse crops.

Keywords: Yield gap, Gobi sarson, Front line demonstration
Session 6
ICT-Led Information Systems for Knowledge Empowerment
Attitude of Farmers towards Information and Communication Technologies in Upper Krishna Project Area of Karnataka

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Agriculture is one of the most important sectors in India, and could benefit tremendously with the applications of ICTs especially in bringing changes to socio-economic conditions of poor in backward areas. The common problems in adoption of ICT in rural segments are ICT illiteracy, availability of relevant and localized contents in their own languages, easy and affordable accessibility and other issues such as awareness and willingness for adoption of new technologies among the rural peoples etc. With this background information, the paper is devoted to outline the level of attitudes of the farmers on ICT application in agriculture, impact of ICT application in agriculture activities and problems in accessing the ICT application in Yadgir district of Karnataka. The Govt. of India is making a remarkable achievements especially in the area of agriculture by giving various facilities to the farmers one among them is the ICT services which is helping the farmers to understand the modern cultivation methods, availability of agriculture inputs, irrigation sources, availability of pesticide and fertilizers for increasing the production and productivity of crops. India is a developing country, where agriculture forms the backbone of Indian economy. For a long period of time, Indian rural communities especially farmers have been facing number of socio-economic problems. So various planners and administrators of the agriculture dept of the government must consider the threats faced by farmers to protect their interest as well as the interest of the nation.

Keywords: ICT, Application of ICT
6.02

**Best Practice Story of Krishi Community Radio UAS Dharwad-Rearing and Management of Livestock**

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The Krishi Community Radio Station gives the information and educates the farmers in rearing and management of the livestock through “Varada Basanna” programme. Basanna means, a messenger who collect the information from University of Agricultural Sciences, Dharwad about protection aspects of animal health coverage and management of live stock. The programmes are organizing by collecting farmers problems and nourishing local talent. There is a veterinary hospital existing at UAS, Dharwad campus, at main gate. Farmers bring their animals to the hospital for treatment. During the visit they discuss live stock diseases, rearing, nutritional aspects, season bond diseases and endemic diseases with veterinary doctors present at the hospital. Based on observations the farmers are facing lot of problems related to animal husbandry and veterinary aspects. To eradicate long existing myths among farmer community with respect to animal husbandry & veterinary. The Krishi Community Radio broadcasting special programme in local qualouial language (Kannada) in order to reach the farmers and educate them effectively on this issue. Varada Basanna, a thematic programme series in the format of a situational discussion of 15-20 min. duration, where the specially created characters, transfer scientific knowledge in the field of Animal husbandry and veterinary Sciences broadcast by KCRS as reality show. The characters like Mr. Basanna a middle aged experienced farmer visits the University to meet the animal scientist to get latest information in production protection aspects of health coverage and maintenance of domestic animals especially dairy animals. Every week the well known friendly Basanna visits the village leaders Gpuda and share the information with villagers who list on to his word as he is respected and venerated, fulfilling the aim of transferring scientific information to the community. Sixty five percent of the listeners were aware of this programme. When farmers approach veterinary hospital at UAS, Dharwad for hospitalizing their cattle, for treatment, this scientist and veterinary doctors of University provides, more information about the new technologies developed in University as a new adventure of the farmer question. Other characters like “Goudashani- Goudas wife, other community leaders like the School teachers, priest, elder farmers, progressive farmers and important people of the village, who take active part in dialogue, drama, or discussion with Basanna, in turn pass the messages to the farm women. So far about 160 programmes have been broadcast through Krishi Community Radio Station every week. This programme has become very popular and appreciated by the farming community and more than 55 percent of farmers are its listeners.

**Keywords:** Krishi community radio, Varada basanna, Farmers
Constraints as Perceived by the Farmers in Using the Services of Kissan Call Center in South Gujarat Region

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The concept of Kisan Call Centers (KCCs) was a logical outcome of the commitment by the Government of India to leverage the ICT for overcoming the constraints of distance and time in providing new generation extension services to the farmers. The farmer may come across a number information sources but they pursue only few of them depending upon the availability and the ease of use. The present study was conducted in the entire seven districts of South Gujarat region. The data were collected with help of well-structured interview schedule following personal interview method. It was revealed that major constraints perceived by respondents were Kisan Call Center (KCC) not providing the information regarding the seed, pesticide etc. About 53 percent of the respondents reported that not providing information about the seed and pesticides of private industry is the main shortcoming of KCC. Pesticides and hybrid seeds being the monopoly of the private sector, the KCC should guide the farmers about it. This constraints ranked 1st. The second limitation was that SMS send by KCC are not displayed in some of the mobile handsets (42.50%), there is no feedback facility in KCC (37%), lack of telephone facility (34.5%), outdated information provided by KCC (31%). These were ranked at II, III, IV & V position by the respondents.

Keywords: KCC, Services provided, Constraints, Feedback
Content Analysis of “Mera Pind Mere Khet Programme” of Doordarshan Kendra Jalandhar

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The present study entitled Content Analysis of “Mera Pind Mere Khet Programme” of Doordarshan Kendra Jalandhar was undertaken with the objectives to study the socio-economic profile of the respondents, to analysis the content of the programme “Mere Pind Mere Khet” (MPMK), to study respondents reactions about content of the programme and satisfaction level and to investigate the viewing behaviour of the respondents. From the three districts selected, two blocks were selected, from each district three villages were then selected from each block, and ten MPMK viewing farming families were selected selectively from each village. Adult member of each farming family were then selected. Thus the total sample comprised of 180 farmers for the present study. The data were collected by following personal interview approach method and were tabulated and analysed using appropriate statistical tools. The findings of the study revealed that one third of the respondents belonged to age group of 40-50 years and most were middle passed. Almost two third of the respondents had frequent extension contacts with agricultural sub-inspector. Less than half of the respondents read newspaper every day, while one third of them viewed TV programme everyday. Package of practices of Rabi and Kharif crops along with PAU magazine were read by less than 50 per cent of the respondents. Majority of the respondents responded that speaker had up to date knowledge about subject matter, confidence, voice impression, speed and flow of presentation and clarity of contents. Less than half of the respondents were satisfied from timing of MPMK programme. It is suggested that the information should be provided in lively conditions and wrapped with traditionally embedded folk media.

Keywords: Content analysis, Reaction, Satisfaction level, Viewing behaviour, Impact
6.05

Content Analysis of Horticultural Information in Agrowon Newspaper

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Agrowon newspaper is a rural oriented newspaper and considered as important source of information on farm technologies to the farmers. The present research concerns about study of various agricultural area, horticultural areas, illustration used in horticultural information and source for getting articles in Agrowon newspaper. The issues of the Agrowon newspaper published in three years from June 2008 to May 2011 were considered for the study. From these selected issues, 122 newspapers were selected randomly for the study. The data were expressed in terms of frequencies and percentage for simple comparison and drawing meaningful conclusion. In Agrowon newspaper, agricultural and horticultural information was about 64.78 percent and non-agricultural information 24.04 percent. In advertisement agricultural and horticultural advertisement was about 4.66 percent and non-agricultural advertisement 6.52 percent. In agricultural contents, information about crop husbandry, animal husbandry, agricultural policies was 13.55, 10.15 and 4.06 percent respectively. Information covered under horticulture was about intercultural operation (19.95%), vegetable marketing (44.26%), prepraratory planting operations in flower (35.20%), spices (36.45%), aromatic and medicinal crops (30.82%). Illustrations used for fruit crop (19.47%), vegetable crops (23.87%), flower crops (21.18%), spices (38%) and in aromatic and medicinal crops (32.07%) stands in first position. Amongst colour used in horticultural fruit, vegetable, flower, spices and in aromatic and medicinal crops multicolour topped. In source for getting article, amongst SAU’s, MPKV, Rahuri (60.92 per cent) had major source for getting farm articles for Agrowon newspaper. The other contents covered were general marketing (21.09%) and crop husbandry of cash crops (37.97%). In case of annual husbandry contents about the general information (29.18%) and policies, finance and insurance (70.54%) were covered. The information about fruit crops was maximum (56.54%) followed by vegetable crops (29.50%), floriculture (7.84%), spices (3.35%) and aromatic and medicinal crops (2.77%).

Keywords: Content analysis, Agriculture, Horticulture, Floriculture
Correlates of the Characteristics of Farmers and Perceived Effectiveness of Farm Telecast in Transfer of Agricultural Technology

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The present study was conducted in Dabra block of Gwalior district of Madhya Pradesh. The sample consisted of 100 respondents spread over 10 villages of the block. Data were collected with the help of structured interview schedule. The majority of the respondents 58.46 percent were perceived medium effectiveness of farm telecast category with reference to transfer of agricultural technology. The characteristics of farm telecast viewers i.e. educational status, family background, social participation, land holding, annual income, credit orientation, economic status, attitude towards farm telecast, belief in telecast and extension participation were found significant relationship with perceived effectiveness of farm telecast. In this study, preferences of the television viewers about different aspects of farm telecast were also studied with following headings namely- Time of telecast, duration, modes of presentation and language of the telecast.

Keywords: Effectiveness, Farm telecast, Agricultural technology
Farmer their Awareness and Listening Habits on Krishi Community Radio Programmes

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The research study conducted in Dharwad district in coverage area of Krishi Community Radio with the sample size of 200 respondents. Here an attempt has been made to study the awareness and listening habits of Krishi Community Radio programmes as perceived by farmers. It can be observed that 40 percent of farmers had medium level of awareness about the programmes while 32 percent of them had low level and 28 percent of them had high level of awareness about Krishi Community Radio programmes. Among all the programmes broadcasted by Krishi Community Radio, Krishi Chinthana (farmers to farmers) programme was most popular programme, 69.17 percent of listeners aware of this programme, followed by Varada Basanna (65%), Krishi kutumba (63.33%), Pakshika Salahegalu (60%). Krishi Chinthana programme has got the highest (50%) number of regular listeners, 19.17 percent of them were occasional listeners and 30.83 percent of them were unaware of that programme. Vigyanigala Sandarshana (30%) programme Nage Chuchchumaddu has the least number of regular listeners. There is need to increase the coverage area of Krishi Community Radio to cater the needs of more number farmers of the villages.

Keywords: Community radio, Awareness of farmers, Popular programme
ICT and Its Role in Rural Development

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According to 11th five year plan (2007-2011) which states that agricultural growth is stagnating and sluggish. Hence, there is a need to adopt agricultural extension through ICTs. There are some steps which are helpful to accelerate agricultural growth through ICTs like expand knowledge resource, information access, technical manpower, etc. Since 1990, various reforms in telecommunication increases which builds a strong ICT infrastructure in India and today, these are also growing at a greater pace through various mediums like land wires, wireless, broadband, etc. National Policy for Agricultural Extension (2000) stated that IT revolution for agricultural extension will touch highest points in India and likewise, extensive use of modern IT, promotes communication between researcher, extension worker and farmers. Further, National Policy for Farmers (2007) emphasized on GyanChaupals (knowledge centers) & CSCs (common service centers) with the help of public & private initiative programmes. Then, National e-Governance Plan giving their services through MMPs (mission mode projects) to provide information to farmers on seeds, fertilizers, pesticides, Govt. schemes, soil recommendations, weather forecasting, marketing through various projects which are running in Assam, Kerela, Karnataka. There are some practices of ICT for agricultural extension like aAQUA, Digital Green, e-Arik (e-agriculture), e-Sagu (e-cultivation), KISSAN, etc. This article also emphasized on different barriers in ICT implementation for agricultural extension in India.

Keywords: ICT, Rural development, Agriculture
6.09

ICT Application for Sustainable Agriculture-Kisan Call Centres as a Farmer Friendly Tool

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Information and communication technology emerged as a great savior to the agricultural extension system during the early nineties. In the past few decades, information and communication technologies have provided society with a wide array of new communication capabilities enabling people to communicate in real-time with other technologies such as instant messaging, voice over IP, and videoconferencing. The social networking sites like Facebook and e groups have allowed user from all over the world to remain in contact and communicate on regular basis.ICT with a clientele as large as 23 crore farmers and agricultural labourers working in agriculture and allied areas, across the country offers great optimism towards handling the information need through the platform of extension system in the country (including public, private, mass media, Input dealer and farmers). The potential of ICTs are therefore visible in the areas involving information common to many people or dissemination of such of the knowledge/information more effectively which is generic and is relevant to a large population or in imparting common training to rural communities. Though it emerges as a tool for knowledge management, it is also linked to the disadvantage of lacking local relevance of content, which is also not customized to the capacity of users. The human intermediation is therefore very important in ICT application. To harness the potential of ICTs in agriculture, ministry of Agriculture took a new initiative by launching the scheme “Kisan Call Centres” on January 21, 2004 aimed at answering farmers queries on a telephone call in farmers own dialect. This scheme provides agriculture related information to the farming community through toll free telephone lines. A countrywide common eleven digit number 1800-180-1551 has been allotted for Kisan Call Centre. Amongst various ICT interventions Kisan Call Centres (KCC) are the most potential means as these centres blend all the successful ICT tools in a well coordinated manner to deliver most credible, reliable and verification information to farmers at times when they really need. A careful and continuous upgradation of Call Centres technology; selection of right candidates to work as KCC agents with continuous capacity building measures; greater ownership of the states and constantly improving the system with farmers feedback would go a long way in serving a much larger farmer population and in a way supplementing and complementing the public extension system.

Keywords: KCC, ICT, Extension, Instant messaging, Video-conferencing
ICT Led Extension- Tool for Rural Development

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The Information and Communication Technology (ICT) in India has undergone a spectacular change since independence. India has been witnessing a revolution in information and communication technology which has changed our life in all spheres and agriculture extension is also amongst it. ICT is trying to change the extension approaches for agricultural development. It is strongly believed that ICT led extension system will lead the future extension services of the world, which can be achieved by improving the access to information seeking and knowledge sharing by the farmers. Hence, extension services personnel have curiosity to use new ICTs for agricultural development programmes or advisory services which led to the development of various e-initiatives. Blending the old extension services with the new ICT led extension services will boost the agricultural growth and also disseminate the information quickly and timely. ICT initiative will led to the improvement in the livelihood of the rural people and improve the agricultural sector as a whole and in totality ICT will help in reduction in the poverty. ICT gadgets will depend on area specific and available resources in that area and different programmes have to be designed according to the location specific. The two major ICT technologies namely mobile and internet will be most effective ICT tools to improve the agricultural in specific and to end the rural poverty in whole. Everybody is aware about the pivotal role of mobile phones in communication and transfer/sharing of information from one person to another at any rapid pace and with ease. Various mobile services like SMS (short messages service) can be used by farming community in their vernacular language, which can play crucial role in exchanging timely information of agriculture related issues, as almost every farming family in Punjab state has access to cell phone services. Similarly educated and progressive farmers have access to internet facilities too. To maximize the benefit of these ICT services Punjab Agricultural University and its Krishi Vigyan Kendras have started using these technologies by sending SMS and email.

Keywords: ICT, Short message service, Krishi Vigyan Kendra
ICT Led Innovation Extension Approach in India

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Agriculture continues to be the most important sector of Indian Economy. Research, Extension and farmers efforts contributed significantly to increase production from 50 million tonnes in 1950-51 to land mark achievement of an estimated production of 241 million tonnes of food production in 2010-11. The total demand for food grains is projected to touch 280 million tonnes by the year 2020-21. Meeting his demand will necessitate a growth rate of nearly 2 percent per annum in food grain production and agriculture sector need to grow at the rate of 4 percent per annum. Recommendation of the Planning commission of India’s working group on agricultural extension for XI five year plan (2007-2011) states that the agricultural growth is stagnating and sluggish. Hence, there is an immediate need of vibrant, dynamic and innovative approach to be adopted for agricultural extension in order to achieve targeted growth rate and serve the farmers better. In this existing scenario, it is expected that integration of ICTs in agricultural extension will provide needed impetus to agricultural sector and ICTs can complement the traditional extension system for “Knowledge Resource” delivery to the millions of the farmers (Saravanan, 2010). Agriculture is most important sector with the majority of the rural population in developing countries depending on it. ICTs are changing all the spheres of human lives. The ICT led extension systems act as a key agent for changing agrarian situation and farmers’ lives by improving access to information and sharing knowledge. The use of new ICTs for agricultural advisory services led to mushrooming of e-initiative pilots in India. Development practitioners are experimenting innovative ICT initiatives exclusively for agricultural information and knowledge delivery. Unlike other sectors agriculture is a complex, more so agricultural extension, hence, there are some projects shown the way forward and continue to grow and most other projects are floundering after few years of operation. Large number of projects stuck as pilots only and very few continuously innovated, replicated and sustained over the years. However, the variety of ICT initiatives are also added lot of lessons to take future course of action. ICT capacity building in agricultural research and extension systems, location-specific content generation and digitization, integration of research-extension and IT technology solution providers, integration of pluralistic extension actors, blending ICTs with traditional extension methods, continuous innovation and refinement need be followed with commitment and accountability are crucial for sustaining momentum in the agricultural advisory services by the ICTs.

Keywords: ICTs, Initiatives, Agriculture, Extension
ICT Use in Rural Development- A Study of Kerala

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Information is a basic element in any development activity and is useful only if it is available, if the users have access to it, in the appropriate form and language. Information in the field of agriculture, to be beneficial, has to be tailored to local agro-ecological and socio-economic conditions backed up by relevant input supply services and public policies. The impact of information revolution with its powerful information and communication technologies is in all encompassing and overpowering revolution shrinking the whole universe into a small global village enabling easy access and faster sharing of knowledge among the world communities. Information Communication Technologies (ICT) have great prospect and wide scope for disseminating information to the people in remote areas with great accuracy and with no loss or distortion of any information. ICTs can empower rural communities and give them ‘a voice’ that permits them to contribute to the development process. A silent revolution is taking place in the communication systems in rural India. In this regard, a study was conducted in Kerala state to analyse the e-readiness, perception and extent of participation of beneficiaries in ICT projects besides knowing their information needs and problems in using ICTs. e-readiness was calculated by assessing six indicators namely, e-access, e-learning, esociety, e-business, e-governance and e-willingness. KISSAN Kerala beneficiaries secured highest scores for all indicators while farmers scored the least. The data were gathered from a randomly selected sample of 80 respondents from two projects namely AKSHAYA and KISSAN Kerala and 40 farmers. The study revealed that KISSAN Kerala beneficiaries had highest mean e-readiness score (3.04) followed by AKSHAYA beneficiaries (2.45) whereas farmers scored the least (1.72). Majority of the KISSAN Kerala beneficiaries (85%) and two fifth of AKSHAYA beneficiaries (40%) belong to high e-readiness group, while most of the farmers exhibited low level of readiness. All respondents had low scores for e-society, e-business and e-governance. Inspite of their low scores for e-access and e-learning farmers expressed high e-willingness. There is a need to make beneficiaries aware about the ICT enabled services and care should be taken to make them adopt more such technologies.

Keywords: ICT, e-readiness, e-learning
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More than six lakhs villages are there in our country. The vital information about agriculture needed by the farmers such as package of practices of crops and other technical support is provided by various agencies. Public and private organizations are providing extension services to the farmers to improve their farm production, productivity and income. State extension agencies are having limited manpower to reach each and every farmer in the village. Information and Communication Technology (ICT) has several unique features which can be utilized by the extension agencies for strengthening the extension system. ICT includes computer, internet, television, radio, mobile phones, etc. It has the potential to reach more number of people, instantly and with more detailed information. ICT has the power to reach a person in a village which is not accessible by road. Information can be stored and retrieved at farmers’ convenience. ICT is less expensive in the long run. The initiatives taken up in the field of ICT can be broadly classified into web-based and mobile-based. Web-based ICT includes websites, portals and kiosks. Mobile-based includes sending text, voice and video SMSs. Smart phones facilitates downloading applications which contains package of practices. ICT has been experimented by government and private organizations. Few prominent ICT initiatives are e-choupal (2000), Parry’s corner (2001), Kisan Call Centre (2004), Reuters Market Light (2007), IFFCO Kisan Sanchar Limited, Digital Green, Lifelong Learning for Farmers (2008), Agropedia and Digital India (2014). Digital India is the latest initiative taken by the Government of India. It is started on August 20, 2014. It is planned to transform the country into a digitally empowered society and knowledge economy. The purpose of this initiative is electronic availability of Government services to people.

Keywords: ICT, Innovative extension approach, India
Information Communication Technology: A New Dimension for Empowerment of Rural Women

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Empowerment of women is understood as building the ability and skills of women to gain insight of actions and issues in the external environment which influence them and to build the capacity to get involved and voice their concerns in external processes in order to make informed decisions. It entails building up capacities of women to overcome social and institutional barriers and strengthening their participation in the economic and political processes for an empowerment in the quality of their lives. ICT is an important resource in modern agriculture. The development of computers and improvement in telecommunication offer women many new opportunities to obtain technical and economic information and to quickly access and use it effectively for their decision making. The modern farm woman is an entrepreneur who tries to grow right crops and animals in the most profitable way. Nowadays the amount of information a woman uses for her management and decision is increasing rapidly. The use of ICT tools to disseminate outreach information to rural women is one of the key areas, which has potential to change the economy of women in India. ICT provides information and ensures effective delivery of information related to production and post harvest technologies. The available infrastructure of ICT tools in the country is thus assuring the percolation of the outreach programmes down to the rural women. It will help to ensure quality development in the field of agricultural development especially to the rural women who are actively engaged in farming activities. An attempt is made in this paper to discuss about the experience of ICT initiatives for women and the strategies to meet the challenge of effective transfer of technologies though the use of ICT to update knowledge on emerging technologies in agricultural and the rural development.

Keywords: ICT, Women empowerment, Transfer of technology
Information Empowerment of Rural People of Rajasthan through e-Choupal

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TC’s e-Choupal is internet kiosk, village gathering place and e-Commerce hub all rolled into one. It caters to the information needs of the farmers at their doorstep by bridging the information and service gap of rural India. It also established a low-cost fulfillment system focused on the needs of rural India, which helps in mitigating rural isolation, create more transparency for farmers, and improve their productivity and income. e-Choupal provides information on agriculture, health, insurance and education. The effectiveness of these services depends upon how well they are being known by rural people. Thus the present research was designed to study the knowledge of rural people about e-Choupal and its services. The present study was conducted in four districts namely Ganga Nagar, Kota, Bharatpur, and Chittorgarh of Rajasthan. Two panchayat samities from each district and two villages from each panchayat samiti were selected on random basis. For studying the impact, one village from each selected district, where e-Choupal is not functioning was selected. The sample consisted of 160 women and 160 men users, and 40 women and 40 men non-users of e-Choupal. Personal interview technique was used for collecting data. The data were analyzed by using frequency, per centage, mean per cent score and ‘Z’ test. The findings of the study clearly indicated that users (13.4, 26.0, 58.1, 71.5, 81.9 MPS) had more knowledge than non-users (0.0, 12.7, 35.3, 42.9 MPS) in all the five services i.e. agriculture, insurance, health, education and entertainment. Thus the e-Choupal has made significant impact in terms of information empowerment of rural people.

Keywords: e-Choupal, Information empowerment.
Information Need of the Farmers about Mustard Production Technology

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The present investigation was conducted in Gohad block of Bhind district Madhya Pradesh and the total sample consisted of 110 farmers. In this study, policy information, market information, technological information and others were included as information need of the farmers. Most of the farmers (39.09%) belonged to high information need category about recommended production technology of mustard. The correlation coefficients in respect of education, social participation, size of land holding, farming experience, annual income, risk preference, source of information, knowledge about mustard production technology, adoption behavior of mustard production technology were found positively significant with information need whereas the size of family was found having no significant relationship. The training programme should be organized for need based information and was the major suggestion suggested by 75.00 per cent respondents.

Keywords: Information need, Mustard production technology
6.17

Mass Media Utilization in the form of Agricultural Advertisement

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Advertising is a form of communication intended to persuade an audience (viewers, readers or listeners) to purchase or to take some action upon products, ideas or services. It includes the name of a product and how that product can benefit the consumer to persuade a target market to purchase or to consume that particular brand. These messages are usually paid by the sponsors and viewed via media. Advertising can also serve to communicate an idea to a large number of people in an attempt to convince them to take a certain action. The commercial advertisers often seek to generate increased consumption of their products or services through branding, which involves the repetition of an image or product name in an effort to associate related qualities with the brand in the minds of consumer. The present study was conducted in the year 2011-12 at SKUAST-J, Chatha Jammu, in which 21 farm magazines was covered to know the content of commercial advertisement. It was found that total advertisements were 55, 23 were agricultural based, out of these 16 were related to awareness and 7 were related to knowledge. The popular magazines covered are Krishi Today, Intensive Agriculture, Kheti, Agrobios, Krishi Vikas Pattrika, Yojana, Kurukhestera, Unnat Krishi, Krishi Vistar Sameskha, Jalchari, Farm and Food and Chattisgarh Kheti.

Keywords: Mass media, Farm magazines, Agriculture contents, Utilization
6.18

New Avenues in Development of Rural Economics through ICT Tools

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The information and communication technology (ICT) has made it possible to consider the whole world as a global village. ICT is emerging as the backbone of commerce. As about 80 percent of India’s population resides in villages and our economy is agriculture dependent, ICT has a great role to play in promoting and establishing Indian agriculture worldwide. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. It involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies in the rural domain, with primary focus on agriculture. Next Generation Internet (NGI) is the need of the hour. Meeting challenges to reduce hunger and poverty, increasing agricultural productivity, protecting the environment, narrowing the gap between production and demand are few reasons for the need of adapting new technologies in agriculture. Multimedia technology which consists of audio visual tools can be used to train the rural people effectively. New methods of farming can be taught in their native language. Solutions for a specific problem can be explained and illustrated. Crop management training can be given. Other established technologies like datawarehouse, datamining, decision support systems, management information systems, expert systems can be effectively used for the upliftment of agriculture. Establishment of e-kiosks, infoshops provide various agricultural based information. Agriclinics which aid in management of diseases should be set up in villages to provide solution and guidance to the farmers. Web based technology combined with audio-visual and graphic information can capture farmers devised best practices in agronomic practices and disseminate them for wider adaptation and greater impact.

Keywords: ICT, Application of ICT
6.19

Reaching the Unreached through ICTs Use for Agricultural Information and Social Transformation

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Information and Communication Technology (ICT) has become a potent force in transforming social, economic, and political life globally. Without its incorporation into the information age, there is little chance for countries or region’s to have development. ICT can be an important tool in meeting basic needs and can provide the access to resources. The information and communication technology revolution has not only opened up new opportunities for economic growth and social development but has also posed problems and challenges. It can shape and enhance wide range of developmental applications in agriculture, industry and social sectors and is influencing all sections of the society. ICT provides unique opportunities for human development and at the same time ICT has been widening the gaps between and within countries, regions, gender while increasing disparities divide between the rural-urban, rich-poor, elite neglected and also within the different categories of men and women in various spheres of activity. It is necessary to build up people capacities to involve them in productive activities, institutional building, family and social transformation, decision-making process, political representation, trade and commerce, entrepreneurial development and social leadership. The widespread availability and convergence of information and communication technologies deals with computers, digital networks, telecommunication, television, etc has capacity for dissemination of knowledge and information and reaching the unreached for agricultural information and social transformation.

Keywords: ICT, Digital divide, Agricultural information, Social transformation
Role and Importance of Information Communication Technologies (ICTs) Led Information System for Knowledge Empowerment in Agriculture

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During the present era of globalization of market and economic integration, the advances in information technology can percolate around the country with the potential to confer fillip to agricultural productivity, income and quality of life of Indian farmers. It is readily accepted that increased information flow has a positive effect on the agricultural sector and individual farmer. However, collecting and disseminating information is often difficult and costly. Information Technology increases the amount of information provided to all participants in the agriculture sector and decreases the cost of disseminating the information. It is a fact that access to information holds the key for successful development. Improved communication and information access is directly related to socio-economic development of any nation. Agriculture is one of the prospective areas in which information technology can effectively be applied particularly for the social and economic development of the Indian agrarian community. However, rural population in our country still have difficulties in accessing crucial information in the forms they can understand in order to make timely decisions for better farming. Information technology is generating possibilities to solve such problems of different categories of end users. For this purpose electronic communication infrastructure needs to be establishing in the country for remote rural areas. This challenge is not only to improve the accessibility of communication technology to the rural population but also to improve the relevance of information to local developments. The purpose of this study was to identify potentials of information technology in agriculture and rural sector. Documentary research and literature review were used as research methods. Findings reveals that most applications of these Information technologies in agriculture and rural sector were trade of inputs and outputs through e-chaupal, extension and training activities for rural people, advantages of Agri-tourism, knowledge transfer from cities to villages through e-kiosks and geographical information System(GIS) for management of natural resources.

Keywords: Information Communication Technology, Development and Agriculture
Role of Cyber Extension in Agricultural Development

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Agriculture is the most important sector of Indian economy, contributes 13.6 per cent of national GDP interestingly India feed 16 per cent of population with 2.4 per cent land. In the last five decades, there is a steady transformation of Indian agriculture from the food deficit to food sufficient status. There has been a global shift from traditionally manufacturing based economies to economies that are largely knowledge based today. It is indeed highly inspiring to see that in India, people are gradually getting aware of the multiple roles of Information Technology in the overall growth of the country. In applied context of agriculture, cyber extension means, using the power of online networks, computer communications & digital interactive multi-media to facilitate dissemination of agricultural Technology. ICT can continuously introduce newer sets of information services to agricultural markets where farmers can have a better control. Developing the capacity of agro-based rural communities through cyber extension with the use of ICT will create opportunities of growth and prosperity and give a chance to Indian Agricultural markets for creating a more efficient information and knowledge network. The important components of Agricultural extension systems are agricultural research, marketing and farmers. There are some best ICT agricultural developments like aAQUA, E-agrik and KISSAN. The main focus of ICT in agriculture is meeting the farmers’ needs for information. Cyber extension bridges the communication gap between these components. The enhanced and smooth communication among these components of the system results in the overall development of the agriculture system of the country.

Keywords: Cyber extension, ICT, Interactive multi-media
Role of ICT in Agriculture

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Today, a new paradigm of agricultural development is fast emerging in both developing and developed countries and the overall development of rural areas is expanding in new directions. Information and Communication Technology (ICT) is seen as an important means of achieving such a transformation. When used as a broad tool for providing local farming communities with scientific knowledge, ICT heralds the formation of knowledge hubs for societies in the rural areas of the developing world. In recent years, there has been a rapid growth of mobile phone networks in developing countries. Currently mobile is the predominant mode of communication in the developing world. The widespread use of mobile phones should add to more use of voice and SMS solutions as they offer easy accessibility after mobile explosion and this technology can even enhances the reach of extension services to a great level. Generating awareness among young and middle-aged farmers about the availability of ICT services is the first step to be considered to increase farmers’ participation in ICT initiatives. ICT plays a major role in economic development of agricultural producers; community development; research and education; small and medium enterprises development; To formulate a strategy for overall agricultural development, the isolated ICT projects need to be studied and the experiences generated must be documented in order to draw lessons for the future.

Keywords: ICT, Role in agriculture
Role of ICT in Women Empowerment

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Information and Communication Technology (ICT) today plays an important role to disseminate recent advances to their ultimate end user. Women is a major key player of development of any nation. ICT should play a key role in women’s economic empowerment and poverty reduction. In many countries, ICTs are working for the poor, especially mobile technologies which reach and positively affect the lives of millions of women and girls in urban and rural areas. ICT has the potential to digitally link each and every woman of the world in a network form which opens up endless possibilities for information exchange. Hence, they can communicate with each other, discuss the ideas and also disseminate information through this medium. This way they could overcome the constraints, seclusion, mobilize resources and support, reach out new markets and open up avenues for lifelong learning. In fact, ICT opens up a direct window for women to the outside world. ICT makes the role of time and distance less significant in organizing business and production related activities. Since, India has been using ICT for development for more than two decades, there are many good practices for the use of ICTs for women’s empowerment. India Shop, an e-commerce website in Tamil Nadu, has been designed to sell products made by rural women’s co-operatives and NGOs. The Dhan Foundation and Swayam Krishi Sangam are using ICTs, such as handheld devices and smart cards, to improve microfinance projects to empower poor women. The Self-Employed Women’s Association has several ICT projects for women, including community learning centers, a school of Science and Technology for self-employed women, and the Theliphone project, which provides mobile phones to women in the informal sector. Self-help groups of rural women in Andhra Pradesh, have been so successful in marketing their products at home and abroad that the major MNCs [multi-national corporations] want to use their selling skills.

Keywords: ICT, Role of ICT, Women empowerment
Role of Information Communication Technology in Agriculture

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Agriculture requires substantial knowledge transfer to and among farmers, including information about successful farming practices, new technologies or controls of insect pests and diseases outbreaks and markets. Information and Communication Technology (ICTs) is now recognized as a technological tool which can serve as a catalytic intervention in respect of transforming the lives and livelihood of rural families. In India, ICT projects that support such information flows are rapidly growing, with many initiatives in operation today. ICT can directly support farmers’ access to timely and relevant information, as well as empower the creation and sharing of knowledge of the farming community itself. ICT has many potential applications in agricultural extension. It can bring new information services to rural areas where farmers as users, will have much greater control then before over current information. ICT essentially facilitate the creation, management, storage, retrieval, and dissemination of any relevant data, knowledge, and information that may have been already been processed and adapted. In the past, television and radio were the main electronic broadcast technologies used to reach rural communities. However, in the past two decades, Internet- and mobile-based channels have emerged. ICT now include computer-based applications and such communication tools as social media, digital information repositories (online or offline), and digital photography and video, as well as mobile phones. New agriculture extension initiatives like village knowledge centres, information kiosks, mobile ICT units, web portals, digital data base and networks, rural telecentres, mobile telephony, video conference, offline multimedia CDs, decision support system, expert system, innovative community radio and television programmes, open distance learning etc helping the farming community in one way or other. ICT initiatives are taken by public, private as well as some NGOs. These are Aaqua, Digital Green, e- Sagu.e-agriculture, Lifelines India, KISSAN, e-extension, CICs, Community Radio Centres KCCs, AGMARKETNET, ITC-e-Choupal, web portals like AGRISNET, DACNET, iKissan, e-kiishi ASHA, iShaktietc, Dhan foundation, ISAP and some value added services like BSNL–Mandi on mobile services, Fisher Friend Project, IFFCO Kisan Sanchar Ltd. Most of these projects are implemented in smaller geographical area and covering few hundred farmers hence drawing generalizations may not appropriate. ICT are going to play greater role in private sector agribusiness, market information and market intelligence. It is high time to find out appropriate information to provide through ICTs.

Keywords: Role of ICT, ICT initiatives, Agriculture
The Impact of ICT on Banking Industry

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In the present knowledge based era, role of ICT in boosting productivity and economic growth is significant. The banking system contributes significantly to economic development through venture financing and other type of loans in key sectors of the economy. With the use of ICT in banking sector the services has become faster and efficient. Role of ICT in achieving financial inclusion cannot be ignored. This paper examines the role of ICT in service delivery and increasing the outreach of financial services to the un-banked population in rural areas with a view to make suggestions that can improve the productivity of banking services. Microfinance has been recognised as an important tool for increasing productivity and poverty reduction. This industry is facing a competitive environment forcing micro finance institutions to maintain a balance between outreach and sustainability goals. Microfinance though is a success still hasn’t been able to reach low density population areas of the country. ICT here plays an important role in microfinance delivery mechanism. Many studies conducted earlier in different countries show significant results of ICT and increased outreach and production. Bangladesh is an example where microfinance has played an important role in development and poverty reduction and ICT played an important role in it. Financial institutions encouraged mobile banking as a financial tool to increase the outreach of banking services in the unbanked rural areas. Nigeria is another example of ICT based customer delivery financial model played its part in strengthening the economy. ICT has brought a paradigm shift on the banks performance and on customer delivery in banking industry. ICT has enabled more flexible and customer friendly banking services. Many ICT based services provided by financial services are ATM’s, Mobile banking, Online banking, POS, Branch networking. RBI also emphasized the role of ICT in banking sector and many discussions have been done on how to improve the technology factor in banking so as to strengthen the economy. The modernization of ICT has set stage for improvement in banking procedures. Farrel and Saloner (1985) and Economides and Sarlop (1992) showed that relationship between ICT and banks performance has encouraged outcomes. It brings the operational costs of the banks and speed up banks procedures to accomplish standardized and low value added transactions and it promotes transactions between customers between the same networks.

Keywords: ICT, Outreach, Banking services
6.26

Use of Information and Communication Technology (ICT) for Dissemination of Farm Technologies in Eastern Uttar Pradesh

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The access of information through newer generation technology dissemination means had made it possible to extend the outreach of services available at KVK to those farmers who were earlier finding it difficult to avail them. The farming in the eastern Uttar Pradesh is primarily traditional. The innovator and progressive farmers were ready for adoption of new and modern methods of farming provided they get continuous information regarding newer and modern technology. The transfer of latest technologies to the remote areas was only with the dissemination services of the Prasar Bharti’s All India Radio (AIR) established in different districts of eastern Uttar Pradesh, agriculture based programmes on Doordarshan Faizabad, Gorakhpur, Mau, Lucknow, New Delhi, private channels like E TV, local channels; and also with the print media like newspaper, pamphlets, leaflets, bulletins, etc. However, these means were the one way process of communication and the technological information provided through these dissemination services only acquainted the farmers about the modern and recent technologies, but couldn’t solve their curiosity, queries and doubts. Krishi Vigyan Kendras at the District level and Directorate of Extension at University level took new initiative of Information and Communication Technology for the dissemination of farm technologies in eastern Uttar Pradesh. With a view to facilitate services to the visiting farmers through “Single Window System” named Agricultural Technology Information Centre, popularly known as ATIC, has been established with the financial support of Indian Council of Agricultural Research, New Delhi (ICAR) in 2002 at the main gate of the University. The major objectives of the ATIC are providing diagnostic and advisory services to the farmers, and other clients in the area of soil testing, plants health care and animal husbandry services; providing technological recommendations through publication and by producing video-cassettes on various aspects of production technology as per the clients need; sale of seeds of improved varieties, plant saplings, vermi-compost, poultry strains, honey, etc.; providing opportunity for easy access of technological products and providing technological solutions under one roof and; strengthening research–extension–farmers linkages and creating the confidence towards technological progress and their impact to raise the socio-economic status of the farmers.

Keywords: ICT, Uttar Pradesh, Doordarshan
Utilization of ICT Tools for Transfer of Technology (TOT)

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The study was conducted in North Karnataka with the objective of funding the utilization pattern of ICT tools for transfer of technologies. All the taluks coming under Dharwad district namely Dharwad, Hubli, Navalgund, Kundgul, Kalghatgi and all the KVK’s and EEU’s coming under Directorate of Extension UAS, Dharwad namely Dharwad, Gadag, Belgaum (Arabhavi), Bijapur, Bagalkot, Haveri (Hannumanamatti) and Uttara Kannada were selected for the study. The Extension personal working in KVKs and EEU’s and Assistant Agriculture Officer(AAO) of state Agriculture were considered as sample for the study and random sampling procedure was followed to select 40 extension personnel from UASD and KSDA making a total sample of 80. The results showed that, 45.00 per cent and 60 per cent of UASD and KSDA extension personnel belonged to high and low ICT utilization respectively. Further, for” gaining the knowledge/for getting the information” UASD extension personnel were used: web based search engine (100%). Whereas, KSDA extension personnel used television (92.5%),for “transfer of technology” UASD extension personnel used internet (90%), Whereas, KSDA extension personnel used mobile(50%) “Training and teaching UASD extension personnel used internet (75%). Whereas, KASD used computer (15%), for “making/sending report” UASD extension personnel used e-mail (97.5%). Whereas, KSDA extension personnel used computer (55%), for “sharing information with concerned organization including input agencies” used e-mail (100%). Whereas, KSDA extension personnel used mobile (75%) for communication with other organization used extension personnel used e-mail (100%).It was also noted that, 80 per cent of UASD and KSDA extension personnel used radio for a duration of ‘½ to 2½ hrs’ and mobile for ‘½ to 2½ hrs’ respectively. It can be concluded from the result that, extension personnel of UASD had high extent of Utilization of ICT tools while Extension personnel’s of KSDA had low extent of utilization of ICT tools. Most of them used computers, mobiles, internet, e-mail for used different purpose for the duration of ‘½ to 5 hrs’. There is need to emphasis the utilization of ICT tools such as web based agriculture information portals, Video conferencing, Decision support system etc. As a matter of policy all the extension personnel must possess proven skills in utilization of ICT tools like computer application, internet browsing.

**Keywords:** ICT tools, Transfer of Technology, Extension personnel
6.28

Video Conferencing and Mobile Based Services: Creating New Dimensions to Reach Farmers Efficiently

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The National Sample Survey Organization (NSSO) survey 2003 showed that 60 percent of farmers had not accessed any source of information through modern technology to assist their farming practices in the past year. With the rapid development of Information and Communication Technologies (ICTs), every sector of the economy is becoming familiar instrument for effective and instant communication. The role of one such ICT tool in the form of video-conferencing and text/voice messaging services in agricultural extension cannot be undermined. With this objective, video-conferencing system as well as facilities for sending farm advisory through text/voice messages to farmers has been set up in Bihar Agricultural University, Sabour through which four Krishi Vigyan Kendras (KVKS) under the jurisdiction of the university are connected for updating the farmers of that region about innovative agricultural practices and responding to their queries immediately by the scientists of the university located at Sabour. A study was conducted in the year 2014 in which a total of 632 farmers were selected as respondents of which 302 farmers were participants of video conferencing training and registered users of text/voice messaging services while the rest 330 farmers were trained by traditional method at the respective KVKS. Personal interview method was followed for data collection by using semi-structured interview schedule. Z-test was applied to find out difference between farmers trained through ICTs and farmers who were trained through traditional training methods. It was seen that there was a significant difference between the two groups of farmers with respect to a number of factors related to farming. This might be because of the reason that farmers who used ICTs might have acquired knowledge regarding farming and refreshed their knowledge through mobile messaging and voice services. These findings are consistent with UNDP study of 2001. It can be concluded that information with the use of ICTs in developing countries can trigger better dissemination and adoption of technologies necessary in extension services of the 21st century.

Keywords: ICTs, Video-conferencing, Extension, Mobile messaging, Mobile voice services
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