

# **Contingent planning for sub-tropical agriculture of Jammu & Kashmir**

### ***Background and introduction***

*Jammu & Kashmir is the hill state located in the northern most extremity of N-W Himalayan region of India, between latitude 32°. 17' to 36°. 58' N and longitude 73°. 26' to 80°. 26' E. The diversity in physiographic features and agro-climatic variations both at macro and micro level divides the state into four distinct hill land situations viz. Cold arid zone of Ladakh with an altitude of > 2500m amsl touching central Asia; high hill land pockets with altitude range of 1500-2500 m amsl, mid-hill land zone having altitude of 800-1500m above amsl and low altitude sub-tropical zone with an altitude of less than 800m amsl. Jammu province of J&K state which extends between latitude 32° 16' 40.9" to 34° 12' 45.17" N and longitude 73° 55' 28.0" to 76° 46' 38.2" E., is located within an altitudinal range of 300-2500m amsl. Jammu division itself being a home for large diversity in physiographic features and agro-climatic variations underlines the vast scope of agriculture in this region. The sub-tropical belt of Jammu and Kashmir State which extends between 300-800 m amsl encompasses whole of Jammu and Samba districts besides parts of Kathua, Udhampur and Reasi districts. The climate of this sub-tropical belt is broadly divided into four main seasons viz; winter season (January- February), pre-monsoon season (March-May), monsoon season (June-September) and post-monsoon season (October-December). As regards the cropping system, double and multiple cropping is followed on a larger scale in the warmer irrigated plains of sub-tropical area. Wheat, maize, rice, oilseeds and pulse crops are the major food grain crops grown of this region.*

*The geographical area of sub-tropical Jammu possess about 4,95,813 ha land, out of which a major chunk of 65% (3, 21, 677 ha) accounts for rainfed ecology with the rest part being irrigated ecology. Rainfall in this belt ranges from 800 mm to 1460 mm with an average annual rainfall of 1134 mm. The probability analysis of 30 years weather data from sub-tropical Jammu reveals that there lies a substantial temporal variation in rainfall and temperature and the situation is compounded by a series of extreme weathers including cold wave, heat wave, untimely rains, hailstorms etc. which limits the productivity of field and horticultural crops immensely, besides impacting the fodder shortage of livestock sector. Crop lodging of rice and wheat has become almost a periodic feature which led to colossal loss of field crops and incur heavy burden on govt. exchequer. Moreover, the present agriculture is already witnessing the climate change impact and will become more and more vulnerable in times to come. Therefore, to cope with the challenges posed by climate change and to keep pace with productivity level to feed the burgeoning population vis-à-vis the livelihood security in this region, it calls for contemplating a comprehensive crop contingent plan. The present contingent plan has been prepared very meticulously in a comprehensive way with the consideration that it will certainly benefit the personnel of line-department and other stakeholders of Jammu.*

## 2.0 Strategies for weather related contingencies

### 2.1 Drought

#### 2.1.1 Rain fed situation

Condition	Major Farming situation <sup>a</sup>	Normal Crop / Cropping system <sup>b</sup>	Suggested Contingency measures		
			Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures <sup>d</sup>	Remarks on Implementation
Early season drought (delayed onset)					
2 w delay (Normal date for onset is 29 June)	Sub-Tropical	<p><b><u>Cropping System-1</u></b>  <b>Maize – Wheat</b>            Maize [Hybrid, Vivek Maize-25, HQPM-9, : Kanchan 517, GS-2, Super Composite (Mansar)]</p> <p>Note: Generally the sowing of normal maize crop commences following the receipt of pre-monsoon rain (usually received from 10<sup>th</sup> of June onwards) with the objective that germination may take place before the regular onset of monsoon.</p>	<p><b><u>Cropping System-1</u></b>  <b>Maize (dry sowing) - Wheat</b>            Maize [Vivek Maize-25, HQPM-9, : Kanchan 517, GS-2, Super Composite (Mansar)]</p> <p><b><u>Cropping System-2</u></b>  <b>Cowpea - Wheat</b>            Cowpea: (EC 4216, Type-2)</p> <p><b><u>Cropping System-3</u></b>            Green gram - Wheat            Green gram(ML-131, PDM-4, SML-668, ML-818)</p> <p><b><u>Cropping System-4</u></b>  <b>Black gram - Wheat</b>            Black gram (Pant U-19, Pant U-26, Uttara)</p> <p><b><u>Cropping System-5</u></b>  <b>Pearl millet – Wheat</b>            Pearl millet (MHB-110, MH-179)</p> <p><b><u>Cropping System-6</u></b>  <b>Maize + Cowpea / Green gram / Black gram – Wheat</b>            Maize (Local maize)</p>	<p>Application of well decomposed organic manure @ 10 t/ha.            Ploughing and sowing should be done across the slope. Cultivate the field on receiving pre-monsoon showers.            Plough once with soil turning plough (<i>Tawi plough</i>) followed by twice with soil stirring plough (<i>deshi plough</i>) followed by planking for conservation of soil moisture.</p> <p>For sole maize, planting on ‘ridge and furrow’ system should be preferred.            Reduce the inter-row spacing from 75 to 60 cm and sow the seed following ‘Kera’ method and placement of fertilizer by ‘Pora’ method to facilitate hoeing/weeding.            Row ratio of maize +cowpea / green gram / black gram for grain purpose, should be 1 : 1.            Seed dressing with Thiram + Carbendazim in 2 : 1 ratio @ 3g/kg of seed            Dry sowing of seed 8-10 days before</p>	<p>Department of Agriculture to ensure supply of seed at block levels.</p> <p>Timely supply of seed and other inputs to farmers by the concerned.</p> <p>Farmers may be advocated to maintain the seed of self-pollinated crops on their own.</p>

			<p><b><u>Cropping System-7</u></b>  <b>Pearl millet + Cowpea/ Green gram/ Black gram – Wheat</b>          Pearl millet (Composite: WCC-75, I-CMS-7703), Cowpea (C-152, PS-42, Culture-1).</p>	<p>rains, with 15% higher seed rate in already tilled fields.          To overcome crust formation, put 1 cm layer of straw or locally available ‘branker leaves’.          Apply nitrogenous fertilizer in splits at proper soil moisture.          Inoculate the seed of pulses with their respective <i>Rhizobium</i> strains + PSB @ 5g/kg seed.</p>	
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Condition	Major Farming situation <sup>a</sup>	Normal Crop / Cropping system <sup>b</sup>	Suggested Contingency measures		
			Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures <sup>d</sup>	Remarks on Implementation
<p>Early season drought (delayed onset)</p> <p>2 w delay (Normal 29 June ± 5 days)</p> <p>2<sup>nd</sup> week of July</p>	Sub-Tropical region	<p><b><u>Cropping System-2</u></b>  <b>Pearl millet – Wheat</b>          (Bajra Hybrid: MHB-110, MH-179)</p> <p><b><u>Cropping System-3</u></b>  <b>Sesame – Wheat</b>          (Sesame: Punjab Til-1)</p> <p><b><u>Cropping system-4</u></b>  <b>Pulse – Wheat</b>          [Pulse: Cowpea(EC 4216, Type-2); Green gram (ML-131, PDM-4, SML-668, ML-818); Black gram (Pant U-19, Pant U-26, Uttara)]</p> <p><b><u>Cropping System-5</u></b></p>	<p><b><u>Cropping System-8</u></b>  <b>Sesame + Black gram – Wheat</b>          Sesame (Punjab Til-1) + Mash (Pant U-19, Uttara)</p> <p><b><u>Cropping System-9</u></b>  <b>Groundnut – Wheat</b>          Groundnut (Punjab No. 1, M-13, JL-24)</p> <p><b><u>Cropping System-10</u></b>          Maize / Sorghum (fodder) – Toria – Wheat          Maize (African tall/Local maize)</p>	<p>Seed hardening with 18 hours soaking in water followed by 24 hours shade drying before sowing.          Sesame and black gram should be intercropped with 1 : 1 ratio by following ‘kera’ method of sowing.          Follow recommended crop geometry for all crops.          Apply <i>pendamethalin</i> @ 1 kg/ha as pre-emergence application in sole pulse crops.          Apply atrazine @ 1 kg/ha as pre-emergence application in sole maize crop.          Weeding-cum-hoeing at 30 DAS with hand blade hoe or khurpa.          Adopt rain water harvesting measures.</p>	

		Maize + Cowpea / Green gram / Black gram – Wheat <u><b>Cropping System–6</b></u> Maize / Sorghum (fodder) – Toria– Wheat (Maize: African tall, Local maize; Sorghum: MP Chari, Type-4, Swarna-413, Ujjain)			
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Condition		Suggested Contingency measures			
Early season drought (delayed onset)	Major Farming situation <sup>a</sup>	Normal Crop / Cropping system <sup>b</sup>	Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures <sup>d</sup>	Remarks on Implementation
4 w delay (Normal date for onset is 29 June)	Sub-Tropical	<u><b>Cropping System–1</b></u> <b>Cowpea - Wheat</b> Cowpea: (EC 4216, Type-2) <u><b>Cropping System–2</b></u> <b>Green gram - Wheat</b> Green gram(ML-131, PDM-4, SML-668, ML-818) <u><b>Cropping System–3</b></u> <b>Black gram - Wheat</b> Black gram (Pant U-19, Pant U-26, Uttara) <u><b>Cropping System–4</b></u>	<u><b>Cropping System–1</b></u> <b>Pearl millet (grain) – Wheat</b> Pearl millet (MHB-110, MH-179) through transplanting of 3 week old seedling. <u><b>Cropping System–2</b></u> <b>Pearl millet + Cowpea (fodder) – Wheat</b> Pearl millet (MHB-110, MH-179, Local) Cowpea: (EC 4216, Type-2, Local) <u><b>Cropping System–3</b></u> <b>Maize + Cowpea + Sorghum</b>	Same as above, however, for some specific crops, measures are as follows:  With anticipation of further delay in rain, nursery of pearl millet may be raised for later transplanting. Seeds of (Maize + Cowpea + Sorghum) should be mixed in the ratio of 2 : 1 : 1. Inoculate the seed of pulses with their respective <i>Rhizobium</i> strains + PSB @ 5g/kg seed.	Department of Agriculture to ensure supply of seed at block levels.  Timely supply of seed and other inputs to farmers by the concerned.  Farmers may be advocated to maintain the seed of self-pollinated crops on their own.

		<p><b>Pearl millet – Wheat</b> Pearl millet (MHB-110, MH-179)</p> <p><b><u>Cropping System-5</u></b> <b>Maize + Cowpea / Green gram / Black gram – Wheat</b> Maize (Local maize)</p> <p><b><u>Cropping System-6</u></b> <b>Pearl millet + Cowpea/ Green gram/ Black gram – Wheat</b> Pearl millet (Composite: WCC-75, I-CMS-7703), Cowpea (C-152, PS-42, Culture-1).</p>	<p><b>(fodder) - Wheat</b> e (African tall / Local maize); Sorghum (MP Chari, Type-4, Swarna-413, Ujjain, Local)</p> <p><b><u>Cropping System-4</u></b> <b>Green gram (fodder) - Wheat</b> Green gram(ML-131, PDM-4, SML-668, ML-818, Local)</p> <p><b><u>Cropping System-5</u></b> <b>Black gram (fodder) - Wheat</b> Black gram (Pant U-19, Pant U-26, Uttara, Local)</p> <p><b><u>Cropping System-6</u></b> <b>Cowpea (fodder) - Wheat</b> Cowpea (C-152, PS-42, Culture-1, Local).</p>		
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Condition	Major Farming situation <sup>a</sup>	Normal Crop / Cropping system <sup>b</sup>	Suggested Contingency measures		
			Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures <sup>d</sup>	Remarks on Implementation
6 w delay (Normal date for onset is 29 June)	Sub-Tropical	<p><b><u>Cropping System-1</u></b> <b>Pearl millet (grain) – Wheat</b> Pearl millet (MHB-110, MH-179) through transplanting of 3 week old seedling.</p> <p><b><u>Cropping System-2</u></b> <b>Pearl millet + Cowpea (fodder) - Wheat</b></p>	<p><b><u>Cropping System-1</u></b> <b>Pearl millet + Cowpea (fodder) - Wheat</b> Pearl millet (Local) Cowpea: (Local)</p> <p><b><u>Cropping System-2</u></b> <b>Maize + Cowpea + Sorghum (fodder) - Wheat</b> e (Local maize); hum (Local)</p>	Incorporation of green manure crops may be done before flowering.	<p>Department of Agriculture to ensure supply of seed at block levels.</p> <p>Timely supply of seed and other inputs to farmers by the concerned.</p>

	<p>Pearl millet (MHB-110, MH-179, Local) Cowpea: (EC 4216, Type-2, Local)</p> <p><b><u>Cropping System-3</u></b> <b>Maize + Cowpea + Sorghum (fodder) - Wheat</b> Maize (African tall / Local maize); Sorghum (MP Chari, Type-4, Swarna-413, Ujjain, Local)</p> <p><b><u>Cropping System-4</u></b> <b>Green gram (fodder) - Wheat</b> Green gram(ML-131, PDM-4, SML-668, ML-818, Local)</p> <p><b><u>Cropping System-5</u></b> <b>Black gram (fodder) - Wheat</b> Black gram (Pant U-19, Pant U-26, Uttara, Local)</p> <p><b><u>Cropping System-6</u></b> <b>Cowpea (fodder) - Wheat</b> Cowpea (C-152, PS-42, Culture-1, Local).</p>	<p><b><u>Cropping System-3</u></b> <b>Green gram (fodder) - Wheat</b> Green gram(Local)</p> <p><b><u>Cropping System-4</u></b> <b>Black gram (fodder) - Wheat</b> Black gram (Local)</p> <p><b><u>Cropping System-5</u></b> <b>Cowpea (fodder) - Wheat</b> Cowpea (Local)</p> <p><b><u>Cropping System-6</u></b> <b>Dhaincha / Sunhemp / Cowpea / Green gram / Black gram (Green manuring) - Wheat</b></p> <p>For all green manuring crops local cultivar should be preferred.</p>		<p>Farmers may be advocated to maintain the seed of self-pollinated crops on their own.</p>
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Condition	Major Farming situation <sup>a</sup>	Normal Crop / Cropping system <sup>b</sup>	Suggested Contingency measures		
			Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures <sup>d</sup>	Remarks on Implementation
Early season drought (delayed onset)					
8 w delay (Normal date for onset is 29 June)	Sub-Tropical	<p><b><u>Cropping System-1</u></b>  <b>Pearl millet + Cowpea (fodder) - Wheat</b>            Pearl millet (Local)            Cowpea: (Local)</p> <p><b><u>Cropping System-2</u></b>  <b>Maize + Cowpea + Sorghum (fodder) - Wheat</b>            Maize (Local)            Sorghum (Local)</p> <p><b><u>Cropping System-3</u></b>  <b>Green gram (fodder) - Wheat</b>            Green gram (Local)</p> <p><b><u>Cropping System-4</u></b>  <b>Black gram (fodder) - Wheat</b>            Black gram (Local)</p> <p><b><u>Cropping System-5</u></b>  <b>Cowpea (fodder) - Wheat</b>            Cowpea (Local)</p> <p><b><u>Cropping System-6</u></b>  <b>Dhaincha / Sunhemp / Cowpea / Green gram / Black gram (Green manuring) - Wheat</b>            For all green manuring crops local cultivar should be preferred.</p>	<p><b><u>Cropping System-1</u></b>  <b>Toria - Wheat</b>            Toria (RSPT-1, RSPT-2)</p> <p><b><u>Cropping System-2</u></b>  <b>Gobhisarson + Toria</b>            Gobhisarson (GSL-1, GSL-2, DGS-1)</p> <p><b><u>Cropping System-3</u></b>  <b>Maize + Cowpea + Sorghum (fodder) - Wheat</b>            Maize (Local)            Sorghum (Local)</p> <p><b><u>Cropping System-4</u></b>  <b>Dhaincha / Sunhemp / Cowpea / Green gram / Black gram (Green manuring) - Wheat</b></p> <p>For all green manuring crops local cultivar should be preferred.</p> <p>Keep fallow or Plan for <i>Rabi</i> crop.</p>	Mixed cropping of Toria + Gobhisarson should be done by using recommended seed rate of respective crops.	<p>Department of Agriculture to ensure supply of seed at block levels.</p> <p>Timely supply of seed and other inputs to farmers by the concerned.</p> <p>Farmers may be advocated to maintain the seed of self-pollinated crops on their own.</p>



Condition	Suggested Contingency Measures				
	Major farming situation	Normal Crop/ Cropping sequence	Crop Management	Soil nutrient & Moisture conservation measures	Remarks on implementation
Early season drought (Normal onset)	Sub-tropical region	<p><b><u>Cropping System-1</u></b> Maize – Wheat</p> <p><b><u>Cropping System-2</u></b> Pearl millet – Wheat</p> <p><b><u>Cropping System-3</u></b> Sesame – Wheat</p> <p><b><u>Cropping system-4</u></b> Pulse – Wheat</p> <p><b><u>Cropping System-5</u></b> Maize + Cowpea / Green gram / Black gram – Wheat</p> <p><b><u>Cropping System-6</u></b> Maize / Sorghum (fodder) – Toria– Wheat</p>	<p>The crop may withstand the dry spell, if recommended quantity of organic matter (10 t/ha) is applied during land preparation.</p> <p>Encourage deep rooting by maintaining only moderate soil moisture during early vegetative growth.</p> <p>Maintain ideal plant population to minimize competition for moisture.</p> <p>Application of crop specific recommended herbicides to counter the weed menace.</p> <p>Resort to re-sowing of seed in the event of poor germination using 25% higher than the recommended seed rate.</p> <p>If plant population is less than 75%, then go for gap filling as &amp; when the soil moisture is conducive, and for gap filling contingent provision for raising seedlings in poly bags may be resorted to.</p> <p>It is always better to re-sow with subsequent rains instead of allowing sub-optimal poor plant stand to persist, provided the sowing window period is not over.</p>	<p>Provision of moisture conservation furrows may be kept to overcome any probable drought.</p> <p>Apply vegetative mulch with locally available herbs e.g. leaves of branker, lantern camera, or leuceana or any other plant materials.</p> <p>Hoeing by hand-hoe/rake to break the capillaries to arrest water loss from sub-surface soil layers.</p>	Ensure availability of seed of pulses from State Department of Agriculture and SKUAST-J.

			Provide life-saving irrigation.		
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Condition	Suggested Contingency Measures				
Mid-season drought [Long dry spell, consecutive 2 weeks rainless (>2.5 mm) period]	Major farming situation	Normal Crop/ Cropping sequence	Crop Management	Soil nutrient & Moisture conservation measures	Remarks on implementation
At vegetative stage	Sub-tropical region	<u>Cropping System-1</u> <b>Maize – Wheat</b> <u>Cropping System-2</u> <b>Pearl millet – Wheat</b> <u>Cropping System-3</u> <b>Sesame – Wheat</b> <u>Cropping system-4</u> <b>Pulse – Wheat</b> <u>Cropping System-5</u> <b>Maize + Cowpea / Green gram / Black gram – Wheat</b> <u>Cropping System-6</u> <b>Maize / Sorghum (fodder) – Toria–Wheat</b>	Life saving irrigation, if available. Thin out about 20% of plant population. <i>In-situ</i> weed mulching. Remove lower leaves. Spray 2% KCl to minimize drought effect. Foliar application of 2% urea at pre-flowering stages to resist effect of drought stress. Spray of kaolin@ 5%. Spray of 1,000 ppm Thiourea.	Opening of conservation furrows in between two rows. Inter-culture operation (soil mulching) by wheel hand hoe to keep the crop weed free. Undertake hoeing, weeding and making of shallow ridges near the base of crop to avoid competition for water as well as its <i>in-situ</i> conservation. Don't use chemicals for weed management under stress. Withhold soil application of N fertilizer up to receipt of rainfall, and split the N application as many times as possible.	

Condition	Suggested Contingency Measures				
	Major farming situation	Normal Crop/ Cropping sequence	Crop Management	Soil nutrient & Moisture conservation measures	Remarks on implementation
Mid-season drought [Long dry spell, consecutive 2 weeks rainless (>2.5 mm) period]					
At flowering/fruiting stage	Sub-tropical region	-do-	<p>Life saving irrigation, if available. If there is no grain setting, harvest the crop for fodder.</p> <p>Spray 2% KCl + 0.1 ppm of boron to green/black gram to lower the effect of drought stress.</p> <p>Remove lower leaves for fodder or for mulching.</p> <p><i>For Maize:</i> If grain setting has occurred, the tassels can be cut down to reduce transpiration. Maize can be cut at harvest maturity and put to sale in the market.</p> <p>Thin out the plants to 50% of plant population and the harvested plants can be used either as mulch material or fed to animals as green fodder or can be used for hay/silage purpose.</p>	<p>Use locally available plant materials or removed lower leaves of respective crops for mulching.</p> <p>Light soil stirring operation by traditional agricultural tools may be resorted to in order to break the capillaries for reducing water loss from soil.</p>	Construction of rain water harvesting farm ponds under MGNREGA and RKVY etc.

Condition	Suggested Contingency Measures				
	Major farming situation	Normal Crop/ Cropping sequence	Crop Management	Rabi crop planning	Remarks on implementation
Terminal drought (Early withdrawal of monsoon)					
	Sub-tropical region	-do-	<p>Give life saving supplemental irrigation.</p> <p>Harvest at intervals as and when the plant show physiological</p>	<p>Deep sowing with minimum soil load on seed.</p> <p>Prefer pre-soaked seed sowing in residual moisture conserved fields.</p>	<p>Policy may be framed for Crop Insurance.</p> <p>Construction of farm</p>

			<p>maturity.</p> <p>For maize, harvest maturity parameter can also be considered.</p> <p>Plough and plank the harvested fields immediately for conserving residual moisture.</p>	<p>If available, FYM may be applied as per recommendations.</p> <p>Practice 'kera' method for sowing and 'pora' for fertilizer placement.</p> <p>Apply nitrogenous fertilizer preferably in three splits comprising 50% as basal, and rest 50% in two splits.</p> <p>Recommended doses of potash must be applied to combat the drought in winter.</p>	<p>ponds under MGNREGA and RKVY etc.</p>
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### 2.1.2 Drought – Irrigated situation

Condition	Suggested Contingency Measures				
	Major Farming situation	Normal crop / Cropping system	Change in crop/Cropping system	Agronomic measures	Remarks on implementation
Delayed release of water in canals due to low rainfall	Canal irrigated systems				
	(Ranbir Canal Command & Ravi-Tawi Command)	<p><b><u>Cropping system-1</u></b> Rice (Long/medium duration) – Wheat – Fallow Rice (Jaya, PR-113, PC-19, Basmati-370, Ranbir Basmati, Basmati-564, Sanwal Basmati); Wheat (HD-2967, RSP-561, Raj-3077)</p> <p><b><u>Cropping system-2</u></b> Rice (early maturing) –</p>	<p>Rice (medium duration) – Gobi Sarson – Summer pulse</p> <p>Rice (medium duration) – Marigold – French bean</p> <p>Rice (long/medium</p>	<p>Grow rice seedlings following staggered mode or by dapog method. Go for direct seeding with 15% higher seed rate through drum seeder.</p> <p>Conserve rainwater by increasing dike height.</p> <p>For rice, increase number of seedlings per hill; reduce spacing (15 x 15 cm, instead of 20 x 15 cm) and transplant at shallow depth (2-3</p>	<p>University may contemplate on rice varietal improvement programme for prolonging the better establishment capabilities of even overage seedlings.</p> <p>Planning for <i>Rabi</i> season needs to be taken up well ahead by considering the</p>

	<p>Berseem (for fodder &amp; seed production) Rice (IET 1410); Berseem (Vardan, VL-1, Mescavi) <b><u>Cropping system-3</u></b> Rice (early maturing) – Potato – Wheat (late) Potato (Kufribadsah); Late wheat (PBW-373, Raj-3765) <b><u>Cropping system-4</u></b> Rice (medium duration) – Gobi Sarson – Summer pulse Gobi sarson (GSL-1, DGS-1); Summer pulse (SML-668, PS-16, PDM-54) <b><u>Cropping system-5</u></b> Rice (medium duration) – Wheat – Mixed fodder (Maize + Cowpea + Chari)</p> <p>Mixed fodder [Local Chari and Cowpea along with Maize (African tall/J-1006)]</p> <p><b><u>Cropping system-6</u></b> Rice (long/medium duration) – Wheat – Dhaincha(green manure) Dhaincha (Local cultivar) <b><u>Cropping system-7</u></b> Rice (early maturing) –</p>	<p>duration) – Wheat – <i>Dhaincha</i>(green manure)</p> <p>For cropping system-10, there will be no change.</p>	<p>cm). For IET-1410, use 3-4 seedlings per hill up to 21 July; and for Jaya, PC-19 use 4-5 seedlings per hill up to last week of July. SRI method of transplanting may be promoted. For long duration rice followed by late sown wheat, zero-tillage for wheat is preferable. Sowing of late varieties of wheat will be a preferable option. Practice of conjunctive use of canal &amp; groundwater is advocated. Relay cropping of berseem in rice can be followed. For sugarcane, where the crop is already in the field, some mulching measures can be adopted to escape moisture stress period. Preferred pre-sowing irrigation for wheat.</p> <p>For potato, follow alternate furrow irrigation or sprinkler irrigation.</p>	<p>available supply of water.</p> <p>Groundwater potential needs to be explored by installation of additional pumping stations by irrigation departments of J &amp;KVarietal improvement for realising better yields even in wheat under late sown conditions.</p>
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		Potato – Onion Onion (Nasik red) <u><b>Cropping system-8</b></u> Rice (early maturing) – Cabbage – Onion <u><b>Cropping system-9</b></u> Rice (medium duration) – Marigold – French bean Marigold (Pusanarangi); French bean (VL-63) <u><b>Cropping system-10</b></u> Sugarcane – Fallow Sugarcane(COJ-64, COJ-81, COJ-77)			
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Condition	Suggested Contingency Measures				
	Major Farming situation	Normal crop / Cropping system	Change in crop/Cropping system	Agronomic measures	Remarks on implementation
	<b>Canal irrigated systems</b>				
Limited release of water in canals due to low rainfall	(Ranbir Canal Command & Ravi-Tawi Command)	<u><b>Cropping system-1</b></u> Rice (Long/medium duration) – Wheat – Fallow Rice (Jaya, PR-113, PC-19, Basmati-370, Ranbir Basmati, Basmati-564, Sanwal Basmati); Wheat (HD-2967, RSP-561, Raj-3077) <u><b>Cropping system-2</b></u> Rice (early maturing) – Berseem (for fodder & seed	No change.	Give irrigation only at critical growth stages. Light irrigation may be applied during initial stages when root growth is limited (5 cm water for 5 days). Follow-up the <i>alternate wetting &amp; drying</i> with every 3-5 days interval instead of continuous ponding. Increase water use efficiency through sprinkler system or drip system or alternate furrow irrigation system.	University may strive to develop less water requiring varieties of different crops without compromising the yield potential.  Planning for <i>Rabi</i> season needs to be taken up well ahead by considering the available supply of water.

	<p>production) Rice (IET 1410); Berseem (Vardan, VL-1, Mescavi) <b><u>Cropping system-3</u></b> Rice (early maturing) – Potato – Wheat (late) Potato (Kufribadsah); Late wheat (PBW-373, Raj-3765) <b><u>Cropping system-4</u></b> Rice (medium duration) – Gobi Sarson – Summer pulse Gobi sarson (GSL-1, DGS-1); Summer pulse (SML-668, PS-16, PDM-54) <b><u>Cropping system-5</u></b> Rice (medium duration) – Wheat – Mixed fodder (Maize + Cowpea + Chari) Mixed fodder [Local Chari and Cowpea along with Maize (African tall/J-1006)] <b><u>Cropping system-6</u></b> Rice (long/medium duration) – Wheat – Dhaincha(green manure) Dhaincha (Local cultivar) <b><u>Cropping system-7</u></b> Rice (early maturing) – Potato – Onion Onion (Nasik red) <b><u>Cropping system-8</u></b> Rice (early maturing) – Cabbage – Onion <b><u>Cropping system-9</u></b> Rice (medium duration) –</p>	<p>Spray of potassic fertilizer with adjuvants. To check lodging and excess transpiration losses, lopping of the upper half of crop canopy (for Basmati rice) after 45 DAT may be resorted to. Reduce loss of soil moisture by mulching of crop rows. Consequent upon the late harvesting of rice, practice zero-tillage in wheat, to offset its yield losses. Besides, planting on beds with ridge seeder, apply irrigation only at critical stages (CRI, flowering, dough) coupled with split application of N. Prefer cropping system having short duration cultivars of crops. Use recommended quantities of organic manures to improve water holding capacity of soils, besides nutrient recycling.</p>	<p>Judicious exploitation of groundwater resources may be resorted to for life saving irrigation.  Water may be released on rotation basis (for upper, middle, and tail-reach).  Linkage with on-going govt. schemes to promote micro-irrigation.  Explore the possibilities / availability of less water requiring crop varieties from different seed sources like NSC or other Universities or Private Companies etc. in order to undertake their testing for adaptability to recommend these under Jammu conditions.</p>
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		Marigold – French bean Marigold (Pusanarangi); French bean (VL-63) <b>Cropping system-10</b> Sugarcane – Fallow Sugarcane(COJ-64, COJ-81, COJ-77)			
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Condition	Suggested Contingency Measures				
	Major Farming situation	Normal crop / Cropping system	Change in crop/Cropping system	Agronomic measures	Remarks on implementation
Non-release of water in canals under delayed onset of monsoon in catchment	Canal irrigated systems				
	(Ranbir Canal Command & Ravi-Tawi Command)	<b>Cropping system-1</b> Rice (Long/medium duration) – Wheat – Fallow Rice (Jaya, PR-113, PC-19, Basmati-370, Ranbir Basmati, Basmati-564, Sanwal Basmati); Wheat (HD-2967, RSP-561, Raj-3077) <b>Cropping system-2</b> Rice (early maturing) – Berseem (for fodder & seed production) Rice (IET 1410); Berseem	Rice may be replaced partially with kharif pulses (black gram /green gram), kharifoilseeds (til/ground nut) and maize using their respective short duration varieties. Black gram: Uttara, Pant U-19, Pant U-26; Green gram: PDM-54, ML-131, SML-668; Til: Punjab Til-1; Groundnut: JL 24.	Promotion of less water requiring short duration pulses, millets and cereals. Supplemental irrigation to be provided with groundwater or any other source of stored rainwater i.e. farm ponds. Try to reduce the conveyance losses through spreading ploythene sheet in field channel. Hoeing-cum-weeding may be carried out to minimize the crop-weed competition for water. Mixed fodder of maize + cowpea + charry in seed ratio of 2 :	Linkage with seed supply agencies to get access for seeds of alternate crops as suggested.  Ensure either power supply or diesel operated system for pumping groundwater.



	<p>(Vardan, VL-1, Mescavi)</p> <p><b><u>Cropping system-3</u></b> Rice (early maturing) – Potato – Wheat (late) Potato (Kufribadsah); Late wheat (PBW-373, Raj- 3765)</p> <p><b><u>Cropping system-4</u></b> Rice (medium duration) – Gobi Sarson – Summer pulse Gobi sarson (GSL-1, DGS- 1); Summer pulse (SML- 668, PS-16, PDM-54)</p> <p><b><u>Cropping system-5</u></b> Rice (medium duration) – Wheat – Mixed fodder (Maize + Cowpea + Chari) Mixed fodder [Local Chari and Cowpea along with Maize (African tall/J- 1006)]</p> <p><b><u>Cropping system-6</u></b> Rice (long/medium duration) – Wheat – Dhaincha(green manure) Dhaincha (Local cultivar)</p> <p><b><u>Cropping system-7</u></b> Rice (early maturing) – Potato – Onion Onion (N-53)</p> <p><b><u>Cropping system-8</u></b> Rice (early maturing) –</p>	<p>Similarly, wheat may also be replace with rabi pulses (chick pea/lentil/peas) or oilseeds (mustard/gobisarson) Chickpea: PBG-1, Gaurav, GNG-469; Lentil: L9/12, PL- 406, L-4147; Pea: Rachna, T-163.</p> <p>Fallow – Fodder – Wheat (in heavy textured soil) Maize - Toria - Wheat Pearl millet - Wheat Short duration vegetable crops of French bean (bush type) / Cabbage</p> <p>may be preferred.</p>	<p>2 : 1(60 kg/ha)can also be a alternative viable option.</p>	
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		Cabbage – Onion Cabbage: Golden acre <u><b>Cropping system-9</b></u> Rice (medium duration) – Marigold – French bean Marigold (Pusanarangi); French bean (VL-63) <u><b>Cropping system-10</b></u> Sugarcane – Fallow Sugarcane(COJ-64, COJ-81, COJ-77)			
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Condition	Suggested Contingency Measures				
	Major Farming situation	Normal crop / Cropping system	Change in crop/Cropping system	Agronomic measures	Remarks on implementation
Lack of inflows into tanks due to insufficient/delayed onset of monsoon	Not applicable.				

Condition	Suggested Contingency Measures				
	Major Farming situation	Normal crop / Cropping system	Change in crop/Cropping system	Agronomic measures	Remarks on implementation
Insufficient groundwater recharge due to low rainfall	Ground water irrigated situation	-do-	Rice may be replaced partially with <i>kharif</i> pulses (black gram /green gram), <i>kharif</i> oilseeds(til/ground nut) and maize using their respective short duration varieties. <i>Black gram:</i> Uttara, Pant U-19, Pant U-26; <i>Green gram:</i> PDM-54, ML-131, SML-668; <i>Til:</i>	Lighter irrigation may be applied during initial stage of crop growth. Reduce conveyance losses while irrigating by spreading polythene sheets in field channels. Laser land levelling for efficient use of water.	Linkage with ongoing IWMP to construct percolation tanks for groundwater recharge.  Policies for provision of subsidy for <b>drip/sprinkler / laser leveller</b> should be formulated to promote efficient water use.

			<p>Punjab Til-1;  <i>Groundnut</i>: JL 24.          Similarly during <i>Rabi</i>, wheat may be replaced with pulses (chick pea/lentil / peas) or oilseeds (mustard / gobisarson)  <i>Chickpea</i>: PBG-1, Gaurav, GNG-469; <i>Lentil</i>: L9/12, PL- 406, L-4147; <i>Pea</i>: Rachna, T-163.</p> <p>The other alternate systems          Fallow – Fodder – Wheat (in heavy textured soil)          Maize - Toria - Wheat</p> <p>Pearl millet - Wheat          Short duration vegetable crops of French bean (bush type) / Cabbage may be preferred.</p>	<p>Life-saving irrigation.          Spray potassic fertilizer with adjuvant.          Foliar N management instead of soil top dressing.          Preferpre-sowing irrigation.          Balance fertilization.          Irrigation at critical growth stages through sprinkler system.          Application of IPNM</p> <p>Inter-culture operation.          Alternate furrow irrigation of wheat under furrow irrigated raised bed system.</p>	<p>Awareness for efficient use of water needs to be inculcated to the line-department personnels like AEOs /ADOs as well as the end-users through KVK / ATMA etc.</p> <p>Convergence with ongoing programmes like MGNREGA, RKVY etc.</p>
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## 2.2 Unusual Rains (Untimely/Unseasonal) (For both rainfed& irrigated situations)

Condition	Suggested Contingency Measures			
	Vegetative Stage	Flowering Stage	Crop Maturity Stage	Post-Harvest
<b>Continuous high rainfall in a short span leading to water-logging</b>				
	Forewarning regarding occurrence of aberrant weather situations (unusual rain) to farmers, so that they get prepared to cope with the situation in a systematic manner.			
<b>Crop-1: Maize</b>	Drain out the excess water as early as possible. Earth-up of maize for anchorage as and	Control the stalk-rot with recommended application of bleaching powder @ 20 kg/ha.	Provide proper drainage and harvest green cobs from lodged plants.	Dry the maize grain to optimum moisture content to ease shelling of cobs with

	<p>when the soil moisture is at optimum level.</p> <p>Inter-cultivation with wheel hoe/hoe to improve the aeration as well as to control weeds.</p> <p>Following the drainage, apply 20 kg N + 10 kg K<sub>2</sub>O/ha, if plant shows yellowing.</p> <p>Spray KNO<sub>3</sub> 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 (Trade name: ) at 1% to support nutrition.</p> <p>Alternatively, foliar spray of 2% urea solution after proper drainage can be undertaken.</p> <p>Take up timely control measures for pink stem borer and sheath blight.</p> <p>Mix Chloropyriphos 1.5% dust or Lindane 1.3% dust @ 25 kg/ha in the soil with last ploughing. to ward off cut worm attack.</p> <p>Measures if not taken before sowing, to avoid population build up and attack of <b>cut worm</b>, practise directed spray to soil by spraying of Endosulfan 35 EC @ 3 lit. in 100 lit. of water per hectare.</p>	<p>Top dressing of N at proper soil moisture level.</p> <p>Apply 20 kg N + 10 kg K/ha after draining excess water.</p> <p>Spray KNO<sub>3</sub> 1% or water-soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition.</p> <p>Take up timely control measures for sheath blight and post flowering stalk rots.</p> <p>For control of <b>head smut</b>, uproot the affected plants and destroy.</p> <p>For control of <b>collar rot</b>, uproot the affected plants and if needed, drench near the collar region with Mancozeb 2.5 kg + 50 g Streptocycline in 1000 L of water.</p>	<p>Perform optimum shed drying of harvested cobs before marketing.</p>	<p>maize-Sheller.</p> <p>Perform further drying of shelled maize grains to attain optimum moisture of 12-14% for safe storage.</p> <p>Clean and fumigate the storage places properly to create infection free environment for long-term safe storage.</p>
Crop-2: <b>Rice</b>	<p>Apply 10 kg of N + 5 kg of K<sub>2</sub>O/ha after draining the excess water, if plants show yellowing, especially in lower leaves.</p> <p>Strengthen field bunds in order to minimize the drain away of nutrients.</p>	<p>Drain out excess water to avoid lodging at this stage.</p> <p>Top dressing of N @ 10 kg/ha and 5 kg of K/ha after draining extra water to offset the effect of leached out nutrients.</p>	<p>Draining of superfluous water at an earliest.</p> <p>Delay the harvesting operation, and resume the same as and when the conditions are favourable.</p> <p>Harvested sheaves are to</p>	<p>Drain out water and spread the sheaves loosely on the field bunds or at any elevated sides which are free of standing water.</p> <p>Panicles should be sprayed with 5% common salt solution in order to prevent germination of grains in the panicles itself</p>

			be shifted to the safer places and be kept there for few days to enable the remaining immature grains to attain maturity.	and to avoid spoilage of straw from moulds. Thresh after drying the sheaves properly. Before storing of grains, grain should be dried properly up to moisture content of about 12-14%. Clean and fumigate the storage places properly to create infection free environment for long-term safe storage.
<b>Crop-3: Pulses (Black gram/Green gram)</b>	<p>Make channels to provide safe passage to drain out the excess water from fields.</p> <p>In the event of high mortality of seedlings, re-sowing may be resorted to as and when the soil attains optimum moisture conditions.</p> <p>Apply 4–5kg N /ha following drainage.</p> <p>Spray KNO<sub>3</sub> 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition, in the event of plant show yellowing, especially in lower leaves.</p> <p>To avoid fungal diseases, spray copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals.</p> <p>Take up timely control measures against the outbreak of pests like <i>Spodoptera</i> etc.</p> <p><b>DISEASE/PEST</b></p>	<p>Do not allow water to stagnate as it will lead to suffocation of roots and eventually disrupting the nutrient uptake especially nitrogen.</p> <p>Adopt plant protection measures with regard to outbreak of pest &amp; diseases.</p> <p>Spray KNO<sub>3</sub> 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition.</p> <p>To avoid fungal diseases, spray copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals.</p> <p>In case of chances of excessive damage, the above ground biomass may be buried in soil for green manuring purpose.</p>	<p>Make field channels to remove surface ponding.</p> <p>Monitor the crop for the extent of pod filling. In case it appears that most of the pods are not filled with grains, the crop may be harvested for use as fodder, and advance planning for <i>rabi</i> sowing may be initiated, specially for sowing of toria as a contingent crop in rainfed areas.</p>	<p>Spread the rainwater soaked bundles on field bunds or drying floors or any other elevated spot to hasten the process of drying.</p> <p>Thresh the bundles after they are dried properly.</p> <p>Dry the grain to proper moisture percent (12%) before bagging and storing to prevent deterioration in quality during storage.</p> <p>Clean and fumigate the storage places properly to create infection free environment for long-term safe storage.</p>

		If excess flower drop is there, the crop may be harvested for use as fodder.		
<b>Crop-4: Wheat</b>	<p>Provide drainage. Top dressing with nitrogen @ 25 kg/ha at optimum soil moisture to remove deficiency of N (yellowing) caused due to leaching loss of N, and wherever possible run-off may be collected to make provision of protective irrigation at early growth stages. Sow wheat in FIRBS method.</p>	<p>Drain out excess water. Proper bunding. Top dressing of nitrogenous fertilizer @ 20-30 kg/ha at optimum soil moisture to gain vigour. For controlling the outbreak of yellow rust, prophylactic measures with the application of Propaconazol (Tilt) @ 1 ml in 1 litre of water at fortnight intervals may be adopted. For the control of <i>Karnal bunt</i> especially in seed crop, the application of Propaconazol (Tilt) @ 1 ml in 1 litre of water may be resorted to at seed development stage.</p>	<p>Drain out excess water. Delay the harvesting operation, and resume the same as and when the conditions are favourable.</p>	<p>Harvested bio-mass are to be shifted to the safer places and be kept there for few days to enable the remaining immature grains to attain maturity. Dry the grain to proper moisture percent (12-14%) before bagging and storing to prevent deterioration in quality during storage. Clean and fumigate the storage places properly to create infection free environment for long-term safe storage.</p>
<b>Crop-5: Torja/Gobhi season/ Mustard</b>	<p>Drain out excess water. In the event of poor germination, reseeded can be resorted to as and when the soil is at optimum moisture. In case of yellowing in leaves, foliar spray of 2% urea solution after proper drainage can be undertaken. Inter-cultivation with hoe to improve the aeration as well as to control weeds.</p>	<p>Drain out excess water. Foliar spray with 2% urea after cessation of rains.</p>	<p>Drain out the water completely. Delay the harvesting operation, and resume the same as and when the conditions are favourable.</p>	<p>Harvested bio-mass are to be shifted to the safer places and staked for few days to enable the remaining immature grains to attain maturity. Dry the grain to proper moisture percent (12-14%) before bagging and storing to prevent deterioration in quality during storage. Clean and fumigate the storage</p>

				places properly to create infection free environment for long-term safe storage.
Crop-6: <b>Chickpea/Lentil</b>	Drain out excess water. Foliar spray with 1% urea after cessation of rains.	Drain out excess water. Foliar spray with 1% urea after cessation of rains.	Drain out water completely. Timely harvest of produce on a clear sunny day to avoid shattering.	Shifting to a safer place and drying of the produce before bagging and storage.
Crop-7: <b>Vegetables</b>  <b>Chilli</b>	Open trench to drain out excess water from field. Re-sowing/re-planting, if there is high mortality. For chilli, drain the water and spray with 2% urea solution 2-3 times.	Adopt plant protection measures with regard to outbreak of pest & diseases. For chilli, drain the water and spray with 2% urea solution 2-3 times.	Open trench to drain out excess water from field. Harvest the mature fruit on a clear sunny day.	In rainy/cloudy weather condition, spread the harvested marketable produce on a clean floor to avoid the fungal disease infection. Dry the pods on concrete floor immediately as and when the day is clear and sunny.
Crop-8: <b>Fruit Crops</b> <b>Mango, Guava</b> <b>Citrus, Aonla</b> <b>Litchi</b>	Avoid water stagnation of more than 48 hours. Measures to be taken to control soil erosion with bunding and gully plugging, planting of deep rooted grasses around the orchard. Raising of soil around the tree trunk to avoid direct contact of trunk with water. Apply Imidacloprid @ 3ml/ 10 litre or thiomethoxame @ 3 ml/ 10litre of water against jassid.	Excess water may be removed as early as possible. Mechanical clipping against mango malformation. Measures to be taken to control soil erosion with bunding and gully plugging, planting of deep rooted grasses around the orchard. Raising of soil around the tree trunk to avoid direct contact of trunk with water.	Dropped fruits of mango, guava, and aonlamay be collected and processed for pickles. Carry out harvesting when there is no rain.	Fruits must be stored in a well-ventilated structure. Market the fruits as soon as possible. Fruits of guava and aonlamaybe processed for preparation of jam and jellies.

<b>Heavy rainfall with high speed wind in a short span</b>				
Crop-1: <b>Maize</b>	Drain out excess water. Apply 20 kg N + 10 kg K /ha	Drain out excess water. Tie the fallen plants into	Drain out excess water.	Harvest the cobs after they are dried up properly.

	<p>after draining excess water. Take up inter cultivation and at optimum soil moisture condition to loosen and aerate the soil and to control weeds.</p> <p>Earthen-up the crop for anchorage.</p> <p>Spray KNO<sub>3</sub> 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition.</p> <p>Take up timely control measures for Pink stem borer, sheath blight and Turcicum leaf blight.</p>	<p>bundles with the help of maize leaves.</p> <p>As in vegetative stage.</p>		<p>Dry the grain to optimum moisture condition before storing.</p>
Crop-2: <b>Rice</b>	<p>Drain out excess water.</p> <p>Top dressing of N @ 10 kg/ha and 5 kg of K<sub>2</sub>O/ha after draining excess water.</p>	<p>Drain out excess water.</p> <p>Top dressing of N @ 10 kg/ha and 5 kg of K<sub>2</sub>O/ha after draining excess water.</p>	Drain out excess water.	
Crop-3: <b>Pulses (Black gram/Green gram)</b>	As in case of heavy rainfall.	-do-	-do-	<p>Dry the grain to optimum moisture condition before storing.</p>
Crop-4: <b>Wheat</b>	<p>Drain out excess water.</p> <p>High speed wind may be protected with vegetative barrier.</p>	<p>Drain out excess water.</p> <p>High speed wind may be protected with vegetative barrier.</p>	<p>Drain out excess water.</p> <p>Harvest on a clear sunny day.</p>	<p>Maintain optimum moisture of grain by drying.</p>
Crop-5: <b>Toria/Gobhi season/ Mustard</b>	As in case of wheat.	As in case of wheat.	As in case of wheat.	<p>Maintain optimum moisture of grain by drying.</p>
Crop-6: <b>Chickpea/Lentil</b>	As in case of wheat.	As in case of wheat.	As in case of wheat.	<p>Maintain optimum moisture of grain by drying.</p>



Crop-7: <b>Vegetables</b>	High speed wind may be protected with vegetative barrier.	High speed wind may be protected with vegetative barrier.	High speed wind may be protected with vegetative barrier.	Keep the produce at safer place.
Crop-8: <b>Fruit Crops</b> <b>Mango, Guava, Citrus, Aonla, Litchi</b>	Proper staking. Earthing around the trunk.	Prior plantation of trees around the orchard to serve as wind-breaks. Installation of anti-hail nets. Canopy management.	Installation of anti-hail nets. Timely harvesting. Proper disposal of fruits.	Matured fruits of guava/aonla may be collected and processed for jam and jellies.
<b>Citrus</b> (Mandarin/Sweet orange)	-do-	Spraying of 2, 4-D @ 20 ppm will enable to minimize the flower/fruit drop.	Fruits may be harvested only at mature stage before winter sets in.	Immediate harvesting of fruits, grading and marketing.

Condition	Suggested Contingency Measures			
	Vegetative Stage	Flowering Stage	Crop Maturity Stage	Post-Harvest
<b>Outbreak of pest and diseases due to unseasonal rains</b>				
<b>Crop1: Maize</b>	For maize cut worm, measures should be taken before sowing. Mix Chloropyriphos 1.5% D or Lindane 1.3% D @ 25 kg/ha in the soil with last ploughing. Where soil application could not be given, spray the crop with Endosulfan 35 EC @ 3 L in 100 L of water per hectare. Spraying should be direct on soil surface.	For control of head smut, uproot the affected plant and destroy. For control of collar rot, uproot the affected plants. If it needed, drench near the collar region with Mancozeb 2.5 kg + 50 g Streptocycline in 1000 L of water.	----	Well dry the produce up to 10-12% moisture before storage.
<b>Crop 2: Rice</b>	For control of leaf folder, spray Carbaryl 50 WP @ 1.5 kg/ha in 750 litre of water or spray the crop with Monocrotophos 36	For control of brown leaf spot, spray the crop with Mancozeb @ 0.25% or Hinosan @ 0.1% at the appearance of disease.	For control of brown leaf spot, spray the crop with Mancozeb @ 0.25% or Hinosan @ 0.1% at the appearance of disease.	Well dry the produce to prevent moulds.

	SL @ 750 ml/ha or Chloropyriphos 20 EC @ 1.5 litre/ha.			
<b>Crop 3: Moong/Mash</b>	For control of hairy caterpillar, spray Endosulfan 35 EC @ 1.5 L/ha or Carbaryl 50% WP @ 1.5 kg/ha in 750 L water.	For control of white fly, spray the crop with Malathion 50 EC @ 1 ml/L of water. For control of leaf spot diseases, spray the crop with Zineb (0.2%) or Mancozeb (0.25%).	For control of white fly, spray the crop with Malathion 50 EC @ 1 ml/L of water. For control of leaf spot diseases, spray the crop with Zineb (0.2%) or Mancozeb (0.25%).	Store in well ventilated temporary structures before marketing.
<b>Crop 4: Wheat</b>	For control of yellow rust, spray the crop with Mancozeb @ 0.25% or Triadimefon @ 0.01%. 1 <sup>st</sup> spray is to be given at the initiation of disease and repeat spraying after 10-14 days interval.	For control of yellow rust, spray the crop with Mancozeb @ 0.25% or Triadimefon @ 0.01%. 1 <sup>st</sup> spray is to be given at the initiation of disease and repeat spraying after 10-14 days interval.	For control of yellow rust, spray the crop with Mancozeb @ 0.25% or Triadimefon @ 0.01%. 1 <sup>st</sup> spray is to be given at the initiation of disease and repeat spraying after 10-14 days interval.	Well dry the produce up to 10-12% moisture before storage.
<b>Crop 5: Mustard / GobhiSarson</b>	For control of alternaria blight, destroy diseased debris. Spray with Mancozeb @ 0.2%.	For control of mustard aphid, spray Chlor-pyriphos 20 EC @ 0.025% or Monocrotophos 36 WSC @ 0.035% or Methyl demeton 25 EC @ 0.03% @ 900 ml or Endosulfan 35 EC @ 1.5 L/ha.	For control of mustard aphid, spray Chlor-pyriphos 20 EC @ 0.025% or Monocrotophos 36 WSC @ 0.035% or Methyl demeton 25 EC @ 0.03% @ 900 ml or Endosulfan 35 EC @ 1.5 L/ha.	Store in well ventilated temporary structures before marketing.
<b>Crop 6: Gram (Chick pea)</b>	For control of pod borer, collect grown up larvae and destroy them. Spray the crop with endosulfan @ 0.07%. For control of collar rot, uproot the affected plants.	For control of pod borer, collect grown up larvae and destroy them. Spray the crop with endosulfan @ 0.07%.	Carry out critical survey of fields for insect and disease attack in crops.	Well dry the produce up to 10-12% moisture before storage. Store in well ventilated temporary structures before marketing.
<b>Crop 7: Lentil</b>	To control collar rot, during sowing treat the seed with	----	----	Store in well ventilated temporary structures before

	Thiram, Carbendazim or Carboxin and Mancozeb @ 0.2%.			marketing.
<b>Crop 8: Peas</b>	To control powdery mildew, spray the crop with wettable sulphur @ 0.25%, Benomyl / Carbendazim @ 0.1% or Dinocap @ 0.05%.	To control pea aphid, or leaf miner, spray the crop with 0.05% Malathion 50 EC @ 1 L or 0.07% Endosulfan 35 EC @ 1.5 L/ha in 750 L of water.	----	Store in well ventilated temporary structures before marketing.
<b>Crop 9: Mango</b>	Drenching with carbendazim @ 0.1% at seeding stage against dampingoff/wilt and other foliar diseases.  Proper drainage of superfluous water.  Pruning of affected twigs and destroying it.	Protect against 'mealy bug' by ploughing of basin around the tree in winter months along with banding of polythene strips around the trunk.  To minimize 'mango malformation' affected or malformed twigs may be removed and burnt. Spray of 400 ppm NAA may be carried out in the month of October to control malformation. Spray sulphur fungicides to control powdery mildew. Spray carbendazim @ 0.1% against anthracnose. Maintenance of optimum moisture level in orchard.	Prophylactic measures should be taken to control powdery mildew. Measures to be taken against mango hoppers and mites.	Dip the fruits in solution of carbendazim to avoid post-harvest losses due course of storage. Proper handling after harvest to avoid fruit injury. Maintain aeration in storage to overcome fungal infection and blackening of fruits.
<b>Crop 10: Guava</b>	Drainage of excess water to manage soil borne diseases.	Spray of 400 ppm NAA at full bloom in the month of <u>April</u> will regulate the crop for winter season. For control of 'fruit fly' crop regulation should be practised	-----	Take preventive measures to check fungal attack on fruit. Taste of guava tend to deteriorate during rainy season than that of winter season and hence affect in marketability.

		for winter season crop.		
<b>Crop 11: Aonla</b>	Not applicable	Not applicable	For control of fruit drops, apply 2,4-D @ 20 ppm.	Immediate harvesting of fruits, grading and marketing.
<b>Crop 12: Citrus</b> (Mandarin & Sweet orange)	Proper drainage to avoid damping off of seedlings.  Drenching with Carbendazim @ 0.1% at seeding stage against damping off/wilt and other foliar diseases.	Spray against canker and leaf miner with recommended chemicals.  Remove the diseased twigs and burn them.	Management of lemon butterfly and citrus psylla with foliar spray of malathion 50 EC @ 10 ml or cypermethrin 25 EC @ 4 ml/10 lit of water.  Spray against canker and leaf miner with recommended chemicals.	Pre-harvest spray with fungicides to avoid post-harvest losses due to pests/diseases. Proper handling to avoid injury to the fruits.
<b>Crop 13: Ber</b>	Drainage of excess water to manage soil borne diseases.	Management of powdery mildew by using denocap or sulphur fungicides @ 0.03%.	Management of fruit fly.	Prophylactic measures to control post-harvest pests/diseases.

### 2.3 Extreme events: Heat wave / Cold wave / Frost / Hailstorm / Cyclone

Condition	Suggested Contingency Measures			
	Seedling/nursery stage	Vegetative stage	Reproductive stage	At harvest
<b>Heat Wave</b>				
Crop-1: <b>Maize</b>	Mulching to buffer the adverse effect of high temperature.	<i>In-situ</i> weed mulching.	<i>In-situ</i> weed mulching.	Not applicable.
Crop-2: <b>Rice</b>	Light and frequent irrigations at the appearance of hair-line cracks at the soil surface. Amend the iron deficiency with spray of iron sulphate @ 0.5%.	Repeated irrigations at the appearance of hair-line cracks on soil surface. Ponding of water for about consecutive 15 days after transplanting to ameliorate iron deficiency and for crop establishment. Proper irrigation throughout stress-period along with growing	Repeated irrigations at the appearance of hair-line cracks on soil surface.	Harvest the crop at physiological maturity.

		heat resistant varieties.		
Crop-3: <b>Pulse</b>	Light irrigation at early morning.	Light irrigation at early morning.	Light irrigation at early morning.	Harvest the crop at physiological maturity
Crop-4: <b>Vegetables</b>	Protect the seedlings by providing the shed. Arrangements/installation of wind breaks.	Light irrigation at evening hours.	Application of N fertilizers.	Harvest and market as early as possible.
<b>Cold Wave</b>				
Crop-1 Wheat	-----	Apply irrigation using sprinkler system, if available. Provide intense smoking during night, Glucose spray	Apply irrigation using sprinkler system, if available. Provide intense smoking during night, Glucose spray.	Harvest the crop at physiological maturity.
Crop-2 Mustard	-----	Light irrigation. Smoking during night.	Light irrigation. Smoking during night.	-do-
Crop-3 Gram	-----	-do-	-do-	-do-
Crop 4 Lentil	-----	-do-	-do-	-do-
<b>Horticulture</b>				
Crop 5: <b>Vegetables</b>	Protect the seedlings by providing the shed net.	Light irrigation either in early morning or evening time.	Application of N fertilizers.	Harvest and market as early as possible.
Crop-2				
<b>Frost</b>				
Crop-1: Wheat	----	Apply irrigation using sprinkler system, if available. Provide intense smoking during night.	Apply irrigation using sprinkler system, if available. Provide intense smoking during night.	Harvest the crop at physiological maturity.
Crop-2: Mustard		-do-	-do-	-do-
Crop-3: Gram		-do-	-do-	-do-
Crop 4: Lentil		-do-	-do-	-do-
<b>Horticulture</b>				

Crop-1				
Crop-2				
Crop-3				
<b>Hailstorm</b>				
Crop-1: Wheat				
Crop-2				
Crop-3				
Horticulture				
Crop-1				
Crop-2				
Crop-3				
<b>Cyclone</b>				

**2.4 Extreme events: Heat wave/Cold wave/Frost/Hailstorm/Cyclone**

Extreme event type	Suggested contingency measures			
	Seeding/Nursery stage	Vegetative stage	Reproductive stage	At harvest
<b>Heat wave</b> (Mango, Citrus, Guava, Anar)	Provide irrigation at weekly intervals for mango, and citrus to counter heat waves. If damage is severe, go for replanting.  Shade with wild bushes.	Apply irrigation if available, to combat the effect of high temperature.  Whitewashing of trunk may be undertaken to protect from heat wave. Mulching of basins with black polythene sheets. Creation of humidity to counter heat wave.	Create drip or sprinkler irrigation facilities to avoid adverse effect of heat wave. Mulching of basins. Creation of humidity to counter heat wave.	Keep the produce in shade.
<b>Frost</b> (Mango, Citrus, Guava, Anar)	Provide light irrigation. Making provision of smoke in the field.	Provide irrigation. Making provision of smoke in the field.	Provide irrigation. Making provision of smoke in the field.	Delay the harvesting of fruits.

	Provide thatching for young mango plants/seedlings before the onset of winters. Shade with wild bushes/jute bags.	Cover the young plants to avoid frost damage.	Mulching of basins.	
<b>Cold wave</b> (Citrus)	Protect with polythene sheet.	Smoking by burning farm waste materials, frequent and light irrigation during evening hours, basin mulching, application of supplementary dose of fertilizer.	Smoking by burning farm waste materials, frequent and light irrigation during evening hours, basin mulching, application of supplementary dose of fertilizer.	Delay the harvesting of fruits.
<b>Hailstorm</b> (Mango, Citrus, Guava)	Use anti-hail net to cover the nursery plants. <i>Thatching</i> should be done before the onset of winters. Weekly irrigation is being advocates to overcome from the same.	Cover the canopy with anti-hail net. Net house technology may be created for mature plants.	Cover the canopy with anti-hail net.	Dry and harvest fruits.  Sort out the injured fruits from the healthy fruits.

## 2.5 Contingency strategies for livestock, poultry, fisheries of Doda district

### 2.5.1 Livestock

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Drought</b>			
Feed & Fodder availability	Preserving the paddy straw, green maize fodder as silage. Establishment of silvi-pastoral models with <i>Grewiaoptiva (Dhamman)</i> , <i>Albizia</i> , <i>Bauhinia (Kachnar)</i> etc. as fodder trees. Encouraging the progressive farmers to grow combined non-leguminous and leguminous fodders like <i>Cenchrus sp.</i> , and <i>Penicitiumalomp</i> with <i>Clitoria</i> , <i>Stylosynthesis</i> etc. in small blocks.	Harvest and use biomass of dried up crops (wheat/maize/bajra/horse gram/green gram) and wetted grain as feed for livestock. Harvest all the top fodder available ( <i>Subabul</i> , <i>Glyricidia</i> , <i>Prosopis</i> etc.) and feed during drought. Concentrate ingrediants such as grains, brans, oilseed cakes, low grade maize grains etc. unfit for human consumption may be procured	Encourage progressive farmers to grow multi-cut fodder crops of berseem/oats/bajra/maize (UP chari. MP chari African tall etc.) on their own lands with input subsidy. Supply quality seeds of multi-cut sorghum, bajra, maize etc. well ahead of monsoon. Replenish feed and fodder banks.

	<p>Encourage growing of short-term fodder crops with multi-cut sorghum/bajra/maize or mixed cultivation of oat, berseem, and mustard.</p> <p>Sowing of cereals (sorghum/bajra) under dry land system and leguminous crops viz., berseem, lucern, horse-gram, cowpea etc. under low-lying/shallow water table conditions.</p> <p>Establishment of fodder bank at village level with available dry fodder (wheat straw, sorghum/bajra/maize stover etc.)</p> <p>Capacity building and preparedness of the stakeholders and official staff for the drought/floods.</p>	<p>from Govt. godowns for feeding as supplement for high productive animals during drought.</p> <p>Continuous supplementation of mineral mixtures to prevent infertility.</p> <p>Encourage mixing available kitchen vegetable waste with dry fodder while feeding to milch animals.</p>	
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<b>Suggested contingency measures</b>			
	<b>Before the event</b>	<b>During the event</b>	<b>After the event</b>
<b>Drought</b>			
Drinking Water	<p>Encourage water conservation methods at village levels to foster the ground water level in order to get adequate water supply during lean season.</p> <p>Identification of water resources</p> <p>Polythene lining of ponds to check percolation loss of water.</p> <p>Rainwater harvesting in farm ponds.</p> <p>Construction of drinking water tanks in herding places/village junctions/relief camp locations.</p> <p>Community drinking water trough can be arranged in community grazing areas.</p>	<p>Restrict wallowing of animals in water bodies/resources.</p> <p>Add alum in stagnant water bodies.</p> <p>Provide wholesome clean drinking water to all the livestock during the day time.</p> <p>Resorting to alternate day watering to camel, sheep, and goat.</p>	<p>Watershed management perspective should be put in place to conserve rain/stream water.</p> <p>Bleach (0.1%) drinking water/water sources.</p> <p>Make available wholesome clean drinking water throughout the year.</p>
Health & disease management	<p>Procure and stock emergency medicines for important endemic diseases.</p> <p>All the stock must be immunized for endemic</p>	<p>Carry out de-worming to all animals entering into relief camp.</p> <p>Identify and quarantine sick animals.</p>	<p>Keep close surveillance on disease outbreak.</p> <p>Undertake vaccination depending on</p>



	diseases before the onset of monsoon. Surveillance and disease monitoring network to be established at Joint Director (Animal Husbandry) office in the district. Procure and stock multivitamins & area specific mineral mixture. Periodic health check-up of all animals through 'Clinical Camp'.	Perform ring vaccination (8 km radius) in case of any disease outbreak. Restricting movement of livestock in case of any epidemic. Tick control measures should be undertaken to prevent tick borne diseases in animals. Organize with community, daily lifting of dung from relief camps.	need. Keep the animal houses clean and spray disinfectants. Farmers should be advised to breed their milch animals during July-September so that peak milk production does not coincide with mid-summer.
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	<b>Suggested contingency measures</b>		
	<b>Before the event</b>	<b>During the event</b>	<b>After the event</b>
<b>Floods/Cyclones</b>	Not applicable in the district		
Heat wave	Plantation with MPTs around the shed. Water sprinklers/foggers in the shed. Application of white paint on the roof to reflect light. Thatched sheds should be provided as a shelter to animal to minimize heat stress.	Allow the animals early in the morning or late in the evening for grazing. Allow for grazing between 10 AM to 3 PM during cold waves. Feed green fodder/maize silage/concentrates during day time and paddy straw during night time in case of heat waves. Put on the foggers/sprinklers, wherever possible, during severe heat waves. In the event of severe heat waves, supplement vitamin C and electrolytes in water.	Feed the animals as per the routine schedule. Allow the animals for grazing (normal timings).
Cold wave	Cover all the open areas with gunny bags/polyethylene sheets (with a mechanism for lifting during the day time and pulling down during night time).	Add 25-50 ml of edible oil in concentrates and feed to the animal during cold waves. Put on heaters during intense/prolonged cold waves, wherever possible. Apply/sprinkle lime powder in the animal shed during cold waves to neutralize ammonia accumulation.	Feed the animals as per routine schedule. Allow the animals for grazing (normal grazing).
Insurance	Encourage insurance of livestock	Listing out the details of the dead animals	Submission for insurance claim and availing insurance benefit.

### 2.5.2 Poultry

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Drought</b>			
Shortage of feed gradients	Store broken rice/wheat/maize or other grains unfit for human consumption for their future use as feed. Establishment of feed serve bank.	Feed supplementation for only productive birds with house hold grains. Supplementation of Shelf grit (calcium) for laying birds. Culling of weak birds.	Supplementation to all surviving birds.
Health & disease management	De-worming and vaccination against Ranikhet Disease (RD) and Infectious Bursal Disease (IBD). Emergency veterinary preparedness with medicines/vaccinations to birds.	Mixing of vitamins A, D, E, K, B-complex and vitamin C in drinking water (5 ml/litre of water). Campaign and mass vaccination program must be resorted to.	Hygiene and sanitation of poultry house. Disposal of dead birds by burning/burying with lime powder in pits.
Heat wave	Provision of shelter with proper ventilation.	In severe cases, foggers/water sprinklers should be arranged or wet gunny bags should be hung to overcome heat stress. Birds should not be allowed for scavenging during mid noon.	Routine management practices are to be followed.
Cold wave	Provision of proper shelter. Proper arrangement for brooding.	Close all openings with polythene sheets/gunny bags. In extreme cases, arrange heaters. Don't allow for scavenging during early morning and late evening.	Routine practices are to be followed.

### 2.5.3 Fisheries

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Drought</b>			
<b>Capture</b>			
Marine	No intervention	No intervention	No intervention

Inland			
Shallow water depth due to insufficient rains/inflow	Stocking of advanced fingerlings than that of normal stocking density.	Immediate harvesting or decreasing the density to half or less than half in accordance with the water quantity.	Clay mixing at the bottom of pond to ensure storage of water for a longer period.
Changes in water quality	Periodic monitoring of water quality parameters and application of geolites, soil probiotics, etc. to maintain water quality.	Immediate harvesting or changing the water quality.	Removal of top layer, deep ploughing of tank and application of lime.
<b>Aquaculture</b>			
Shallow water depth due to insufficient rains/inflow	Switches to density reduction of yearlings according to availability of water.	Harvesting of fish and leaving the pond fallow till next season.	Removal of top layer, deep ploughing of tank and application of lime.
Impact of salt load build up in ponds/changes water quality	Application of geolites and other buffers.	Frequent change of water with fresh water.	Frequent draining of the pond with fresh water.
<b>2) Floods</b>			
<b>Capture</b>			
Marine	No intervention	No intervention	No intervention
Inland			
(iv) Loss of stock	Erection of nets across the spill way or just beyond it.	Erection of nets at spill ways.	Taking up compensatory stocking.
(v) Changes in water quality	No intervention	In the event of dissolved oxygen levels recedes – aerators, recirculation of water etc. are to be resorted to.	No intervention
(vi) Health & disease	Routine check-up for outbreak of any diseases.	Addition of antibiotics with the feed to check the disease.	Cleaning of weeds, deep ploughing of tanks and larger exposure to sunlight, application of lime.

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Aquaculture</b>			
Inundation of ponds with flood	Raising and riveting the bunds,	Continuous pumping of excess	Renovation of bunds, excavating channels

water	construction of spill ways to drain excess water, erection of nets to reduce escape of fish.	water and erection of net.	along the sides of the ponds for free escape of water.
Water contamination and changes in water quality		In the event of dissolved oxygen level goes down, aerators, recirculation of water etc. are to be resorted to in order to maintain the threshold oxygen level; and go in for partial harvest etc.	
Health & disease	Excessive accumulation of organic matter can be eliminated.	Addition of antibiotics like chloro-tetra-cycline or oxy-tetra-cycline along with feed to control the disease.	Removal of weeds, removal of top layer of soils, deep ploughing of tank, application of lime, and exposure to sunlight may be advocated.
Loss of stock and inputs (feeds/chemicals etc.)	Advance erection of nets, strengthening of bunds where there is anticipation of breaches, reducing the density of fish by partial harvesting.	Suspension of feeding, application of organic manures.	Payment of subsidy on inputs, compensatory stocking.
Infrastructure damage (pumps, aerators, huts etc.)	Following the warnings, aerators, pumps etc. must be shifted to safer place.	Relocating pumps, aerators etc. to some elevated places.	Critical assessment of damages and facilitates the subsidy.
<b>3) Cyclone/Tsunami</b>	Not applicable		
<b>4) Heat &amp; Cold wave</b>	Plantation around the pond.	Water level should be increased in the pond.	