State: Uttarakhand

Agriculture Contingency Plan for District: Dehradun

1.0	**District Agriculture profile**			
1.1	**Agro-Climatic/Ecological Zone :**			
	Agro Ecological Sub Region (ICAR)	Western Himalayas, Warm Subhumid (To Humid With Inclusion Of Perhumid) Eco-Region. 14.4		
	Agro-Climatic Zone (Planning Commission)	West Himalayan Region (I)		
	Agro Climatic Zone (NARP)	Zone -1 , Hill Zone		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Uttarkashi, Chamoli, Pauri Garhwal, Tehri Garhwal, Dehradun, Pithoragarh, Almora, Hill region of Nainital		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		30.19^0N	78.04^0E	960 m (2100ft) above sea level
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Horticultural Research and Extension Centre, Dhakrani, Dehradun		
	Mention the KVK located in the district with address	Krishi Vigyan Kendra, Dhakrani, District Dehradun Uttarakhand Telefax 01360224378 email: kvkdehradun@gmail.com		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	IMD, Dehradun		

1.2	**Rainfall**	**Normal RF(mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-Sep):	1767.6	1st week of June	Forth week of September
	NE Monsoon(Oct-Dec):	86.8	1st week of October	3rd week of November
	Winter (Jan- March)	147.6	-	-
	Summer (Apr-May)	63.7	-	-
	Annual	2065.7	-	-

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area (000' ha)	308.8	49.9	20.5	21.4	0.2	63.4	14.7	36.2	8.3	-

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area ('000 ha)****	**Percent (%) of total geographical area**
	1.		
	2.		
	3.		
	4.		
	5.		
	Others (specify):		

1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	45.5	145.7
	Area sown more than once	20.8	
	Gross cropped area	66.3	

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	22.5		
	Gross irrigated area	34.2		
	Rainfed area	32.0		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals		13.5	
	Tanks	1219		
	Open wells			
	Bore wells	529		
	Lift irrigation schemes			
	Micro-irrigation			
	Other sources (please specify)		5.6	
	Total Irrigated Area			
	Pump sets			
	No. of Tractors			
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited			
	Critical			
	Semi- critical			
	Safe			
	Wastewater availability and use			
	Ground water quality			
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

1.7 Area under major field crops & horticulture (2010-11) (Directorate of agriculture, Uttarakhand)

1.7	Major field crops cultivated	Area ('000 ha)						
		Kharif			*Rabi*			Grand total
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	
Cereals	Wheat	-					20.3	20.3
	Rice	-		11.4				11.4
	Maize			9.3				9.3
	Barnyard millet			1.7				1.7
	Finger millet			0.8				0.8
	Barley						0.7	0.7
Pulses	French bean			0.8				0.8
	Horsegram			0.7				0.7
	Blackgram			0.6				0.6
	Lentil						0.4	0.4
	Redgram			0.2				0.2
	Chickpea						0.03	0.03
	Soybean (black)			0.003				0.003
Oilseed	Mustard						0.3	0.3
	Sesame			0.3				0.3
	Groundnut			0.1				0.1
	Soybean			0.01				0.01
Others	Sugarcane			5.4				5.4
	Amaranth			1.2				1.2

Horticulture crops – Fruits		Total area ('000 ha)
	Apple	4.7
	Pear	1.4
	Peach	0.5
	Plum	1.0

	Apricot	1.1		
	Walnut	2.7		
	Citrus	2.5		
	Mango	6.0		
	Litchi	3.7		
	Aonla	0.1		
	Guava	0.1		
Horticulture crops – Vegetables	**Horticulture crops – Vegetables**	**Total area (‘000 ha)**		
	Potato	0.668		
	Ginger	0.406		
	Vegetable pea	1.567		
	Radish	0.276		
	French bean	0.962		
	Cabbage	0.583		
	Cauliflower	0.782		
	Onion	0.425		
	Capsicum	0.077		
	Okra	0.754		
	Tomato	1.061		
	Brinjal	0.365		
	Medicinal and Aromatic crops	-	-	-
	Plantation crops	-	-	-
	Fodder crops	**Total area (‘000 ha)**		
	Fodder	3.2		
	Total fodder crop area	3.2		

1.8	**Livestock**	**Male (‘000)**	**Female (‘000)**	**Total (‘000)**
	Indigenous cattle	65846	32271	98117
	Improved / Crossbred cattle	6077	33714	39791
	Buffaloes (local low yielding)	7151	64534	71685
	Graded Buffaloes		44229	44229
	Goat	38368	63874	102242
	Sheep	1339	14427	15766

	Others (Camel, Pig, Yak, horse, mule, donkey etc.)	horse& mule -2014 swine-387	557 429	2571 816
	Commercial dairy farms (Number)			
1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**	
	Commercial	140949	359300	
	Backyard	22261		

1.10 **Fisheries** (Data source: Chief Planning Officer)

A. Capture

i) Marine (Data Source: Fisheries Department)

No. of fishermen	**Boats**		**Nets**		**Storage facilities (Ice plants etc.)**
	Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
-	-	-	-	-	-

ii) Inland (Data Source: Fisheries Department)

No. Farmer owned ponds	**No. of Reservoirs**	**No. of village tanks**
-	-	-

B. Culture

	Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	-	-	-
ii) **Fresh water** (Data Source: Fisheries Department)	-	-	-
Others	-	-	-

1.11 Production and Productivity of major crops

1.11	Name of crop	Kharif		Rabi		Summer		Total	
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)
Major Field crops (Crops to be identified based on total acreage)									
Cereal	Wheat			48.3	2376.1			48.3	2376.1
	Rice	22.4	1968.9					22.4	1968.9
	Barley			1.3	1957.0			1.3	1957.0
	Maize	17.0	1833.9					17.0	1833.9
	Barnyard millet	2.6	1594.6					2.6	1594.6
	Finger millet	1.1	1294.9					1.1	1294.9
	Sugarcane	314.3	58700.0					314.3	58700.0
	Amaranth	7.1	598.6					7.1	598.6
Pulses	Blackgram	0.4	643.3					0.4	643.3
	Horsegram	0.6	850.4					0.6	850.4
	Soybean	0.003	1000.0					0.003	1000.0
	Redgram	0.2	887.0					0.2	887.0
	Chickpea			0.02	720.0			0.02	720.0
	Lentil			0.3	713.9			0.3	713.9
	French bean	0.9	11.7					0.9	11.7
Oilseed	Mustard			0.2	597.9			0.2	597.9
	Til	0.1	232.1					0.1	232.1

	Groundnut	0.1	1079.4					0.1	1079.4
	Soybean	0.01	833.0					0.01	833.0
Major Horticultural crops – Fruits	Mango	17.7	2970.0					17.7	2970.0
	Apple	12.7	2680.0					12.7	2680.0
	Litchi	8.4	2260.0					8.4	2260.0
	Walnut	3.0	1120.0					3.0	1120.0
	Citrus	7.4	2970.0					7.4	2970.0
	Pear	5.0	3770.0					5.0	3770.0
	Apricot	3.0	2690.0					3.0	2690.0
Vegetables	Vegetable pea	21.2	13530.0					21.2	13530.0
	Tomato				18.3	17270.0		18.3	17270.0
	French bean	5.751	5980.0					5.8	5980.0
	Cauliflower				14.6	1872.0		14.6	1872.0
	Okra	5.4	7100.0					5.352	7100.0
	Cabbage				6.8	11650.0		6.8	11650.0
	Onion				4.9	11460.0		4.9	11460.0
	Potato				15.0	22140.0		15.0	22140.0
	Ginger	4.2	10315.0					4.2	10315.0

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	Wheat	Rice	Maize	sugarcane	Barnyard millet
	Kharif- Rainfed		April –June	May-July		April - May
	Kharif-Irrigated		1st week of June to fourth week of July	June-July	Feb/March-Next march	-
	Rabi- Rainfed	October				
	Rabi-Irrigated	October - December				

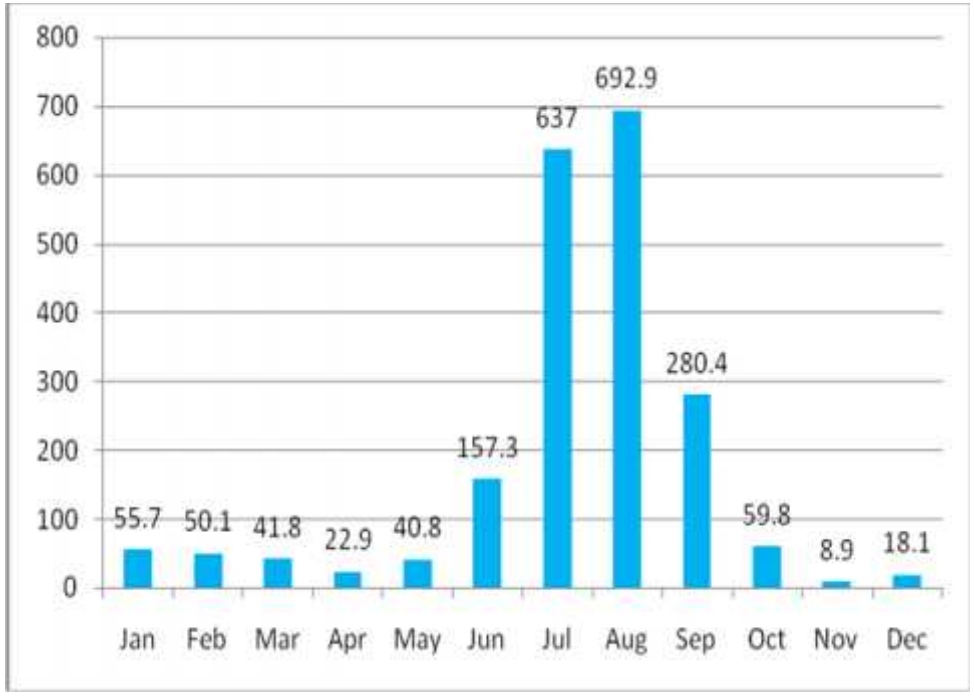
1.13	**What is the major contingency the district is prone to?**	**Regular**	**Occasional**	**None**
	Drought		✓	
	Flood			✓
	Cyclone			✓
	Hail storm		✓	
	Heat wave		✓	
	Cold wave		✓	
	Frost		✓	
	Sea water intrusion			✓
	Pests and disease outbreak	Fruit fly of guava, mango, tomato and cucurbits; Stem borer and leaf folder of rice; Powdery mildew and leaf miner of peas; Rhizome rot of ginger; Buckeye rot of tomato; Brown and false smut of rice; Loose smut of wheat; Erwinia stalk rot and maydis leaf blight in maize; Yellow rust and karnal bunt in wheat; Hopper and shoot gall psylla in mango; Neck blast and leaf blight of millets.	Wheat aphid mustard aphid, cabbage butterfly of mustard, maize stem borer, brown plant hopper, aphids and white butterfly of cole crops, mealy bug and hoppers of mango; Blast and bacterial leaf blight, brown leaf spot, false smut in rice; Bacterial stalk rot and leaf sheath blight of maize; Late and early blight of potato; Yellow rust, loose smut and covered smut of wheat and barley; alternaria blight and white rust of mustard, powdery mildew of cucurbits; stalk rot of cole crops; bacterial wilt and phytophthora blight of solanaceous crops; yellow rust, helminthosporium leaf blight in barley, blister beetle	

1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Enclosed: Yes
		Mean annual rainfall as Annexure 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes / No

Annexure -1

Location map of the Uttarakhand state and district Dehradun

Annexure -2 Mean rainfall of Dehradun district in Uttarakhand



2.0 Strategies for weather related contingencies

2.1 Drought
2.1.1 Rainfed situation

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation[a]**	**Normal Crop / Cropping system[b]**	**Change in crop / cropping system[c] including variety**	**Agronomic measures[d]**	**Remarks on Implementation[e]**
Delay by 2 weeks 1st week of July	1 Rain fed lower hills/foot hills	Rice- Wheat	Normal Crop / Cropping system can be followed. varieties like PD-6,VL-81, VL-82, VL-85 may be included	Soaking seed with water before sowing. Increase seed rate	Supply of seeds through TDC/ NSC Seed given by under RKVY Supply of seeds through TDC/ NSC/ VPKAS Supply of potato seeds through state Hort. dept.
		Maize-wheat	Maize + Soybean – Wheat Maize- Naveen, Sartaz	One row of soybean in between two rows of Maize Undertake summer ploughing Carry out gap filling of maize if plant population is around 70% of the optimum Carry out timely weed control and mulching Conserve residual moisture for sowing of wheat	
		Maize-Toria	Resowing Hybrid K 25 in maize & Bhawani in Toria	Intercropping of soybean/urd with maize 1:1 ratio, & row spacing in maize as 90 cm apart ,seed rate of maize 25 kg /ha and intercrop ½ of normal	
		Sugarcane –urd	Resowing of urd	Intercropping of urd/cowpea	
	2 Rain fed mid hill	Upland Rice- Wheat	Rice can be replaced by horse gram or soybean Horse gram: Local, VLG-1	Water conservation measures like terrace bunding and drainage of	

			Soybean – PRS-1, PS-1225 Wheat-Raj 3765, Raj 3777	excess water.	
		Barnyard/Finger millet-wheat	Delayed sowing of Finger millet VLM-324, VLM-149 Resowing of barnyard	maintain the population by uprooting and transplanting plants with in the field	
		French bean -Wheat	Frenchbean Frenchbean: Pant Anupma, VL bean- 2	-	
		Maize-Lentil	Resowing Hybrid K 25 in maize & PL 406 in lentil	Intercropping of soybean/urd with maize (1:1 ratio, & row spacing in maize as 1 m apart ,seed rate of maize 25 kg /ha and intercrop ½ of normal) and mustard intercropping with lentil at 4:1 ratio	
	3 Rain fed High hills	Barnyard/Finger millet-wheat	Delayed sowing of Finger millet VLM-324, VLM-149	maintain the population by uprooting and transplanting plants with in the field	
		Potato-Wheat	Delayed sowing of potato Potato: Kufri Jyoti, Kufri Giriraj, Kufri Himalani	-	
		Urd/Gahat/Rajma-Toria	Resowing Pant urd 31 in urd & Bhawani toria	Intercropping of Maize with urd / gahat in 2:1 ratio,seed rate of urd 20 kg /ha and intercrop ½ of normal) lentil at 4:1 ratio	

Condition			**Suggested Contingency measures**		
Early season drought	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Change in crop/cropping system[c]**	**Agronomic measures[d]**	**Remarks on Implementation[e]**
Delay by 4 weeks	1 Rain fed lower hills/foot hills	**Cropping system 1:** Rice- Wheat	Rice can be replace by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	Overnight Seed soaking with water before sowing. Control measure for white fly in cowpea by	Supply of seeds through TDC/ NSC/ VPKAS

3rd week of July				0.2% monocrotophos.	Seed given by under RKVY
		Cropping system 2: Soybean- Wheat	Soybean can be replace by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	Overnight Seed soaking with water before sowing. Control measure for white fly in cowpea by 0.2% monocrotophos	
		Cropping system 3: Maize-wheat	Maize can be replaced by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	Overnight Seed soaking with water before sowing. Control measure for white fly in cowpea by 0.2% monocrotophos	
	2 Rain fed mid hills	**Cropping system 1:** Upland Rice- Wheat	Upland Rice can be replaced by horse gram or Buck wheat Horse gram: Local, VLG-1 Buck wheat: PRB-3	Water conservation measures like terrace bunding and drainage of excess water.	
		Cropping system 2: French bean -Wheat	Frenchbean can be replaced by bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	-	Seed given by under RKVY
	3 Rain fed High hills	**Cropping system 1:** Barnyard/Finger millet-wheat	Delayed sowing of Finger millet VLM-324, VLM-149	maintain the population by uprooting and transplanting plants with in the field	Supply of seeds through TDC/ NSC/ VPKAS
		Cropping system 2: Potato-Wheat	Potato can be replaced by vegetable pea PSM-3, VLM-10, VLM-7	-	Supply of potato seeds through state Hort. dept.
Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Change in crop/cropping system[c]**	**Agronomic measures[d]**	**Remarks on Implementation[e]**
Delay by 6 weeks (2nd week of Aug**)**	1 Rain fed Lower hills/foot hills	**Cropping system 1:** Rice- Wheat	Rice can be replaced by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042, lobia-1111	Overnight Seed soaking with water before sowing. Control measure for	Supply of seeds through TDC/ NSC/ VPKAS

			Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	white fly in cowpea by 0.2% monocrotophos.	Seed given by under RKVY
		Cropping system 2: Soybean- Wheat	Soybean can be replace by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042, lobia-1111 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	Overnight Seed soaking with water before sowing. Control measure for white fly in cowpea by 0.2% monocrotophos	
		Cropping system 3: Maize-wheat	Maize can be replaced by grain cowpea/ bhindi/ corriander Cowpea- Pusa Komal, lobia- 1042, lobia-1111 Bhindi- Prabhani kranti, Pusa Sawani Coriander: Pant Haritima	Overnight Seed soaking with water before sowing. Control measure for white fly in cowpea by 0.2% monocrotophos	
	2 Rain fed Mid hills	**Cropping system 1:** Upland Rice- Wheat	Upland Rice can be replaced by horse gram / Buck wheat Horse gram: Local, VLG-1 Buck wheat: PRB-3	Water conservation measures like terrace bunding and drainage of excess water.	
		Cropping system 2: French bean -Wheat	French bean can be replaced by coriander / Radish/ Veg. Pea Coriander: Pant Haritima Radish : Dunagiri gol Veg.pea; PSM-3, VLM-10	-	
	3 Rain fed High hills	**Cropping system 1:** Finger millet- wheat	Finger millet can be replaced by Rajmash/ radish Rajmash: VL-63 Radish : Dunagiri gol	Ridge sowing	
		Cropping system 2: Potato-Wheat	Potato can be repaced by Rajmash/ radish Rajmash: VL-63 Radish : Dunagiri gol	Ridge sowing	
Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Change in crop/cropping system[c]**	**Agronomic measures[d]**	**Remarks on Implementation[e]**
Delay by 8 weeks (4th week of Aug**)**	1 Rain fed Lower hills/foot hills	**Cropping system 1:** Rice- Wheat	Rice can be replaced by French bean/ Bhindi / corriander Frenchbean: Pant Anupma, VL bean- 2 Bhindi: Pusa sawni, VL Bhindi-1 Coriander- Pant Haritima	Ridge bed sowing	Supply of seeds through TDC

		Cropping system 2: Soybean- Wheat	Soybean can be replaced by French bean/ Bhindi / corriander Frenchbean: Pant Anupma, VL bean- 2 Bhindi: Pusa sawni, VL Bhindi-1 Coriander- Pant Haritima		
		Cropping system 3: Maize-wheat	Maize can be replaced by French bean/ Bhindi / corriander Frenchbean: Pant Anupma, VL bean- 2 Bhindi: Pusa sawni, VL Bhindi-1 Coriander- Pant Haritima		
	2 Rain fed Mid hills	**Cropping system 1:** Upland Rice- Wheat	Upland rice can be replaced by veg. pea/ Veg. rye/cow pea/ radish Veg. Pea: PSM-3, VLM-10 Cow pea: Pant lobia-1 Veg. rai: Hathi Kan, Jhurmuri Radish: Dunagiri local, Japani white, Pusa Himani	Ridge sowing Inter culture operation	
		Cropping system 2: French bean -Wheat	French bean can be replaced by veg. pea/ Veg. rye/cow pea/ radish Veg. Pea: PSM-3, VLM-10 Cow pea: Pant lobia-1 Veg. rai: Hathi Kan, Jhurmuri Radish: Dunagiri local, Japani white, Pusa Himani		
	3 Rain fed High hills	**Cropping system 1:** Finger millet- wheat	Finger millet can be replaced by Rajmash/ radish/ Veg. Pea/ Veg. Rye Rajmash: VL-63 Veg. Pea: PSM-3, VLM-10 Veg. Rye: Hathi Kan, Jhurmuri Radish: Dunagiri local, Japani white, Pusa Himani	Ridge sowing	
		Cropping system 2: Potato-Wheat	Potato can be repaced by Rajmash/ radish/ Veg. Pea/ Veg. Rye Rajmash: VL-63 Veg. Pea: PSM-3, VLM-10 Veg. Rye: Hathi Kan, Jhurmuri Radish: Dunagiri local, Japani white, Pusa Himani	Ridge sowing	

2.1.2 Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation[f]	**Crop/cropping system[g]**	**Change in crop/cropping system[h]**	**Agronomic measures[i]**	**Remarks on Implementation[j]**
Delayed release of water in canals due to low rainfall.	Bhabhar area, sandy clay with gravels, highly percolating soils, Zn deficient along with NPK. Flat lands, boring is not possible due to hard rocks.	• Rice - wheat • Rice – toria/yellow sarsoon -wheat • Rice – Lentil • Rice – vegetable pea – sugarcane- ratoon- wheat • Soybean- Wheat- Moong	• DSR / SRI – vegetable pea – green gram • DSR – autumn cane + vegetable pea/ garlic/ potato- ratoon – wheat • DSR – lentil/ gram/mustard/field pea • Urd/ cowpea/ green gram – wheat –green gram • DSR - Zero till wheat	Use of sprinkler irrigation, Furrow irrigation, intercultural operations, Mulching, Crop planting on raised beds like wheat, Land leveling	Vegetables (cucumber), Cowpea

2.2 Un-timely (un-seasonal) rains (for both Rainfed and irrigated situations) (Kharif and Rabi both)

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage[k]**	**Flowering stage[l]**	**Crop maturity stage[m]**	**Post harvest[n]**
Rice	Strengthening of field bunds, Improve drainage, N top dressing & foliar spray of 0.5%Zn. Uprooting of weeds.	Drain out excess water Improve drainage , N top dressing.	Improve drainage , Harvest at physiological maturity	Store the produce under shed and dry using artificial sources like large fans Spray common salt at 3% on panicles to prevent sprouting and moulds Ensure proper grain moisture by sun drying
Wheat	Improve drainage, N top dressing @ 25 kg/ha to correct deficiency of nitrogen caused due to leaching	Improve drainage and control rust/blight with zineb @ 0.25% N top dressing @	Remove excess water	Store the produce under shed Undertake threshing Store at 12% moisture

		25 kg/ha to correct deficiency of nitrogen caused due to leaching		
Barley	Improve drainage, N top dressing @ 25 kg/ha to correct deficiency of nitrogen caused due to leaching	Improve drainage and control rust/blight with zineb @ 0.25% N top dressing @ 25 kg/ha to correct deficiency of nitrogen caused due to leaching	Remove excess water	Store the produce under shed Undertake threshing Store at 12% moisture
Sugarcane	Improve drainage, N top dressing, earthing up	Propping and tying, Drainage	Removing of lower dead leaves ie. Detrashing of lower leaves	Keep produce on dry place and cover with trash or tripal
Soybean	Intercultural operations	Two Foliar spray of 0.1 %B before flowering and at pod setting stage. Management of insect & pest	Safe removal of excess water	Keep produce at dry place.
Lentil	Drainage excess water. Intercultural operations.	2% spray of urea before flowering	Safe removal of excess water	Keep produce at dry place
Maize, cowpea, finger millet	Construct open drainage channels across the fields	Drain out excess water	Drain out excess water Harvest cobs from matured cobs if physiological maturity attained	Shell and dry the grain upto 12% moisture and store
Green fodder	Construct open drainage channels across the fields	Drain out excess water		
Rape seed and mustard	Remove excess water from the field Maintain plant population Apply balance fertilizer	Remove excess water from the field Spray the crop with mancozeb 0.25% hexaconazole to manage alternaria leaf spot	Maintained drainage Spray metalaxyl @ 0.2% and even the entire patch of severely blight affected plants should be removed	Take harvest to safe place and dry for storage
Chickpea/lentil	Drain excess water Apply foliar 2% urea spray after rains	Drain excess water	Timely harvest the produce	Take harvest to safe place and dry for storage

		Apply foliar 2% urea spray after rains Spray of monocrotophos @ 0.15% for the management of pod borer		
Black gram	Drain excess water as early as possible and apply 10-55 kg N/ha Spray KNO3 1% or water soluble fertilizers @ 1% to support nutrition Spray fungicides hexaconazole/propiconazole/carbendazim 0.1% or difenacozole @ 0.05% to manage web blight, anthracnose Take timely action to control insects like Spodoptera etc	Drain excess water Apply 4-5kg/ha N/acre after draining excess water Spray KNO3 1% or water soluble fertilizers @ 1% like 19-19-19 or 18-18-18 or 21-21-21 to support nutrition Spray fungicides hexaconazole/propiconazole/carbendazim 0.1% or difenacozole @ 0.05% to manage web blight, anthracnose Take timely action to control insects like leaf cum pod borer	Drain excess water as quickly as possible Allow the crop to dry completely before harvesting	Spread the bundles drenched in rain on the field bunds Thresh after drying Store only after proper drying
Horticulture				
Mango	Remove excess water Till the soil within basin to improve soil aeration Apply 40-50 kg FYM/tree	30-40 ppm NAA/ 10 – 20 ppm 2 4 D spray, to improve fruit set Drain out excess water	Ethylene spray to advance the maturity Drain out excess water Till the soil within basin Spray hormones or multi nutrients to promote flower and fruit set	Store at cool dry ventilated place, avoid heaping, Package in wooden boxes

		Till the soil within basin Spray hormones or multi nutrients to promote flower and fruit set Use supplementing pollinating techniques		
Litchi	Remove excess water	30-40 ppm NAA/10 – 20 ppm 2 4 D spray, , to improve fruit set	Ethylene spray to advance the maturity	Conditioned fruits in cool dry ventilated place and package in cart board boxes
Guava	-	30-40 ppm NAA spray, , to improve fruit set	-	Wipe out the excess moisture with muslin cloth and Package in wooden boxes
Pea, tomato, potato, cucurbits	Form open drainage channels across the field	Drain excess water	Harvesting at proper stage	Take harvest to a safe storage and dry before packaging
Cauliflower, cabbage	Drain off water from the field and use of split application of nitrogen and Dithane M 45 when the sky is clear	Drain the fields, apply NPK and spray Dithane M45 @ 2.5g/l	Drain the fields, control the curd rot with spray, harvest the curds which are ready and also remove the infected leaves from the plants	Immediate market the harvested curds
Heavy rainfall with high speed winds in a short span[2]				
Horticulture				
Mango	• Planting of wind breaks on east and west sides (pre- planning) • Staking of saplings during pre bearing phase • Selection of dwarf varieties			
Litchi	• Planting of wind breaks on east and west sides (pre- planning) • Staking of saplings during pre bearing phase			
Guava	• Staking of saplings during pre bearing phase			
Outbreak of pest and diseases due to unseasonal rains				
Rice	Brown plant hopper Spray monocrotophos @ 1250ml/ha or acephate	Brown plant hopper	Cutworm – spray chloropyriphos 2.5 ml/l False smut- spray copper oxychloride	Store at safer places

	500g/ha Drain the water before spraying of insecticide and direct the sparay towards base of plant	Spray monocrotophos @ 1250ml/ha or acephate 500g/ha Drain the water before spraying of insecticide and direct the sparay towards base of plant Blast- spray carbendazim @ 1g/l after observing initial disease symptoms	0.25%	Cover the produce with polythene Ensure 10-20% moisture before storage
Maize	Drain out excess water	Top dress with nitrogen after rain spells	Harvest cobs from standing crop	Store at safer places Cover the produce with polythene Ensure 10-20% moisture before storage
Pulses-kharif	Wilt in low lying water logged patches-drench carbendazim 1.0g/l at the base of plants	Root rot-drench carbendazim 1.0g/l at the base of plants Powdery mildew- spray carbendazim 0.1%	Drain excess water Commence harvesting	
Wheat	Drain out excess water Apply split doses of nitrogen for crop recovery	Control rust with Zineb Z 78 (0.25%) or propiconazole	Drain out excess water	After threshing undertake drying of

		0.1%		grains
Barley	Drain out excess water	Drain out excess water and top dress with nitroge	Drain out excess water	After threshing undertake drying of grains
Horticulture				
Mango	Mango malformation –follow recommended practices	For Powdery mildew Control- spray of wettable sulpher Mango hopper- follow recommended spray schedule	Mango fruit fly-follow the recommended spray schedule, gur 50g + malathion 10 ml in 5 lt water + fruit fly traps @ 25/ha	Proper storage and immediate transportation
Litchi	-	-do-	-	
Guava	-	-		
pea	Wilt in low lying water logged areas- drench carbendazim 1.0g/l at the base of plants	Root rot- drench carbendazim 1.0g/l at the base of plants Powdery mildew- spray carbendazim 0.1%	Undertake field drainage Do not harvest in wet condition delay harvesting till weather clears	
Potato	Drain out excess water Apply mancozeb M 45 @ 0.25% as foliar spray for control of early blight	Undertake drainage Immediately follow the spray schedule with mancozeb M 45 @ 0.25% and metalaxyl @ 0.2% if blight is not under control	Maintain drainage Spray metalaxyl @ 0.2% and even the entire patch of severely affected blight affected plants should be removed	Ensure proper storage

Cole crops	Drain out excess water Carry out IDM/IPM	Drain out excess water Carry out IDM/IPM	Drain out excess water	
Tomato	 Drain excess water Undertake need based pest and disease management Fill gap with seedlings Apply 10-20 kg N/ha to regain lost vigour	Drain excess water Undertake need based pest and disease management Fill gap with seedlings Apply 20-30 kg N/ha to regain lost vigour	Stake plants Drain water Harvest on clear and sunny days	 Undertake grading and packing

2.3 Floods, (not applicable)

Condition	**Suggested contingency measure[o]**			
Transient water logging/ partial inundation[1]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Crop1 (specify)				
Horticulture				
Crop1 (specify)				
Continuous submergence for more than 2 days[2]				
Crop1				
Horticulture				
Crop1 (specify)				
Sea water inundation[3]				
Crop1				

2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone (For Bhabhar Area)

Extreme event type	Suggested contingency measure[r]			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave[p]				
Wheat			Light and frequent irrigation at evening hours, N topdressing	
Sugarcane	Light irrigation, Intercultural operations	Frequent irrigation	Light and frequent irrigation at evening hours,	
Mustard			Light and frequent irrigation at evening hours,	
Mango	• Planting of wind breaks on east and west sides (pre-planning) • Frequent irrigations	Frequent irrigations	Frequent irrigations	
Litchi	• Planting of wind breaks on east and west sides (pre-planning) • Frequent irrigations	Frequent irrigations	Frequent irrigations	
Guava	• Planting of wind breaks on east and west sides (pre-planning) • Frequent irrigations	Frequent irrigations	Frequent irrigations	
Cold wave[q]				
Wheat		Light irrigation, N top dressing		Not common
Vegetable pea		Sprinkler irrigation, hormone spray		do
Potato		Light irrigation, N top dressing		do
Mustard		Light irrigation		do
Horticulture				
Mango	Planting of wind breaks on east and west sides (pre-planning) Smudging/smoking	Smudging/smoking	Smudging/smoking	
Litchi	Planting of wind breaks on east and west sides (pre-planning) Smudging/smoking	Smudging/smoking	Smudging/smoking	
Guava	Planting of wind breaks on east and west sides (pre-	Smudging/smoki	Smudging/smoking	

	planning) Smudging/smoking	ng		
Frost				
Wheat	Not common	Light irrigation, smoke	Not common	Not common
Potato	do	Light irrigation, smoke	do	do
Vegetable pea	do	Sprinkler irrigation, smoke	do	do
Mustard	do	Light irrigation	do	do
Horticulture				
Mango	• Planting of wind breaks on east and west sides (pre-planning) • Thatching with straw • Frequent irrigations • Smudging/smoking	• Thatching with straw • Frequent irrigations • Smudging/smoking	• Frequent irrigations • Smudging/smoking	
Litchi	• Planting of wind breaks on east and west sides (pre-planning) • Thatching with straw • Frequent irrigations • Smudging/smoking	• Thatching with straw • Frequent irrigations • Smudging/smoking	• Frequent irrigations • Smudging/smoking	
Guava	• Planting of wind breaks on east and west sides (pre-planning) • Thatching with straw • Frequent irrigations	• Frequent irrigations	• Frequent irrigations	
Hailstorm				
Rice	Replanting and gap filling as per severity	N top dressing		Early harvesting and disposal of produce
Wheat	Re-sowing (short duration variety) / gap filling as per severity	N top dressing		Early harvesting and

				disposal of produce
Sugarcane	Gap filling and N top dressing	Earthing, N top dressing, Tying	Tying	
Vegetable pea	Hormone spray	Hormone spray	Early picking	
Potato	N top dressing/ Earthing up	Earthing up	Remove upper portion	
Horticulture				
Mango			Anti hailstorm net	Anti hailstorm net
Litchi			Anti hailstorm net	Anti hailstorm net
Guava			Anti hailstorm net	Anti hailstorm net

2.4 Extreme events: Heat wave/ Cold wave/ Frost/ Hailstorm/ Cyclone (Hill condition)

Extreme event type	**Suggested contingency measure**			
	Seedling/ nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat wave	-	-	-	
Upland rice	-			
Transplanted rice	Light irrigation	Irrigation		
Finger millet	-	Irrigation		
Horticulture				
Fruit crop	Irrigation in the evening hours	Irrigation and mulching in tree basin	Mulching in tree basin	
Veg crop (Tomato, Capsicum, Caulifower etc.)	Irrigation	Life saving irrigation in evening hours	-	
Cold wave				
Wheat	-	Light irrigation, Smoking around the field		
Oilseed		Light irrigation, Smoking		

		around the field		
Pulse		Light irrigation, Smoking around the field		
Horticulture				
Veg pea		Light irrigation and spray of karathane 1 ml/lt water in January		
Potato		Light irrigation and two spray of Indofill M-45		
Mango		Light irrigation, Smoking around the orchard during Jan. in evening hour.		
Hailstorm				
Horticulture				
Apple			Cover the tree with hail net	
Pear			Cover the tree with hail net	
Peach			Cover the tree with hail net	
Plum			Cover the tree with hail net	

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event[s]	**During the event**	**After the event**
Drought			
Feed and fodder availability	Increase area under fodder crops, collect crop residue, collect tree fodder Conserve maize green fodder as silage Encourage fodder production of jowar and bajra Preparation of compact feed block for Storage. Establishing fodder banks at block levels. Plantation of perennial grass/fodder crops for livestock on bunds, wasteland and penchant land on community basis.	Harvest and use biomass of maize, wheat, barley, millets etc Transport feed to affected areas Utilize stored hay/silage Use of compact feed block for feeding animals From fodder bank reserves. Utilizing fodder from perennial trees. Use of feed mixture while feeding the animals.	• Building up fodder bank reserves. • Planning of fodder crop for plantation in wastelands, punchiest lands or in irrigated lands. • Avail insurance • Replace unproductive animals with improved ones • Train and educate farmers • Maintain and repair silo pits • Encourage farmers to grow multi cut fodder crops (African tall, MP chari, UP chari) • Supply of fodder seed before onset of monsoon •
Drinking	Preserving water in the tanks.	Using water from preserves.	Continue rain water harvest.

water	Provision of conventional house, With plantation nearby, good ventilation.	Using ground water resources for maintains community in drinking water supply.	Use of water treatments for cleaning of water
Health and disease management	Ensure regular health checkup of animals to check incidences of any disease annoy live stocks. Veterinary preparedness with medicines and vaccines and using mobile vans. Identification and recording in	Organization of animal health camp and distribution of medicine in case of outbreak of any epidemic. Awareness Campaigns for farmers to judge general health of animals	Camps to judge health status of animals. Segregation of introduction sick/animals. Discarding of unproductive animals. Culling of sick animals.
Floods	Growing water logging resistant fodder plants and trees.	Ensuring proper supply of the fodder to the livestock	Planning of fodder crop for plantation wastelands, punchiest lands or in irrigated lands
Feed and fodder availability	Planning appropriate ignore streusel for fodder bank as well as for holding animals hers.	Holding thawed livestock at appropriate place for proper claming of the place holding animal herds to privet outbreak of diseases.	Maintenance of infrastructure. Expansion in physical .
Drinking water	Preparation of overhead water reservoirs. Installation of appropriate channels for distastes ablution of clean drinking water	Using of chambers for prosing & feeding animals with clean drinking water.	Cleaning of water. Water treatment
Health and disease management	Preparedness with medicines & vaccines for checking the spread of water borne diseases Identification and recorded of information on indigenous/alternative medicines for water brogue diseases. Preparation of vaccination schedules	Regular checking of animal herds for invoice g any disease to prevent out break of any epidemic Vaccination of animals . Treatment of disease affected animals .	Organization Segregate Discarding of animals
Cyclone			
Feed and fodder availability	Not applicable		
Drinking water			
Health and disease management			
Heat wave and cold wave			
Shelter/environment	Proper infrastructure planning and construction for preparedness & towards	Effective impanation of plans for environment might doting adverse	Maintenance of infrastructure. Evaluation of implemented plans & modifying existing

management	adverse conditions. Identification of the alternatives for modifying existing infrastructures according to environmental conditions and their communications to farmers. Shift the animals from high hill pasture lands to nearby pastures	conditions. Group housing, feed during cooler Use dry grass flooring and gunny bags on windows Wrap the gunny bags on the belly of milch animals Restrict open grazing during sunny days only	plans.
Health and disease management	Veterinary preparedness in term of vaccines & medicine stocking . Planning for mobile services of sick animals through vans. Identification of indigenous/ herbal /alternative medicines from local resources for use during adverse conditions. Feeding traditional herbs to animals	Organization of healthy camps for. Vaccination . Treatment of the animals. Awareness among the farmers on general health Make provision of fans/shade and cold drinking water during hot wave and provision of warm housing during cold wave	Health camps for establishing health status of live animals. Segregation of animals. Discarding animals Culling animals Prompt veterinary care in case of acute problem Use multi vitamins and minerals in feed

[s] based on forewarning wherever available

2.5.2 Poultry

	Suggested contingency measures		
	Before the event[a]	**During the event**	**After the event**
Drought			
Shortage of feed ingredients	Establishing of feed reserve banks. Identifying alterative feed ingredients and their storage. Identifying sources for procurement of feed in case of acute shortage.	Utilizes feed from reserves. Ensuring supply of feed by procumbent from adjudge areas. Portman from adjuring area.	Building up of though emptied reserves.
Drinking water	Building infrastructure for water harvesting and building up water reservoirs.	Supply of clean drinking water from reservoir.	Clearing of warder reservoir. Water treatment to ensure clean & safe water.
Health and disease management	Minting the health profile of poultry. Vet. pureness with medicines vaccination to bird duds during enrages	Campaign for creation awaking for proper vaccination of birds . Mass vaccination. Treatment of disease	Animal camp for Judging the health profile of birds. Segregation treatment of affected birds.
Floods			

Shortage of feed ingredients	Stabilization of feed reserve banks. Identifying alternative feed ingrains & there stringy	Utilizing feed from reserves. Ensuing supply of feed by procure meant from adjuring areas.	Building up used up reservoirs for future.
Drinking water	Building information for over storage of water. Treatment of water to ensure clean and safe water for birds.	Utilizing water from overhead reservoirs.	Cleaning of tanks. Treatment of waters
Health and disease management			
Cyclone			
Shortage of feed ingredients	Planning of makeshift alternation adjustment in existing intrastate. Building infrastructure for prevention of birds from drawing.	Implementation of makeshift altermentive adjustment in existing infrastructures. Shifting birds to neuter crested structure	Maintenance of existing of structure. Expansion of prevention infrastructure
Drinking water			
Health and disease management	Minting the health profile of poultry. Vet. pureness with medicines vaccination to bird duds during enrages	Campaign for creation awaking for proper vaccination of birds . Mass vaccination. Treatment of disease	Animal camp for Judging the health profile of birds. Segregation treatment of affected birds.
Heat wave and cold wave			
Shelter/environment management	Proper planning for infrastructure alternation .in existing structures during extreme condition and their communication to bird rear.	Effective implementation of plans for interior environment during heat and cold wave.	Maintains of infrastructure. Evaluation of implemented phase altering the existing plans.
Health and disease management	Maintain health profile of birds though regular check up. Planning of mobile veterinary van.	Organization of camps for Vaccination. Treatment of birds. General health status of the birds	Health camp to establish health status of living birds. Culling of the infected birds.

2.5.3 Fisheries

	Suggested contingency measures		
	Before the event[a]	**During the event**	**After the event**
Drought			
Shallow water in ponds due to insufficient rains /inflows	Water harvesting structures with rain water impounding from	Up to 50% of pond surface area may be covered with floating algae like azolla to	Water harvesting structures with rain water impounding from catchment areas;

	catchment areas Keep a deeper portion as a refuge pond/depression/trench preferably at lower side of pond	reduce evaporation. Water to supplement at least 20% of the impoundment of pond to safeguard the stocked fish biomass may be arranged if available. Partial or complete fish harvesting may be done in extreme conditions to reduce the density & stress.	watershed development planning and implementations with focus on renovation and de-silting of pond
Heat wave and Cold wave			
Management of pond environment	Water exchange	Water exchange up to 50%	Water level maintenance and quality checking
Health and disease management	Preventive measures	Liming and $KMNO_4$ treatment	Liming and stock treatment