Model Agriculture Contingency Plan (Rainfed)

District: Amravati

State: Maharashtra

<table>
<tr><th colspan="5">1.0 District Agriculture profile</th></tr>
<tr><td rowspan="8">1.1</td><td>Agro-Climatic/Ecological Zone</td><td colspan="3"></td></tr>
<tr><td>Agro Ecological Sub Region (ICAR)</td><td colspan="3">Western Maharashtra Plateau, hot moist semi-arid eco- sub region (6.3)</td></tr>
<tr><td>Agro-Climatic Region (Planning Commission)</td><td colspan="3">Western Plateau and Hills Region (IX)</td></tr>
<tr><td>Agro Climatic Zone (NARP)</td><td colspan="3">Central Maharashtra Plateau Zone (MH-7)</td></tr>
<tr><td>List all the districts or part thereof falling under the NARP Zone</td><td colspan="3">Amravati, Akola, Buldhana, Washim</td></tr>
<tr><td rowspan="2">Geographic coordinates of district headquarter</td><td>Latitude</td><td>Longitude</td><td>Altitude</td></tr>
<tr><td>20° 55' 53.82” N</td><td>77° 45' 32.57” E</td><td>374 m above MSL</td></tr>
<tr><td>Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS</td><td colspan="3">Regional Research Center (Dr. PDKV), Morshi Road, Amravati-444603</td></tr>
<tr><td>Mention the KVK located in the district with full address</td><td colspan="3">KVK, Durgapur, Tq. Badnera Distt. Amravati- 444701
KVK, Ghatkhed, Tq. Chandur Rly. Distt. Amravati “Chirantan” Madhuban Colony,Camp,Amravati-444602</td></tr>
<tr><td></td><td>Name and address of the nearest Agromet Field Unit for agro-advisories in the Zone</td><td colspan="3">AMFU Station, Akola, Maharashtra</td></tr>
</table>

1.2	**Rainfall**	Normal RF(mm)	Normal Rainy days (number)	Normal Onset	Normal Cessation
	SW monsoon (June-September):	775.2	40	2nd week of June	1st week of October
	NE Monsoon(October-December):	69.6	4	-	-
	Winter (January- February)	29.4	3	-	-
	Summer (March-May)	12.2	1	-	-
	Annual	886.4	48	-	-

Source: IMD

1.3	**Land use pattern of the district**	Geographical Area	Cultivable area	Forest area	Land under non agricultural use	Permanent pastures	Cultivable waste land	Land under miscellaneous tree crops & groves	Barren & uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	1304	766	321	16	29	20	8	28	19	97

Source: DACNET 2005-06

1. 4	**Major soil types**	**Area ('000 ha)**	**Percent (%) of total geographical area**
	Deep black soils	653.7	55.9
	Medium deep black soils	13.1	1.1
	Shallow black soils	501.2	42.9
	Others:	Saline soils in Purna river valley area	

Source: NBSS & LUP, Nagpur

1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %**	
	Net sown area	602	118.3	
	Area sown more than once	110		
	Gross cropped area	712		

Source: DACNET 2005-06

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	51.3		
	Gross irrigated area	63.8		
	Rainfed area	540.7		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals		4.5	8.8
	Tanks			
	Open wells	55382	46.7	91.2
	Bore wells	38		
	Lift irrigation schemes	3		
	Micro-irrigation			
	Other sources (please specify)			
	Total Irrigated Area		51.2	
	Pump sets	40835		
	No. of Tractors	7077		

Source: DACNET 2005-06

	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	3	-	Morshi, Warud and Daryapur tehsils
	Critical	1	-	RSC > 2.5, unsuitable for irrigation purpose in well water of Chandur Bazaar tehsil
	Semi- critical	-	-	
	Safe	10	-	
	Wastewater availability and use	-	-	
	Ground water quality	-	-	Good and suitable for drinking and irrigation purpose except the saline areas of Purna Alluvium. The areas of Purna River Alluvium covering southern parts of Anjangaon and Achalpur talukas and entire Daryapur taluka are affected by inland salinity problem.
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: CGWB, 2004

1.7 Area under major field crops & horticulture etc. (average of last 3 years)

1.7	Major Field Crops cultivated	Area ('000 ha)							
		Kharif			*Rabi*			Summer	Total
		Irrigated	*Rainfed*	Total	*Irrigated*	Rainfed	Total		
	Soybean	-	317.6	317.6				-	317.6
	Cotton	-	179.4	179.4				-	179.4
	Pigeon pea	-	102.1	102.1				-	102.1
	Sorghum	-	49.1	49.1				-	49.1
	Green gram	-	37.1	37.1				-	37.1
	Chickpea				-	79.0	79.0	-	79.0
	Wheat				45.4	-	45.4	-	45.4

Source: District Social and Economic Abstract 2010, Directorate of Finance and Statistics, Govt. of Maharashtra

	Horticulture crops - Fruits	Total area ('000 ha)
	Mandarin (Santra)	80.8
	Mango	5.1
	Mosambi	4.2
	Kagzi lime	1.1
	Ber	0.7
	Banana	0.4
	Guava	0.3
	Aonla	0.3
	Pomegranate	0.2
	Custard apple	0.2
	Sapota	0.14
	Tamarind	0.01
	Papaya	0.09
	Total	**93.54**

Horticulture crops - Vegetables		Total area (000'ha)
	Tomato	0.38
	Brinjal	0.46
	Cabbage `	0.21
	Cauliflower	0.22
	Cluster bean	0.13
	Dolichos bean	0.10
	Lady's finger	0.19
	Spinach	0.16
	Fenugreek	0.05
	Ridge gourd	0.03
	Cucumber	0.05
	Bitter gourd	0.05
	Onion	1.67
	Other	0.08
	Total	**3.79**
Medicinal and Aromatic crops		**Total area (000'ha)**
	Piper longum	0.78
	Safed musli	0.010
	Palmarosa, Aromatic grasses	0.040
	Plantation crops	-
	Total fodder crop area	-
	Grazing land	29
	Sericulture etc (Mulbery)	0.06

Source: Project Manager (Special project), Maharashtra State Horticulture, Medicinal Plants Board, Pune and State Department of Agriculture

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (local low yielding)	257.8	262.5	520.4
	Crossbred cattle	8.0	20.7	28.7
	Non descriptive Buffaloes (local low yielding)	12.8	102.0	114.0

	Graded Buffaloes	0.6	3.6	4.2
	Goat	64.9	222.6	291.5
	Sheep	4.5	17.7	22.2
	Others (Camel, Pig, Yak etc.)			
	Commercial dairy farms (Number)			
1.9	**Poultry**	**Total No. of birds ('000)**		
	Commercial	22.22		
	Backyard	409.36		

*Livestock Census 2007, GOI

1.10	**Fisheries**					
	A. Capture					
	i) Marine -	**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)	
		Not applicable					
	ii) Inland	**No. Farmer owned ponds**		**No. of Reservoirs**	**No. of village tanks**		
	B. Culture	5		41	279		
		Water Spread Area ('000)ha		**Yield (t/ha)**	**Production ('000 tons)**		
	i) **Brackish water**	Not applicalbe					
	ii) **Fresh water** (Data Source: Fisheries Department)	94.36		0.4	3.79		
	Others						

Source: State Fisheries Department

1.11 Production and Productivity of major crops (Average of last 5 years: 2004, 2005, 2006, 2007, 2008)

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								
	Soybean	242.8	764	-	-	-	-	242.8	764
	Cotton Lint	238.3	1328	-	-	-	-	238.3	1328
	Green gram	14.8	399	-	-	-	-	14.8	399
	Pigeon pea	76.9	753	-	-	-	-	76.9	753
	Kharif Sorghum	92.8	1890	-	-	-	-	92.8	1890
	Wheat	-	-	47.5	1046	-	-	47.5	1046
	Chickpea	-	-	57.6	729	-	-	57.6	802
	Major Horticultural crops								
	Banana	-	-	-	-	-	-	23.6	6000
	Orange	-	-	-	-	-	-	501.1	6197
	Onion	-	-	-	-	-	-	33.4	2000
	Other	-	-	-	-	-	-	0.2	200

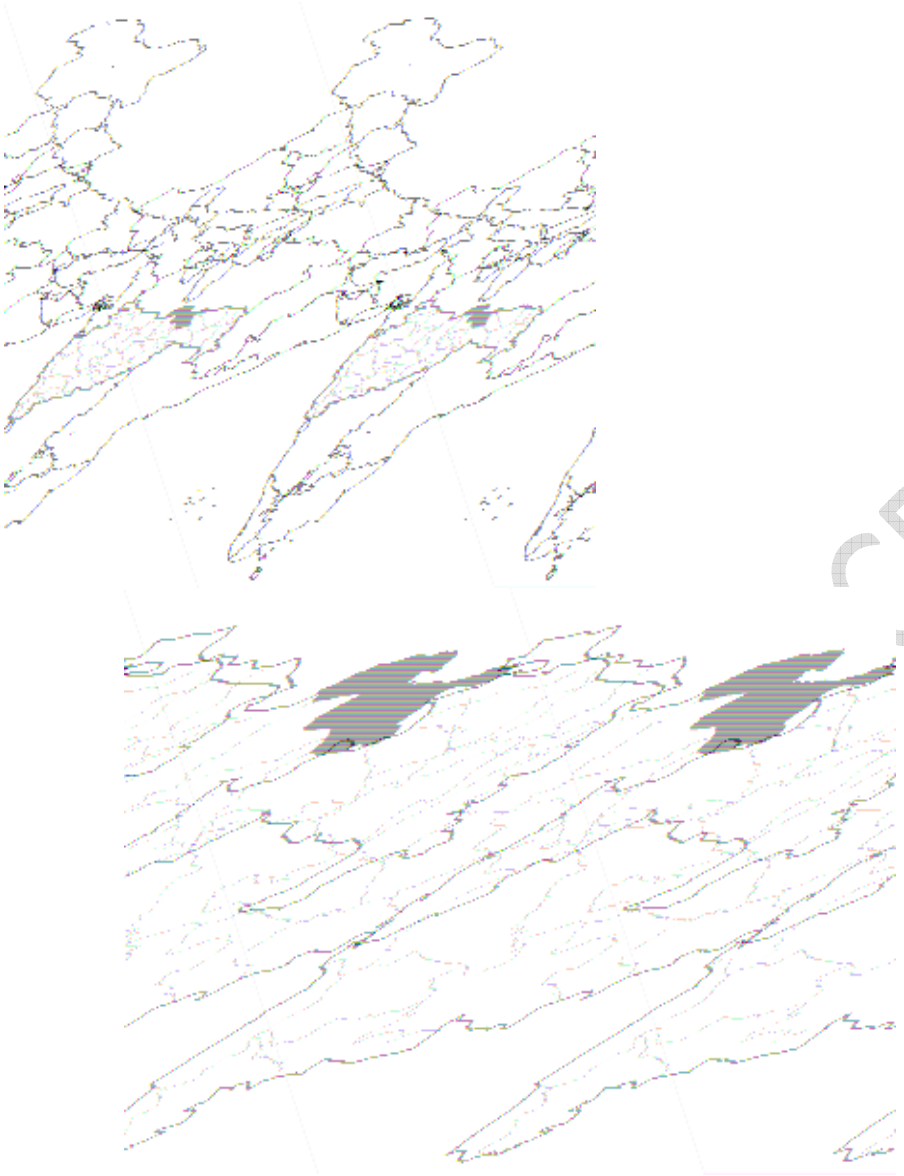
Source: District Social and Economic Abstract 2010, Directorate of Finance and Statistics, Govt. of Maharashtra

1.12	**Sowing window for 5 major field crops**	**Cotton**	**Soybean**	**Greengram & Blackgram**	**Pigeonpea**	***Kharif* Sorghum**
	Kharif - Rainfed	15th June – 30th June	15th June – 15th July	15th June – 30th June	15h June – 10th July	15h June – 10th July
	Kharif - Irrigated	20 th - 30th May (Pre monsoon) 1st – 30th June	--	--	--	--
	Major *rabi* crops	**Wheat**	**Chickpea**	**Safflower**		
	Rabi - Rainfed	--	1st October -15th October	25th September - 7th October		
	Rabi - Irrigated	1st November – 15th November	15th October - 15th November	1st October - 30th October		

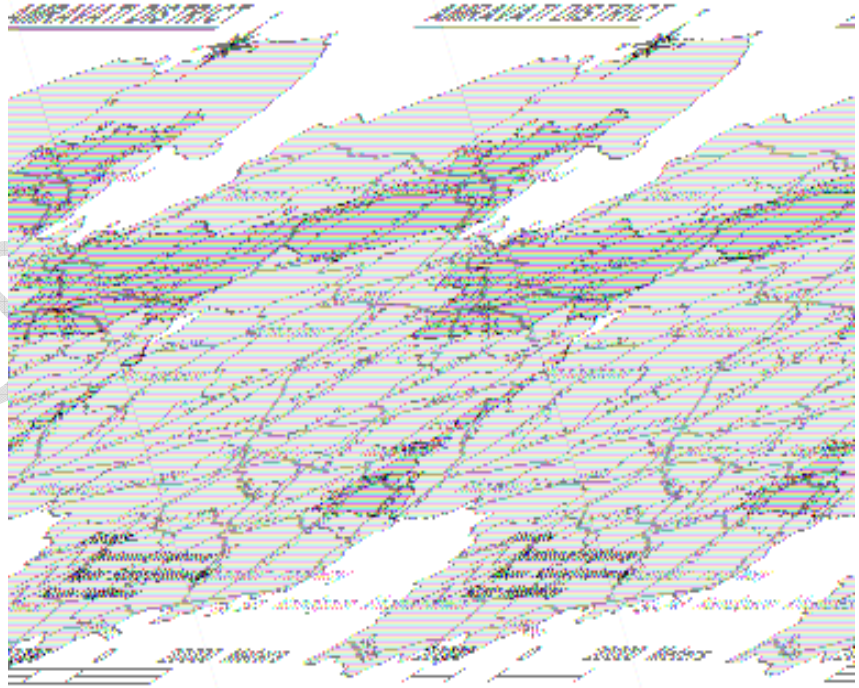
1.13	**What is the major contingency the district is prone to** (Tick mark)	Regular	Occasional	None
	Drought	--	✓	--
	Flood	--	--	✓
	Cyclone	--	--	✓
	Hail storm	--	✓	--
	Heat wave	✓	--	--
	Cold wave	--	✓	--
	Frost	--	--	✓
	Sea water intrusion	--	--	✓
	Pests and disease outbreak 1) Soybean - *Spodoptera litura*, Semilooper, *Helicoverpa*, girdle beetle, Soybean Mosaic Virus 2) Cotton - Jassids, Mealybug, BLB, red leaf disorder 3) Pigeonpea - Pod borer complex, Sterility mosaic disease, wilt 4) Citrus - *Phytopthora* (gummosis)/CTV/FSM 5) Chickpea - wilt, gram caterpillar, *Helicoverpa armigera* 6) Safflower - aphid	✓	--	--

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

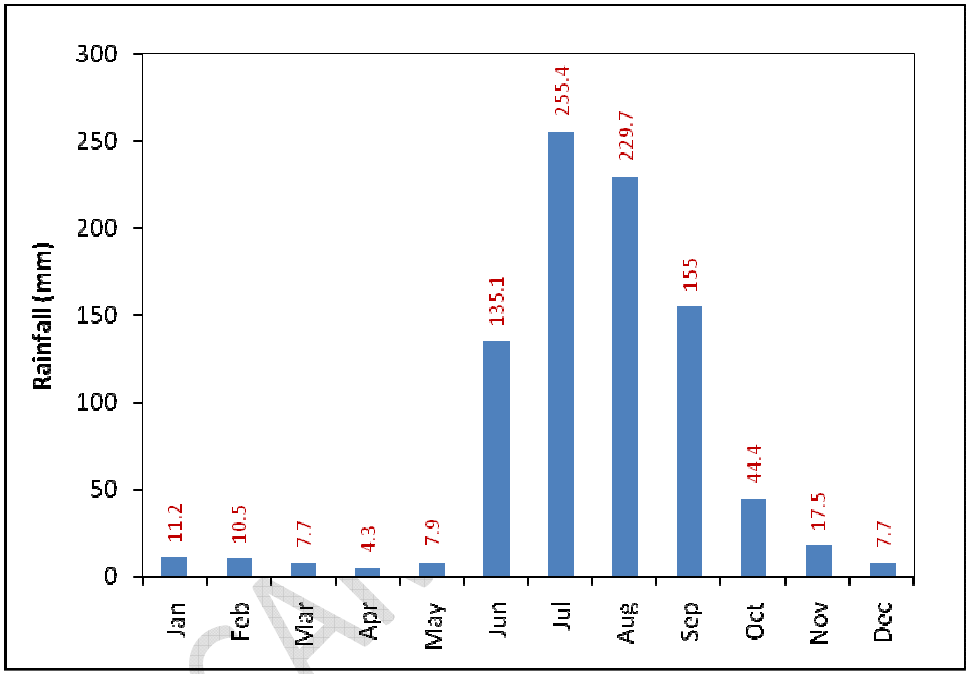
Annexure-1



Location map of Amravati district

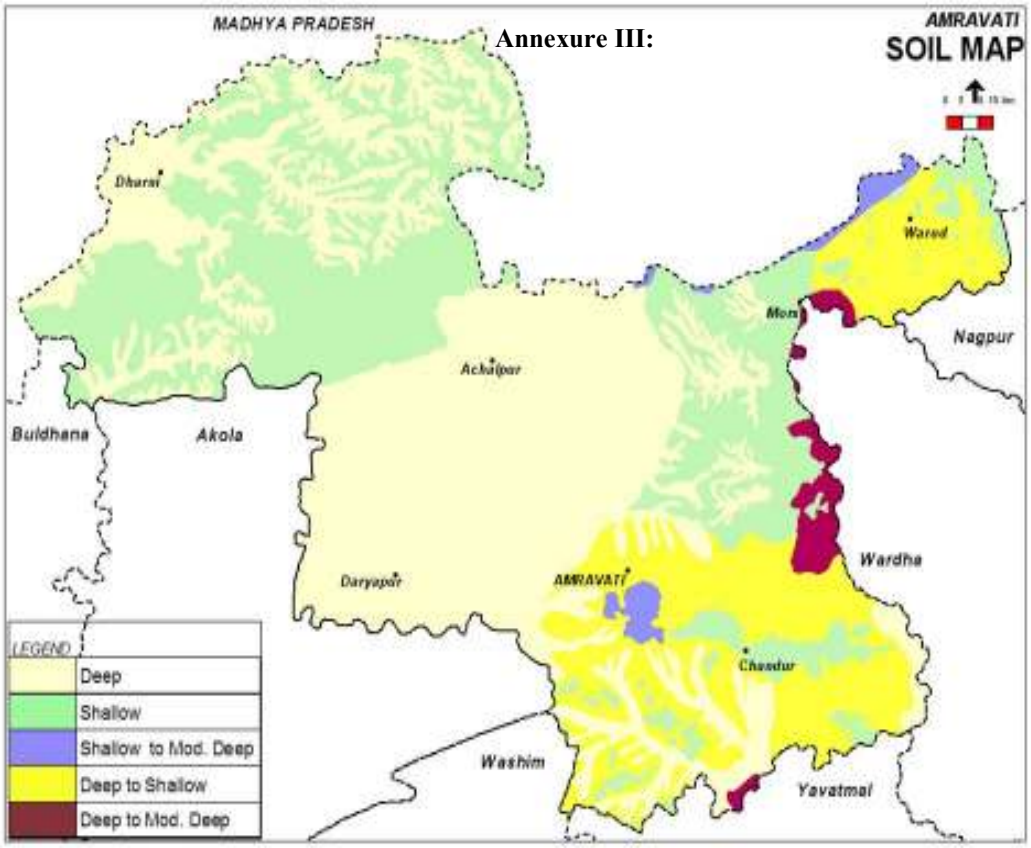


Tehsils and road network of Amravati district



Mean monthly rainfall (Source: IMD)
(1941-1990)

Annexure III:



Soil Map of Amravati District (Source: NBSS & LUP, Nagpur)

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**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks **4th week of June**	Deep and medium deep black soils	Cotton	No change	Normal recommended package of practices of Dr.PDKV, Akola	
		Cotton + Pigeonpea	No change	• Normal recommended package of practices of Dr. PDKV, Akola • Cotton + Pigeonpea (6:2) • Cotton + Greengram/ Blackgram (1:1)	Linkage with Dr.PDKV, MSSC, NSC
		Soybean	No change	• Normal recommended package of practices of Dr. PDKV, Akola • Test seed for higher germination percentage • Adopt seed rate of 75-80 kg/ha • Seed treatment with Thiram 3 g + Carbendazim 1g /kg seed, dried and then treated with bio-inoculants such as *Rhizobium* 200g + PSB 200g and *Trichoderma* 40 g for every 10 kg seed • Prefer intercropping with one row of pigeonpea after every 4 or 6 rows of soybean • Open the furrow after every 3 or 6 rows of soybean	
		Pigeonpea	No change	• Normal recommended package of practices of Dr.PDKV, Akola • Prefer intercropping: pigeonpea + soybean (4:2 or 6:2 ratio or pigeonpea + cotton (8:1 or 6:2 ratio)	
		Sorghum (*kharif*)	No Change	• Normal recommended package of practices of Dr. PDKV, Akola • Seed treatment with Imidacloprid 70 WS @ 7g/ kg seed and thiram @ 3g/kg seed	

	Shallow black soils*	Soybean	No change	• Normal recommended package of practices of Dr.PDKV, Akola • Test seed for higher germination • Adopt a seed rate of 75-80 kg/ha. • Seed treatment as above	
		Greengram	No Change	Normal recommended package of practices of Dr.PDKV, Akola	
		Blackgram	No change	Normal recommended package of practices of r.PDKV, Akola	

*Farmers do cultivate cotton in shallow black soils also; however, the productivity is low

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks **(2nd week of July)**	Deep and medium deep black soils	Cotton	Soybean (varieties JS-335, JS-93 -05) Pigeonpea (varieties AKT- 8811, Vipula , PKV- Tara, BSMR-736)	• Normal recommended package of practices of Dr. PDKV, Akola • Test seed for higher germination percentage • Adopt seed rate of 75-80 kg/ha • Seed treatment with Thiram 3 g + Carbendazim 1g /kg seed, dried and then treated with bio-inoculants such as *Rhizobium* 200g + PSB 200g and *Trichoderma* 40 g for every 10 kg seed • Prefer intercropping with one row of pigeonpea after every 4 or 6 rows of soybean • Open the furrow after every 3 or 6 rows of soybean • Weed free condition at critical stages of crop growth • Sowing at wider spacing (90x90 cm)	Linkage with Dr.PDKV / MSSC. NSC for seed for seed
		Cotton + Pigeonpea	Prefer early varieties/hybrids of American cotton / desi cotton No change in varieties	• In cotton adopt 20-25% more seed rate than recommended and reduce fertilizer dose by 25% • Replace hybrids with improved varieties in cotton (American Cotton: AKH-8828, PKV Raj, AKH-081, Desi Cotton:- AKA-5, AKA-7, AKA-8) • Avoid intercropping of greengram and blackgram in cotton	Linkage with PDKV / MSSC NSC for seed

			for Pigeonpea	• Adopt intercropping system of cotton + sorghum + pigeonpea + sorghum (6:1:2:1) to reduce the risk due to delayed sowing • Maintain weed free condition at critical stages of crop growth	
		Soybean	No Change	• Maintain weed free condition at critical stages of crop growth • Normal recommended package of practices	
		Pigeonpea	Prefer varieties: AKT 8811,Vipula, PKV-Tara, BSMR-736	• Adopt weed free condition at critical stages of crop growth • Adopt a spacing of 90 x 20 cm instead of 90 x 30 cm	
		Sorghum (Kh. Jowar)	Replace sorghum with soybean (varieties JS-335, JS-93 -05) or with pigeonpea (varieties AKT 8811, Vipula, PKV- Tara, BSMR-736)	• Follow normal recommended package of practices • Maintain seed free condition at critical stages of crop growth	
	Shallow black soils	Soybean	No change in varieties	• Normal recommended package of practices of Dr. PDKV, Akola • Test seed for higher germination percentage • Adopt seed rate of 75-80 kg/ha • Seed treatment with Thiram 3 g + Carbendazim 1g /kg seed, dried and then treated with bio-inoculants such as *Rhizobium* 200g + PSB 200g and *Trichoderma* 40 g for every 10 kg seed • Soil test based application of fertilizers is recommended	
		Greengram	Replace greengram with Blackgram and soybean	Seed treatment as above	Linkage with PDKV / MSSC NSC for seed
		Blackgram	No change	As above	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks	Deep and medium deep	Cotton	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736)	• Adopt closer spacing (60 x 30 cm) in pigeonpea • Frequent interculture for i*n situ* moisture conservation and for weed free conditions	Linkage with MSSC and NSC for seed and

(4th week of July)	black soils		• Sunflower (hybrids) / Sesame (variety AKT64) • Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi) • Pearlmillet + Pigeonpea inter-cropping(2:1 or 4:2 row ratio)		Dr.PDKV , KVK for agro-techniques
		Cotton + Pigeonpea	Sole pigeonpea / sunflower / sesame / castor / pearlmillet, pearl millet + pigeonpea as above	As above	
		Soybean	Sole pigeonpea / sunflower / sesame / castor / pearlmillet, pearl millet + pigeonpea as above	As above	
		Pigeonpea	No change. Prefer varieties AKT-8811, Vipula, PKV Tara, BSMR-736.	• Seed hardening • Soil test based fertilizer application is recommended • Frequent interculture for i*n situ* moisture conservation and for weed free conditions	
		Sorghum	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736) • Sunflower (hybrids) / Sesame (variety AKT64) • Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi) • Pearlmillet + Pigeonpea inter-cropping(2:1 or 4:2 row ratio)	• Adopt closer spacing(60x30 cm)for pigeonpea • Follow *insitu* moisture conservation measures. • Apply 2% urea as foliar spray for millets	
	Shallow black soils	Soybean	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736) • Sunflower (hybrids) / Sesame (variety AKT64)	• Seed hardening • Follow *in situ* moisture conservation measures • Soil test based fertilizer application • Weed free condition at critical stages of crop	

			• Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi) Pearlmillet + Pigeonpea inter-cropping (2:1 or 4:2 row ratio)	growth	
		Greengram	Same as above	Same as above	
		Blackgram	Same as above	Same as abov	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks **(2nd week of August)**	Deep and medium deep black soils	Cotton	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736) • Sunflower (hybrids) / Sesame (variety AKT64) • Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi) • Pearlmillet + Pigeonpea inter-cropping(2:1 or 4:2 row ratio)	• Adopt closer spacing (60x30 cm)for pigeonpea • Follow *in situ* moisture conservation measures	Linkage with MSSC and NSC for seed and Dr.PDKV , KVK for agro-techniques
		Cotton + Pigeonpea	Same as above	-do-	
		Soybean	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736) • Sunflower (hybrids) / Sesame (variety AKT64) • Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi)	-do-	
		Pigeonpea	Prefer varieties: PKV Tara and BSMR-736	-do-	

		Sorghum (*kharif*)	• Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736) • Sunflower (hybrids) / Sesame (variety AKT64) • Castor (varieties / hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32) • Pearlmillet (varieties PKV Raj, Shradha, Saburi)	-do-	
	Shallow black soils	Soybean	• Sunflower (hybrids) • Sesame (AKT64) • Pearlmillet (PKV Raj Shradha, Saburi)	-do-	
		Greengram	Same as above	-do-	
		Blackgram	Same as above	-do-	

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Deep and medium deep black soils	Cotton / Cotton + Pigeonpea	• Give protective irrigation wherever possible • Raise cotton seedlings in nursery & transplant when sufficient soil moisture is available • Gap filling aided with pot watering 7-10 days after sowing when crop stand is less than 80% • In case of less than 30% germination, take up re-sowing with a wider spacing of 45 cm when sufficient soil moisture is available	• Avoid applying fertilizer till sufficient soil moisture is available • Mulching with crop residue • Apply organic matter / FYM / Compost for better moisture retention • Making of conservation furrows for moisture conservation. • Sowing on broad bed furrow (BBF)	

		Soybean	• Give protective irrigation wherever possible • Gap filling with maize and sesame • If germination is less than 50% re-sowing immediately after receipt of rains • Take up one hoeing for weed management	-do-	
		Pigeonpea	• Gap filling either with sesame or maize • Provide protective irrigation, wherever possible. • Take up one hoeing	-do-	
		Sorghum (*kharif*)	Take up thinning to maintain optimum plant population	-do-	
	Shallow black soils	Green gram	• Protective irrigation wherever possible • Take up thinning to maintain optimum plant population and one hoeing	-do-	
		Blackgram	-do-	-do-	
		Soybean	• Give protective irrigation wherever possible • Gap filling with maize and sesame • If germination is less than 50% re-sowing immediately after receipt of rains • Take up one hoeing for weed management	-do-	

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At vegetative stage	Deep and medium deep black soils	Cotton / cotton + pigeonpea	Avoid applying fertilizer till sufficient soil moisture is available Interculture for weeding	• Opening of alternate furrows • Mulching with crop residue • Take up intercultivation to create soil mulch to conserve soil moisture • Give protective irrigation, if possible	Linkage with on-going government schemes to encourage adoption of micro-irrigation for better use efficiency of scare water

					Linkage with on-going farm ponds programme and IWMP for rainwater harvesting and efficient use of water with micro-irrigation techniques like sprinklers.
		Soybean	-do-	-do-	
		Pigeonpea	-do-	-do-	
		Sorghum (*kharif*)	-do-	-do-	
	Shallow black soils	Soybean	-do-	• Foliar spray of 2 % urea or DAP • Other measures as above	
		Greengram	Intercultivation	• Spraying of 2 % urea or DAP. • Protective irrigation if possible.	
		Blackgram	-do-	-do-	

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At flowering/ fruiting stage	Deep and medium deep black soils	Cotton / Cotton + Pigeonpea intercropping	Protective irrigation if possible	• Apply foliar spray of 2 % urea or DAP • Adopt soil moisture conservation measures like ridges and furrows • Supplemental irrigation (10 mm depth) with harvested rain water in ponds by adopting micro-irrigation (sprinklers)	
		Soybean	-do-	-do-	
		Pigeonpea	-do-	-do-	

		Sorghum (*kharif*)	-do-	• Protective irrigation, if possible • In case of poor grain filling harvest for fodder. • Adopt soil moisture conservation measures like ridges and furrows	
	Shallow black soils	Soybean	Protective irrigation	-do-	
		Greengram	-do-	-do-	
		Blackgram	-do-	-do-	

Condition			**Suggested Contingency measures**		
Terminal drought (Early withdrawal of monsoon)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Rabi Crop planning**	**Remarks on Implementation**
	Deep and medium deep black soils	Cotton / Cotton + Pigeonpea Intercropping	• Giving life saving supplemental irrigation, if available • Picking / harvesting at physiological maturity	-	Linkage with NFSM or ISOPOM for seed supply and other inputs
		Soybean	-do-	Plan for *rabi* crops Chickpea/Safflower	
		Pigeonpea	-do-	-do-	
		Sorghum (*kharif*)	-do-	-do-	
	Shallow black soils	Soybean	-do-	-do-	
		Greengram	-do-	Prepare for *rabi* sowing provided irrigation is available	
		Blackgraim	-do-	-do-	

2.1.2 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	Deep and medium deep black soils	Wheat and Chickpea	Wheat to be replaced by Chickpea/Safflower/Mustard	Follow alternate row / micro-irrigation Irrigate at critical crop growth stages	Linkage with on-going government schemes to encourage adoption of micro-irrigation for better use efficiency of scare water
	Shallow black soils	Chickpea	Safflower / Mustard	-do-	-do-

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Limited release of water in canals due to low rainfall	Deep and medium deep black soils	Wheat and Chickpea	Wheat to be replaced by Chickpea/Safflower/Mustard/ Linseed/Sesamum	Follow alternate row or micro-irrigation Irrigate at critical crop growth stages	As in previous condition
	Shallow black soils	Chickpea	Safflower / Mustard	-do-	

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	Not applicable				

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	Open well irrigated *rabi* cropping situation	Wheat, Chickpea, Safflower	Chickpea / Safflower	Adopt micro-irrigation (sprinkler)	Linkage with on-going IWMP Encourage percolation tanks for groundwater recharge

2.2 Unusual rains (untimely, unseasonal etc) (for both rainfed and irrigated situations)

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Cotton	• Open field channels to drain excess water and avoiding surface ponding • Apply 2% urea foliar spray after cessation of rains • Interculture at optimum soil moisture to improve soil aeration	• Open field channels to drain excess water and avoiding surface ponding • Apply multi-nutrient or hormonal spray to promote flowering	• Open field channels to drain excess water and avoiding surface ponding • Timely picking of cotton	• Protect picked cotton in storage from drenching and soiling • Drying of wet cotton and marketing
Soybean	Provide drainage	Provide drainage	Timely harvesting of	Shifting to safer place and drying of

			produce	produce
Greengram	As above	-do-	-do-	-do-
Blackgram	As above	-do-	-do-	-do-
Pigeonpea	• Open field channels to drain excess water and avoiding surface ponding • Interculture at optimum soil moisture to improve soil aeration	Open field channels to drain excess water and avoiding surface ponding	-do-	Stacking and drying of produce followed by threshing
Horticulture				
Acid Lime and orange	Opening of field channels to drain out excess water and avoid surface ponding in the orchard Interculture at optimum soil moisture to improve soil aeration	• Mrig bahar crop is unaffected • For Ambe bahar crop, open field channels to drain out excess water and avoid surface ponding, • Nutrient spray of NAA 10 ppm + 1% urea to prevent flower drop	Timely harvest to avoid losses	Grading of fruits, cleaning of mold affected ones followed by washing and waxing
Heavy rainfall with high speed winds in a short span				
Cotton	• Open field channels to drain excess water and avoiding surface ponding	• Opening of field channels to remove surface ponding,	Timely picking in case of early forewarning of rains	Shifting to safer place for drying
Soybean Greengram Blackgram Pigeon pea	Opening of field channels to remove surface ponding	Opening of field channels to remove surface ponding	Timely harvesting in case of early forewarning of rains	Shifting to safer place for drying
Horticulture				
Nagpur Mandarin	Provide bamboo staking to less than 3 year	• Provide bamboo staking to less	Opening of field	Collection and

Acid lime and sweet orange	aged plants to avoid lodging	than 3 year aged plants to avoid lodging • Opening of field channels to drain out excess water and avoid remove surface ponding	channels to remove surface ponding,	grading of fallen fruits followed by washing, waxing and marketing

Outbreak of pests and diseases due to unseasonal rains	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Cotton	Provide drainage for removing stagnant water and drench plant base with copper oxy chloride 0.3% or carbendazim 0.1% particularly in low lying patches in the fields to prevent *Fusarium* wilt incidence	• Incessant rains trigger grey mildew incidence – apply foliar spray of sulphur @ 25 g/10 l water • Wet spells aggravate bacterial leaf blight incidence, protect with streptocycline sulphate 6 g / 10 l + copper oxychloride 30 g/ l0 l • Drench plant base with carbendazim 0.1% or COC 0.3% after rains to prevent wilt incidence in low lying patches in field • Remove water logging as excess soil moisture leads to leaf reddening. Go for soil application of $MgSO_4$ @ 20-25 kg/ha or foliar spray of 0.5-1.0% $MgSO_4$ and 1% urea as soon as the reddening symptoms appear • Timely correction of N status either by optimum supply in the soil or through foliar application of 2% urea or DAP at boll development stage reduces leaf reddening	Incessant rains trigger grey mildew incidence – prevent with foliar spray with sulphur @ 25 g/10 l water Protect boll rot with carbendazim 0.1% spray immediately after cessation of rains	Drying of wet cotton to prevent molds

Soybean	Early planted soybean is likely to be attacked by girdle beetle and green semilooper due to copious rains. Watch for drooping and drying of leaves. Manually remove the infested plants or plant parts from below the girdles Protect against semilooper when density reaches 2-4 larvae per m row length then go for with foliar spray of NSKE 5% or dimethoate 30 EC 1 ml/l	Monitor adult moth activity of *Spodoptera* through pheromone traps (10 traps /ha) and observe egg masses and gregarious larvae. Wet spell followed by a dry spell of 7-10 days during flowering or up to two weeks after flowering severe pest incidence is likely. When density crosses ETL of 1-2 larvae /m row length, apply quinalphos 25 EC 20 ml/10 l or Emamectin benzoate 5 SG @ 4 g/10 l or Profenofos 50 EC @ 25 ml/10 lit or Lambda cyhalothrin 5 EC @ 6 ml/10 lit or Indoxacarb	-	-
Greengram	Protect against powdery mildew with foliar application of penconozol 5 ml or dinocap 10 ml or tridemorph 5 ml or sulphur spray @ 30 g/10 litre of water.	To control Powdery mildew penconozol 5 ml or dinocap 10 ml or triadomorph 5 ml or sulphur spray @ 30 g/10 litre of water.	-	-
Blackgram	-do-	-do-	-	-
Pigeonpea	Improved field drainage of excess water and drenching with copper oxy chloride @ 25g/10 lit of water to avoid incidence of wilt and root rot	Improved drainage and drenching with copper oxy chloride @25g/10 lit of water to avoid incidence of wilt and root rot	-	-
Horticulture				
Mandarin	Protect against Citrus *psylla* with foliar spray of malathion 50 EC 10 ml Or quinalphos 25EC 10ml Or cypermethrin 25 EC 4 ml/10 litre.	Protect against Citrus *psylla* with foliar spray of malathion 50 EC 10 ml Or quinalphos 25EC 10ml Or cypermethrin 25 EC 4 ml/10 litre	-	-
Sweet Orange	-do-	-do-	-	-

2.3 Floods: Not Applicable

Condition	**Suggested contingency measure**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**

Transient water logging/ partial inundation	**Not Applicable**
Continuous submergence for more than 2 days	
Sea water intrusion	

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

Extreme event type	**Suggested contingency measure**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat wave				
Oranges (Mandarin and Sweet orange)	• Increase the frequency of irrigation, • Use of temporary shade net • Mulching	• Increase the frequency of irrigation • Pruning of damaged branches / twigs	• Increase the frequency of irrigation • Mulching to reduce soil temperature • Pruning of damaged parts and apply Bordeaux paste 1% to cut ends	Immediate harvesting of fruits, grading and marketing
Cold wave				
Oranges (Mandarin and Sweet orange)	Protect with polythene sheet	Smoking, flood irrigation during evening hours, Basin mulching, Apply supplementary dose of fertilizer	Smogging, frequent light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizer	Not applicable
Frost	Not applicable			
Hailstorm				
Wheat, chickpea, safflower	Re-sowing in case of severe damage	Light and frequent irrigation.	• Apply 10% additional nitrogen • Light and frequent irrigation	Timely harvesting and shifting of produce to safer place in case of early forewarning
Oranges (Mandarin and Sweet Orange)	Not applicable	Prune damaged branches and twigs and apply Bordeaux paste 1% to avoid fungal infections	Prune damaged branches and twigs and apply Bordeaux paste 1% to avoid fungal infections Apply hormonal spray NAA 20 ppm + 1 % urea to prevent flower drop.	Immediate harvesting, grading and marketing of produce
Cyclone	Not Applicable			

2.5 Contingency strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Feed and fodder availability	As the district is occasionally prone to drought the following measures are to be taken to mitigate the fodder deficiency problem: • Sowing of cereals (sorghum/bajra) and leguminous crops (lucerne, berseem, horsegram, cowpea) during North-East monsoon under dry land system • Collection of soya meal waste for use as feed supplement during drought • Preserving the green maize fodder as silage • Establishment of fodder bank at village level with available dry fodder (wheat straw, sorghum/ bajra stover etc.) • Development of silvopastoral models with *Leucaena*, *Glyricidia*, *Prosopis* as fodder trees and Marvel, Madras Anjan, Stylo, Desmanthus, etc., as under storey grass • Encourage fodder production with Sorghum – *Stylo* - sorghum on rotation basis and also to cultivate short-term fodder crops like sunhemp • Promote *Azola* cultivation in backyards • Formation of Village Disaster Management Committee • Capacity building and preparedness of the stakeholders and official staff for the drought/floods	• Harvest and use biomass of dried up crops (wheat/ sorghum/ bajra,/ maize / horse gram/ greengram /soyabean) material as fodder • Use of unconventional and locally available cheap feed ingredients especially soya meal waste for feeding of livestock during drought • Harvest all the top fodder available (*Subabul*, *Glyricidia*, *Prosopis* etc) and feed the livestock during drought • Concentrate ingredients such as grains, brans, chunnies and oilseed cakes, low grade grains etc. unfit for human consumption may be procured from Government godowns for feeding as supplement for high productive animals during drought • Promotion of horsegram as contingent crop and harvesting at vegetative stage as fodder • Hay should be enriched with 2% Urea molasses solution or 1% common salt solution and fed to livestock • Continuous supplementation of minerals to prevent infertility. • Encourage mixing available kitchen waste with dry fodder while feeding to the milch animals	• Encourage progressive farmers to grow multi cut-fodder crops of sorghum/ bajra/ maize (UP chari, MP chari, HC-136, HD-2, giant bajra, L-74, K-677, Ananad /African Tall, Kisan composite, Moti, Manjari, B1-7 on their own lands with input subsidy • Supply of quality seeds of COFS 29, *Stylo* and fodder slips of Marvel, Yaswant, Jaywant, Napier, Guinea grass well before monsoon • Flushing the stock to recoup • Replenish feed and fodder banks

Drinking water	• Adopt water conservation methods at village level to improve the ground water level for adequate water supply • Identification of water resources • Desilting of ponds • Rainwater harvesting and create water bodies/ watering points • Construction of drinking water tanks in herding places/village junctions/relief camp locations • Community drinking water trough can be arranged in shandies /community grazing areas	• Adequate supply of drinking water. • Restrict wallowing of animals in water bodies/resources • Add alum in stagnant water bodies	• Watershed management practices should be promoted to conserve rainwater. Bleach (0.1%) drinking water / water sources • Provide clean drinking water
Health and disease management	• Procure and stock emergency medicines for important endemic diseases of the area • All the stock must be immunized for endemic diseases like Hemorrhagic septicemia (HS), Black quarter (BQ) (large ruminants) and Enterotoxaemia (ET) (small ruminants) etc. 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	• Carryout de-worming to all animals entering into relief camps • Identify and quarantine sick animals • Performing ring vaccination (8 km radius) in case of any outbreak • Restricting movement of livestock in case of any epidemic • Tick control measures be undertaken to prevent tick borne diseases in animals • Organize with community, daily lifting of dung from relief camps	• Keep close surveillance on disease outbreak • Undertake vaccination depending on 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

Floods	Not applicable in the district		
Cyclone	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 during heat waves • Allow for grazing between 10 AM to 3 PM during cold waves • Feed green fodder/silage / concentrates during day time and roughages / hay during night time in case of heat waves	• Feed the animals as per routine schedule • Allow the animals for grazing (normal timings)
Cold wave	• Covering all the wire meshed walls / open area with gunny bags/ polyethylene sheets (with a mechanism for lifting during the day time and putting down during night time)	• Add 25-50 ml of edible oil in concentrates and fed to the animal during cold waves • Put on the foggers / sprinklers during severe heat weaves and heaters during prolonged cold waves, where ever possible • In severe cases, vitamin 'C' and electrolytes should be added in water during heat waves • 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 timings)
Insurance	Encouraging 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**
Drought			
Shortage of feed ingredients	Store broken rice and other grains such	• Supplementation only for productive birds	Supplementation to all surviving birds

	as maize unfit for human consumption for use as feed later	with house hold grain • Supplementation of shell grit (calcium) for laying birds • Culling of weak birds	
Drinking water		Use water sanitizers or offer cool hygienic drinking water	
Health and disease management	• Culling of sick birds. • De-worming and vaccination against Ranikhet Disease (RD) and Infectious Bursal Disease (IBD)	• Mixing of Vitamins A, D, E, K, B-complex and Vitamin C in drinking water (5ml in one litre water)	• Hygienic and sanitation of poultry house • Disposal of dead birds by burning / burying with lime powder in pits
Floods	Not applicable in the district		
Cyclone	Not applicable in the district		
Heat wave			
Shelter/environment management	Provision of shelter with proper ventilation	• In severe cases, foggers/ water sprinklers/ should be arranged or wet gunny bags should be hung to reduce heat stress • Don't allow for scavenging during mid day	Routine practices are followed
Health and disease management	De-worming and vaccination against RD and fowl pox	• Supplementation of house hold grain • Provide cool and clean drinking water with electrolytes and Vitamin C • In hot summer, add anti-stress probiotics in drinking water or feed	Routine practices are followed
Cold wave			
Shelter/ environment management	• Provision of proper shelter • Arrangement for brooding • Assure supply of continuous electricity	• Close all openings with polythene sheets • In severe cases, arrange heaters • Don't allow for scavenging during early morning and late evening	Routine practices are followed
Health and disease	Hygienic and sanitation of poultry house	Supplementation of house hold grain	Routine practices are followed

management	Apply lime in poultry houses	Mix antibiotic supplements in feed to prevent non-specific enteric and respiratory infections	

[a]based on forewarning wherever available

2.5.3. Fisheries

	Suggested Contingency Measures		
1. Drought	**Before the event**	**During the event**	**After the event**
A. Capture			
Marine	Not applicable	Not applicable	Not applicable
Inland			
Shallow water depth due to insufficient rains / inflow	Stocking of advnced fingerlings in half or even less than the normal stocking density or stocking of common carp seed	Immediate harvesting or decreasing the density commensurate with the water quantity.	De weeding and deepening of tank to ensure retention of water for a longer period and provision of employment under MGNREGP
Changes in water quality	Regular monitoring of water quality parameters and application of geolites, soil probiotics, etc to maintain water qaulity	Immediate harvesting or changing the water quality by application of sanitisers.	Removal of top layer, deep ploughing of tank and application of lime
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains / inflow	Crop holiday or going for stocking of yearlings by reducing the density 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
(ii) Impact of salt load build up in ponds / changes water quality	Stocking of salinity tolerant fish / shrimp, application of geolites and other buffers	Frenquent change of water with fresh water	Frequent draining of the pond with fresh water, removal of top layers
2. Floods	Not applicable in the district		
3. Cyclone / Tsunami	Not applicable in the district		

4. **Heat and Cold wave conditions**			
A. Capture			
Marine	Not applicable		
Inland	No intervention		
B. Aquaculture			
Changes in water quality (fresh water / brackish water ratio)	Reduction of biomass by partial harvest in the event of heat as the DO levels will be very low.	Avoidance of fishing	Compensatory stocking of seed and restoration of all physical and chemical parameters
Health and disease	Removal of stress causing factors to maintain the health of the animal	Removal of stress causing factors to maintain the health of the animal	Compensatory stocking of seed and restoration of all physical and chemical parameters