State: MAHARASHTRA

Agriculture Contingency Plan for District: NAGPUR

1.0 District Agriculture profile					
1.1	**Agro-Climatic/Ecological Zone**				
	Agro Ecological Sub Region (ICAR)	Central Highlands (Malwa, Bundelkhand and Eastern Satpura Range), Hot, subhumid (dry/moist) ecoregion (10.2).			
	Agro-Climatic Zone (Planning Commission)	Western plateau and hills region (IX)			
	Agro Climatic Zone (NARP)	Eastern Vidarbha zone (MH-9)&Part of Central vidarbha zone (MH-8)			
	List all the districts or part thereof falling under the NARP Zone	Akola, Buldhana, Washim, Amravati, Wardha, Nagpur			
	Geographic coordinates of district headquarter : Nagpur	Latitude	Longitude	Altitude	
		21° 09' 23.58" N	79° 05' 16.99" E	339 m	
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Associate Dean, College of Agril. Nagpur- 444001			
	Mention the KVK located in the district	Krishi Vigyan Kendra, (ICAR), CICR, Shankarnagar Post Office, Nagpur-440010			
1.2	**Rainfall**	Normal RF(mm)	Normal Rainy days (number)	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	936.1	44.9	24th MW (June 11-17)	40th MW (01-07 October)
	NE Monsoon(Oct-Dec):	76.3	4.1	-	-
	Winter (Jan- March)	49.8	3.6	-	-
	Summer (Apr-May)	19.9	1.9	-	-
	Annual	1082.1	54.5	-	-

1.3	**Land use pattern of the district** (latest statistics)	**Geogra-phical Area**	**Cultivable area**	**Forest area**	**Land under non agricultural use**	**Perm-anent pastures**	**Cultivable waste land**	**Land under miscellane-ous tree crops & groves**	**Barren & uncultivable land**	**Current fallows**	**Other fallows**
	Area ('000 ha)	986	639	159	87	55	41	10	34	62	40

Source : * District Soci economic Review 2009 of respective district pub by Govt. of M.S., Mumbai Hand Book of Basic Statistics of Maharashtra State.2006**

**1.4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area ('000 ha)**	**Percent (%) of total**
	Deep black soils	427.9	43.4
	Medium deep black soils	136.4	13.8
	Shallow black soils	421.5	42.7

Source NBSS & LUP, Nagpur

1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	499	123.2
	Area sown more than once	116	
	Gross cropped area	615	

1.6	**Irrigation**	**Area ('000 ha)**		
	Net irrigated area	134		
	Gross irrigated area	228.9		
	Rainfed area	**499**		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area

	Canals		**86.92**	**63.5**
	Tanks	216		2.6
	Open wells	55277	**56.16**	27.1
	Bore wells	5661	-	
	Lift irrigation schemes	3	-	
	Micro-irrigation		-	
	Drip	3433 (Sets)	3.1	
	Sprinkler	5353(Sets)	4.8	
	Other sources (please specify)	730	**7.9**	6.6
	Total Irrigated Area			
	Pump sets	39189		
	No. of Tractors	9951		

	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		43	
	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 etc. (2008-09)

1.7	Major Field Crops cultivated	Area ('000 ha)									
		Kharif			*Rabi*				Summer	Total	
		Irrigated	*Rainfed*	Total	*Crop*	*Irrigated*	Rainfed	Total	Crop		
	Soybean	-	305.5	305.5	Wheat	4.1		4.1	Groundnut	0.2	0.2
	Cotton	-	74.8	74.8	Gram		4.4	4.4	Moong	0.3	0.3
	Paddy	-	58.1	58.1	Linseed		0.4	0.4			
	Pigeonpea	-	57.1	57.1	R.Jowar		2.3	2.3			
	Jowar (Sorghum)	-	17.2	17.2	Other Pulses		1.8	1.8			
	Groundnut	-	5.7	5.7	Other Oil seed		0.4	0.4			
	Moong	-	1.2	1.2							
	Urd	-	1.2	1.2							
	Sesamum	-	0.09	0.09							
	Sugar cane	-	0.14	0.14							

	Horticulture crops - Fruits	**Total area ('000 ha)**
	Nagpur Mandarin	25.33
	Acid lime	3.81
	Mango	9.43
	Total	38.57
	Horticultural crops - Vegetables	**Total area ('000 ha)**
	Brinjal	6.5
	Tomato	0.95
	Cauliflower	2.0
	Cabbage	0.5
	Onion	0.4
	Total	**10.35**

		Total area	Irrigated	Rainfed
	Plantation crops	**-**	**-**	**-**
	Horticulture crops fruits	38.7	29.1	
	Vegetables	**10.3**		
	Others such as industrial pulpwood crops etc (specify)			
	Fodder crops	**Total area** (ha).	**Irrigated** (ha).	**Rainfed**
	Total fodder crop area	0.2		
	Grazing land	0.5		
	Sericulture etc (Mulberry)	80.5	80.5	-

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	257.4	210.9	468.4
	Crossbred cattle	22.4	79.6	102.1
	Non descriptive Buffaloes (local low yielding)	11.1	64.5	75.7
	Graded Buffaloes	1.3	7.3	8.6
	Goat	74.0	197.7	271.7
	Sheep	3.8	6.2	10.1
	Commercial dairy farms (Number)			

1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**
	Commercial	-	312.2
	Backyard	-	159.1

1.10	**Fisheries** (Data source: Chief Planning Officer)				
	A. Capture				
	i) Marine (Data Source: Fisheries Department)	**No. of fishermen**	**Boats**	**Nets**	**Storage**

N.A.		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	**facilities (Ice plants etc.)**
		-	-	-	-	-

ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
	430	**78**	**502**

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)	15000	0.73	10900
Others			

1.11 Production and Productivity of major crops (Average of last 5 years: 2004, 05, 06, 07, 08; specify)

1.11	Name of crop	**Kharif**		**Rabi**		**Summer**		**Total**		**Crop residue as fodder** ('000 tons)
		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)										
	CottonLint	238.3	210	Gram	57.6	481	-	-	-	-	
	Soybean	242.8	1020	Wheat	47.5	1476	-	-	-	-	

	Green gram	14.8	234	Safflower	2.4	615	-	-	-	-	
	Black gram	1.9	283						-	-	
	Pigeon pea	76.9	824						-	-	
	Others (specify) Kh Jowar	92.8	1133						-	-	

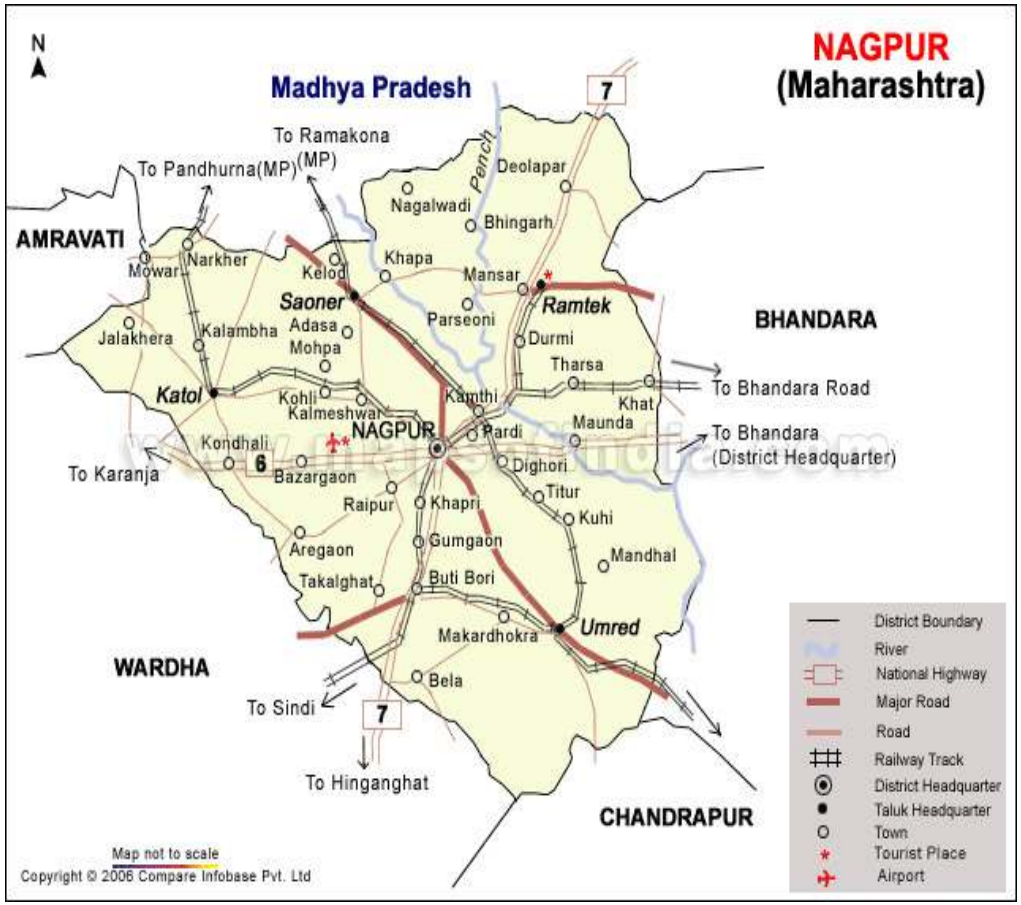
Major Horticultural crops (Crops to be identified based on total acreage)										
Banana	6.0	4.2								
Orange	6.3	3.2								
Onion	13.7	11.5								

1.12	**Sowing window for 5 major field crops**	Cotton	Soybean	Paddy	Pigeonpea	Kh. Jowar (K.Sorghum)
	Kharif- Rainfed	20 June –10July	20 June – 15 July	20 June-10July	20 June – 15 July	20 June – 10 July
	Kharif-Irrigated	-	--	--	--	--
		Wheat	Chickpea	-	-	-
	Rabi- Rainfed	-	1st October-15 October			
	Rabi-Irrigated	1st November-15th November	15October-1November	-	-	-

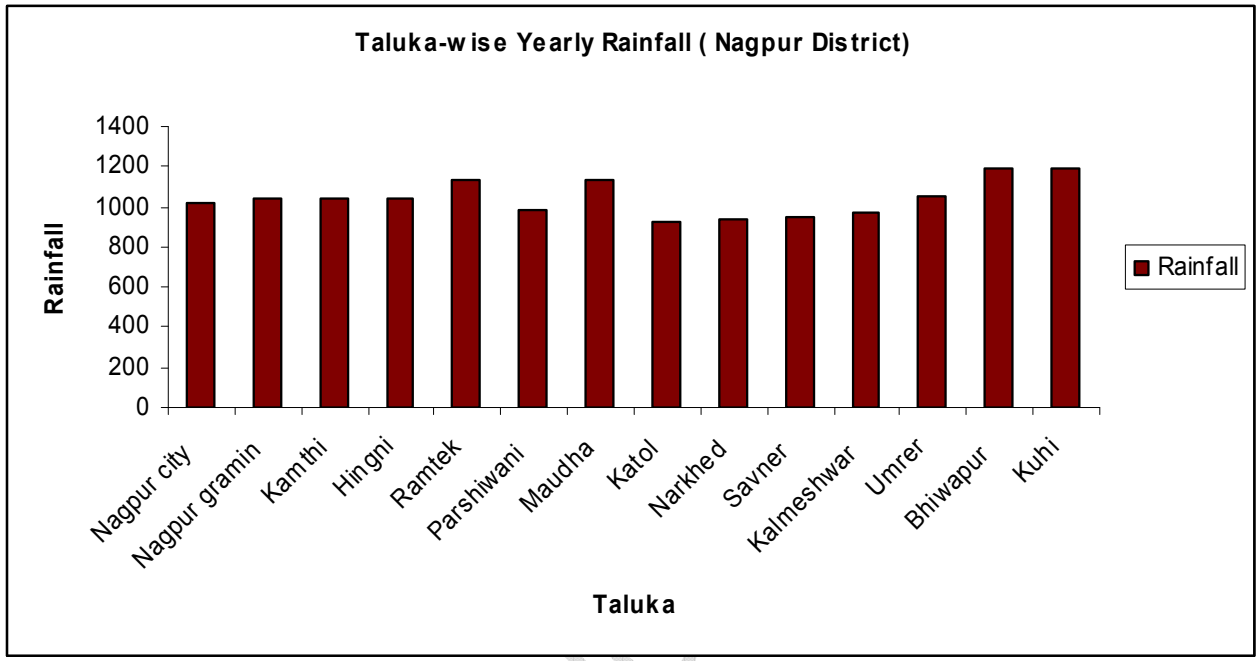
1.13	**What is the major contingency the district is prone to?** (Tick mark)	Regular	Occasional	None
	Drought	--	✓	-
	Flood	-	--	✓
	Cyclone	-	--	✓
	Hail storm	-	✓	-
	Heat wave	-	✓	-
	Cold wave	-	--	✓
	Frost	-	--	✓
	Sea water intrusion	-		✓
	Pests and disease outbreak		✓	
	Others (specify)			

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

Annexure I: Map of Nagpur District

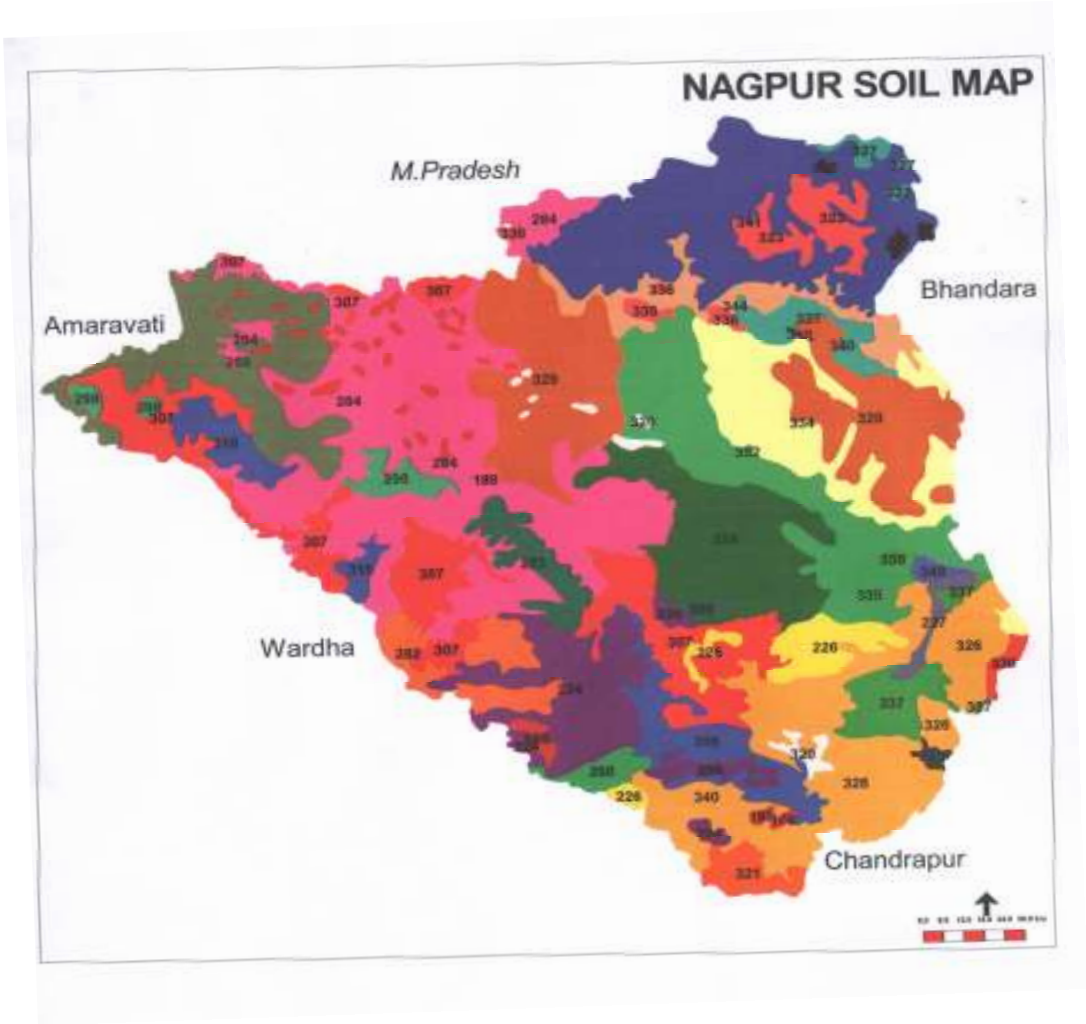


Annexure-II Mean Annual Rainfall



District Nagpur		
Taluka	**Rainfall**	**Rainy Day**
Nagpur city	1020.9	62.8
Nagpur gramin	1045.0	54.2
Kamthi	1045.0	52.1
Hingni	1045.0	52.1
Ramtek	1133.0	52.1
Parshiwani	986.0	52.1
Maudha	1133.0	52.1
Katol	921.0	52.1
Narkhed	940.0	52.1
Savner	945.8	57.8
Kalmeshwar	976.0	52.1
Umrer	1055.3	59.6
Bhiwapur	1196.0	52.1
Kuhi	1196.0	52.1
Overall	1045.6	54.0

Annexure III Soil Map



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 **25th June- 1st July** **26th MW**	Deep & Medium deep black soils	Bt Cotton	No change		
		Cotton+Tur Intercropping	No change	(Cotton + Pigeonpea 6:2/8:2 & intercropping system.)	Linkage with Dr.PDKV / MSSC NSC
		Soybean	No change	Test GP% Use seed rate @ 75-80kg/ha Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+Carbendazim 1gm+*Trichoderma* 4 gm/Kg of seed Intercrop one row of pigeon pea after every 4 or 6 rows of soybean as per convenience Open furrow after six /Three rows of soybean	
		Soybean+Pigeonpea Intercropping	No Change	Test GP% Use seed rate @ 75-80kg/ha Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+Carbendazim 1gm+*Trichoderma* 4 gm/Kg of seed	
		Sorghum (Kh. Jowar)	No Change	Seed Treatment of Imidachloprid 70 WS 7g/Kg Seed Sulphur 4g/Kg Seed	
	Shallow black soils	Paddy (Transplanted) Bandhi system	No change Prefer SKL-6, PKV Makrand, PKV Ganesh, PKV HMT, SYE 2001	Staggered sowing of paddy nursery	
		Soybean	No change in var.	Test GP% Use seed rate @ 75-80kg/ha Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+Carbendazim 1gm+*Trichoderma* 4 gm/Kg of seed	
		Green gram	No Change Of varieties	Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+ Carbendazim 1 gm + *Trichoderma* 4 gm/Kg of seed	

		Black gram		Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+ Carbendazim 1 gm + *Trichoderma* 4 gm/Kg of seed	

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 28th wk 9-15th July	Deep to medium deep black soils	Bt Cotton	**Soybean,** JS-335, JS-93 -05 **Pigeonpea** Varieties AKT- 8811, Vipula , PKV- Tara, BSMR-736	Test GP% Use seed rate @ 75-80kg/ha Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3gm+Carbendazim 1gm+*Trichoderma* 4 gm/Kg of seed Intercrop one row of pigeon pea after every 4 or 6 rows of soybean as per convenience Open furrow after six /Three rows of soybean)	Linkage with Dr.PDKV / MSSC NSC
		Cotton +Tur Intercropping	Replace the hybrids with improved varieties in cotton. (American Cotton:- AKH-8828,PKV Rajat,AKH-081, Desi Cotton:- AKA-5, AKA-7, AKA-8 No change in varieties for Pigeonpea	Use 20-25% more than recommended seed rate and reduce fertilizer dose by 25% for Cotton. Avoid sowing of green gram and black gram. To reduce the risk of late sowing follow cotton: sorghum: pigeon pea: sorghum (6:1:2:1) intercropping system.	
		Soybean	No Change	Follow Normal Recommended Package of Practices	
		Soybean + Pigeonpea Intercropping	No Change	-do-	
		Sorghum (Kh. Jowar)	Replace sorghum by soybean Varieties	-do-	

			JS-335, JS-93 -05		
		Paddy (Transplanted) Bandhi system	Prefer mid late and early varieties MTU 1010, SKL 6, Ganesh, PKV HMT SYE2001 Makrand	Drilling of paddy in main field and use of weedicide Sprouted seed sowing by using drum seeder on puddled field	The seedlings should be raised in community nurseries
	Shallow black soils	Soybean	No change in var.	Test GP% Use seed rate @ 75-80kg/ha Seed Treatment with *Rhizobium*+ PSB (250gm each /10Kg seed + Thiram 3 gm+Carbendazim 1gm+*Trichoderma* 4 gm/Kg of seed	

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 **23-29 July** **30th MW**	Deep to Medium deep black soils	Bt Cotton	Sunflower (hybrids) / Sesame AKT64/ Pearlmillet. PKV Raj Shradha, Saburi Pearlmillet + pigeon pea inter-cropping(2:1,.4:2)	Follow *insitu* moisture conservation measures	
		Cotton +Tur Intercropping	Sole Pigeonpea AKT-8811, Vipula, PKV Tara, BSMR-736. Sunflower (hybrids) /Pearlmillet. PKV Raj Shradha, Saburi / sesame AKT64/ Castor, Pearlmillet + pigeon pea inter-cropping(2:1,.4:2).	Adopt closer spacing(60x30 cm)for pigeonpea Follow *insitu* moisture conservation measures	For Seed Source and Technology contact Dr.PDKV / KVK/MSSC/ NSC.
		Soybean	Sunflower (hybrids) / sesame AKT64/ Castor /pearlmillet. PKV Raj Shradha, Saburi Pearlmillet + pigeon pea inter-cropping(2:1,.4:2).	Follow *insitu* moisture conservation measures	
		Paddy (Transplanted) Bandhi system	Early varieties of paddy SKL-6, IR 64, SYE- 1, SYE - 2001	Raising of nursery by Dapog method and transplanting in field Sowing of sprouted paddy seed by using drum seeder on puddled field Drilling of paddy directly in main field and pre-emergence application of Pendamethalene 30 EC @ 1 kg a.i. Closer transplanting (15 X 15 cm) and adopt	

				25 % higher seed rate for nursery.	
		Sorghum	Sunflower / Sesame AKT64/ Castor/Pearlmillet. PKV Raj Shradha, Saburi Pearlmillet + Pigeon pea inter-cropping (2:1,.4:2).	Follow *insitu* moisture conservation measures	
	Shallow black soils	Soybean	Sunflower / Sesame AKT64/ Pearlmillet. PKV Raj Shradha, Saburi	Follow *insitu* moisture conservation measures	
		Paddy (Transplanted) Bandhi system	Drilled paddy	Protective irrigation	

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 6-12 August, 32nd MW	Deep to Medium deep black soils	Bt Cotton	Sunflower /Sesame AKT64/ Castor/pearlmillet. PKV Raj Shradha, Saburi	Follow *insitu* moisture conservation measures	
		Cotton +Tur Intercropping	-do-	-do-	
		Soybean	-do-	-do-	
		Soybean+Pigeonpea Intercropping	-do-	-do-	
		Sorghum (Kh. Jowar)	-do-	Adopt closer spacing(60x30 cm)for pigeonpea Follow *insitu* moisture conservation measures	
	Shallow black soils	Soybean	Sunflower / sesame AKT64/ pearlmillet. PKV Raj Shradha, Saburi,	Follow *insitu* moisture conservation measures	
		Paddy (Transplanted)	-do-	-do-	

Condition			Suggested Contingency measures		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Deep to Medium deep black soils	**Bt Cotton** Cotton +Tur Intercropping	Give protective irrigation wherever possible. Raise cotton seedlings in nursery & transplant at sufficient soil moisture or Gap filling to be done by pot watering 7-10 days after sowing when crop stand is less than 80%	Avoid applying fertilizer till sufficient moisture in soil.	Sowing on BBF
		Soybean	Give protective irrigation wherever possible. Gap filling with maize and sesame. If germination is less than 50% resowing immediately after receipt of rains.	One hoeing	Rain water harvesting &recycling to be strengthened
		Soybean+Pigeonpea Intercropping	-do-	-do-	-do-
		Sorghum (Kh. Jowar)	Follow thinning to maintain optimum plant population.	One hoeing. Fertilizer application at sufficient moisture	-do-
	Shallow black soils	Soybean	Give protective irrigation wherever possible. Gap filling with maize and sesame. If germination is less than 50% resowing immediately after receipt of rains.	One hoeing	-do-
		Paddy (Transplanted)	Protective irrigation, Weeding	Application of fertilizers at sufficient soil moisture	

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 to Medium deep black soils	Bt Cotton	Weeding Intercultivation to create soil mulch to conserve moisture. Protective irrigation if possible.	Avoid applying fertilizer till there is sufficient moisture in the soil. Opening of alternate furrows.	With limited water availability prefer micro irrigation system Intercultivation implements/ machineries to be popularized through Govt. schemes.
		Cotton +Tur Intercropping	-do-	-do-	
		Soybean	-do-	Opening of alternate furrows.	
		Paddy (Transplanted)	Life saving irrigation	Application of nitrogenous fertilizers at sufficient soil moisture. Interculture	
		Sorghum (Kh. Jowar)	Weeding, Intercultivation to create soil mulch to conserve moisture. Protective irrigation if possible.	Avoid applying fertilizer till there is sufficient moisture in the soil. Opening of alternate furrows.	
	Shallow black soils	Soybean	-do-	Opening of alternate furrows. Spraying of 2 % urea or DAP.	
		Paddy (Transplanted)	Life saving irrigation	Application of nitrogenous fertilizers at sufficient soil moisture. Interculture	Rain water harvesting and recycling. Deepening of bodies

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
At flowering/ fruiting stage	Deep to Medium deep black soils	Bt Cotton	Protective irrigation if possible.	Spraying of 2 % urea or DAP.	
		Cotton + Pigeonpea Intercropping	-do-	-do-	
		Soybean	-do-	-do-	
		Paddy (Transplanted) Bandhi system	Life saving irrigation		
		Sorghum (Kh. Jowar)	Protective irrigation if possible.		
	Shallow black soils	Soybean	Protective irrigation if possible.	Spraying of 2 % urea or DAP.	
		Paddy (Transplanted)	Life saving irrigation		

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 to Medium deep black soils	Bt Cotton	Giving life saving supplemental irrigation, if available or taking up harvest at physiological maturity with some realizable yield	-	- -

		Cotton + Pigeonpea Intercropping	-do-	-	
		Soybean	-do-	Plan for *rabi* season	
	Deep to Medium deep black soils	Paddy (Transplanted) Bandhi system	Give second dose of nitrogen (25 kg N) under Protective irrigation.		
		Sorghum (Kh. Jowar)	Giving life saving supplemental irrigation, if available or taking up harvest at physiological maturity with some realizable yield.	Plan for *rabi* season	
	Shallow black soil	Soybean	-do-		
		Paddy (Transplanted)	Give second dose of nitrogen (25 kg N) under Protective irrigation.		

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 to Medium deep black soils and Shallow black soils	Wheat, Sugarcane & Chickpea	Wheat to be replaced by Chickpea/Linseed/Lathyrus /Mustard	Follow alternate row irrigation/irrigate at critical stages/ Stream cutoff	Tapping of other sources of irrigation. Sprinkler Irrigation

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 to Medium deep black soils and Shallow black soils	Wheat, Sugarcane & Chickpea	Wheat to be replaced by Chickpea/Safflower/Mustard/ Linseed/Sesamum	Follow alternate row irrigation/irrigate at critical stages/ Stream cutoff	Tapping of other sources of irrigation. Sprinkler Irrigation

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	Deep to Medium deep black soils and Shallow black soils	Wheat, Sugarcane & Chickpea	Wheat to be replaced by Chickpea/Safflower/Mustard/ Linseed/Sesamum	Follow alternate row irrigation/irrigate at critical stages/ Stream cutoff	Tapping of other sources of irrigation. Sprinkler Irrigation

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	NA				

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	Wheat , Chickpea	Chickpea, Lathyrus, Linseed, Vegetables	Sprinkler Irrigation, MIS	

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	Opening of field channels to	Opening of field channels	Opening of field channels to	

	remove surface ponding, Foliar spray of 2% Urea Interculture at optimum soil moisture to improve soil aeration	to remove surface ponding, Nutrient spray to arrest flower drop	remove surface ponding,	
Soybean	-do-	-do-	-do-	
Paddy	Drain excess water above 5 cm.	Drain excess water	Drainage Delay harvesting for few days. Harvesting and threshing Threshing at physiological maturity	Harvesting at physiological maturity Drying of paddy on bunds. Salt treatment of wetted paddy seeds with 5 % common salt to prevent germination. Shifting of produce at safer place or covering with paddy straw. Use of Paraquat as pre-harvest desiccant @ 0.1 % spray application for early harvesting to avoid losses by unpredictable monsoon at later stages.
Horticulture				
Acid Lime and orange	Opening of field channels to remove surface ponding,	Mrig bahar not affected For Ambia bahar Opening of field channels to remove surface ponding, Nutrient spray of NAA 10 ppm+ 1% urea to prevent flowers drop	Timely harvest to avoid losses	Fungal removal followed by Washing & waxing
Heavy rainfall with high speed winds in a short span				
Cotton	Opening of field channels to remove surface ponding. Improved drainage and drenching with copper oxy	Opening of field channels to remove surface ponding, Improved drainage and	Occurrence of grey mildew- control by sulphur spray @ 25 g/10 lit.	Shifting to safer place for drying

	chloride to avoid wilting incidence.	drenching with copper oxy chloride by opening of the nozzle of spray pump to avoid wilting incidence. Occurrence of grey mildew- control by sulphur spray @ 25 g/10 lit.		
Soybean	Opening of field channels to remove surface ponding	Opening of field channels to remove surface ponding		Shifting to safer place for drying
Paddy	Drainage excess water above 5 cm.	Drainage excess water above 10 cm.	Drainage Delay harvesting	Harvesting at physiological maturity Drying of paddy on bunds. Salt treatment of wetted paddy sheaves with 5 % common salt to prevent germination. Shifting of produce at safer place or covering with paddy straw. Use of PARAQUAT as pre-harvest desiccant @ 0.1 % spray application for early harvesting to avoid losses by un predictable monsoon at later stages.
Horticulture				
Nagpur Mandarin Acid lime and sweet orange	Support by bamboo if < 3 years plants.	Support by bamboo if < 3 years plants. Opening of field channels to remove surface ponding,	Opening of field channels to remove surface ponding,	Fungal removal followed by Washing & waxing
Outbreak of pests and diseases due to unseasonable rains	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Cotton	To control Jassids and Thrips spray with Acetamiprid 20 SP @ 1.5 g/ 10 lit.	Jassids and Thrips will increase spray with Acetamiprid 20 SP @ 1.5 g/ 10 lit.	-	-

Soybean	To control semi-looper spray NSKE 5% or quinalphos 25 EC 20 ml/10 lit.	To control semi-looper spray NSKE 5% or quinalphos 25 EC 20 ml/10 lit.	-	-
Paddy	Spraying of Mono-crotophos 36 EC 14 ml or Cypermetharin 10 EC 6 ml per 10 liter of water	Spraying of Mono-crotophos 36 EC 14 ml or Cypermetharin 10 EC 6 ml per 10 Liter of water	Removal and destruction of infected panicles due to Loose smut	
Horticulture				
Mandarine Orange	To control Citrus *psylla* Malathion 50EC 10ml Or Quinolphos 25EC 10ml Or Cypermethrin 25 EC 4 ml/10 lit	To control Citrus *psylla* Malathion 50EC 10ml Or Quinolphos 25EC 10ml Or Cypermethrin 25 EC 4 ml/10 lit	Immediateharvesting	Selling
Sweet Orange	-do-	-do-	-do-	-do-

Note:- Field bunds on slopy area to be strengthened

2.3 Floods: Not Applicable

Condition	**Suggested contingency measure**			
Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Horticulture				
Continuous submergence for more than 2 days				
Horticulture				
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				
Horticulture	Increase the frequency of irrigation, Use of temporary shed net., Spraying of antitranspirant. ,Mulching , Pruning of damaged parts	Increase the frequency of irrigation, Spraying of antitranspirant, Mulching. , Pruning of damaged parts, Application of Bourdeux paste	Increase the frequency of irrigation, Spraying of antitranspirant., Mulching, Pruning of damaged parts	Immediate harvesting of fruits, Increase the frequency of irrigation, Spraying of antitranspirant, Mulching , Pruning of damaged parts, Application of Bourdeux paste
Cold wave				
Horticulture	Covering with poly tunnel, flood irrigation at evening	Smogging, Flood irrigation at evening, Basin Mulching, Supplementary dose of fertilizer	Smogging, Flood irrigation at evening, Basin Mulching, Foliar application of potash fertilizers	Immediate harvesting, smogging, Flood irrigation, Basin Mulching, Foliar application of potash fertilizers
Frost				
Horticulture	NA	NA	NA	NA
Hailstorm				
Horticulture	Remove damaged parts , fungicidal spray	Remove damaged parts , fungicidal spray	Remove damaged parts, fungicidal spray, Spraying of NAA 20 ppm + 1 % urea.	Harvesting and grading
Cyclone	**NA**	NA	NA	NA

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.6 2.5.1 Livestock

	Suggested contingency measures		
	Before the event[s]	**During the event**	**After the event**
Drought			
Feed and fodder availability	As the district is occasionally prone to drought the following measures to be taken to mitigate the fodder deficiency problem Sowing of cereals (Sorghum/Bajra) and leguminous crops (Lucerne, Berseem, Horse gram, Cowpea) during North-East monsoon under dry land system for fodder production. Collection of soya meal waste and ground nut haulms 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 (paddy 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 at backyard 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 (soybean, paddy, sorghum, groundnut, black gram, green gram, bajra, chick pea, sugar cane etc.,) material as fodder Use of unconventional and locally available cheap feed ingredients especially soya meal waste and groundnut cake for feeding of livestock during drought Harvest all the top fodder available (Subabul, Glyricidia, Pipol, Prosopis etc) and feed the LS during drought Concentrate ingredients such as Grains, brans, chunnies & oilseed cakes, low grade grains etc. unfit for human consumption should be procured from Govt. Godowns for feeding as supplement for high productive animals during drought Promotion of Horse gram as contingent crop and harvesting it at vegetative stage as fodder All the hay should be enriched with 2% Urea molasses solution or 1% common salt solution and fed to LS. 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, GAINT 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 the feed and fodder banks

Drinking water	Adopt various water conservation methods at village level to improve the ground water level for adequate water supply. Identification of water resources Desilting of ponds Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals) 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 stagnated water bodies	Watershed management practices shall be promoted to conserve the rainwater. Bleach (0.1%) drinking water / water sources Provide clean drinking water
Health and disease management	Procure and stock emergency medicines and vaccines for important endemic diseases of the area All the stock must be immunized for endemic diseases of the area Surveillance and disease monitoring network to be established at Joint Director (Animal Husbandry) office in the district Adequate refreshment training on draught management to be given to VAS, Jr.VAS, LI with regard to health & management measures Procure and stock multivitamins & area specific mineral mixture	Carryout deworming to all animals entering into relief camps Identification and quarantine of sick animals Constitution of Rapid Action Veterinary Force 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 Rescue of sick and injured animals and their treatment Organize with community, daily lifting of dung from relief camps	Keep close surveillance on disease outbreak. Undertake the 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 the peak milk production does not coincide with mid summer

Floods	**NA**		
Cyclone	NA		
Heat & Cold wave	Arrangement for protection from **heat wave** i) Plantation around the shed ii) H_2O sprinklers / foggers in the shed **iii)** Application of white reflector paint on the roof **iv)** 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 Make available adequate cool drinking water during day time Feed green fodder/silage / concentrates during day time and roughages / hay during night time in case of heat waves Put on the foggers / sprinkerlers during heat weaves In severe cases, vitamin 'C' and electrolytes should be added in H_2O during heat waves.	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 Purchase of new productive animals

Vaccination schedule in small ruminants (Sheep & Goat)

Disease	Season
Foot and mouth disease (FMD)	Preferably in winter / autumn
PPR	All seasons, preferably in June-July
Black quarter (BQ)	May / June

Enterotoxaemia (ET)	May
Haemorrhagic septicaemia (HS)	March / June
Sheep pox (SP)	December / march

Vaccination programme for cattle and buffalo:

Disease	Age and season at vaccination
Anthrax	In endemic areas only, Feb to May
HS	May to June
BQ	May to June
FMD	November to December

2.5.2 Poultry

Drought	**Suggested contingency measures**		
	Before the event[a]	**During the event**	**After the event**
Shortage of feed ingredients	Storing of house hold grain like maize, broken rice etc, in to use as feed in case of severe drought	Supplementation only for productive birds with house hold grain Supplementation of shell grit (calcium) for laying birds Culling of weak birds	Supplementation to all survived birds

Drinking water		Use water sanitizers or offer cool hygienic drinking water	
Health and disease management	Culling of sick birds. Deworming and vaccination against RD and IBD	Mixing of Vit. A,D,E, K and B-complex including vit 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 pit
Floods	NA		
Cyclone	**NA**		
Heat wave			
Shelter/environment management	Provision of proper shelter with good ventilation	In severe cases, foggers/water sprinklers/wetting of hanged gunny bags should be arranged Don't allow for scavenging during mid day	Routine practices are followed
Health and disease management	Deworming and vaccination against RD and fowl pox	Supplementation of house hold grain Provide cool and clean drinking water with electrolytes and vit. C In hot summer, add anti-stress probiotics in drinking water or feed	Routine practices are followed
Cold wave	**NA**		

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine			
Inland			
(i) Shallow water depth due to insufficient rains/inflow	1. Proper planning of water storage 2. Conservation & development of water resources by construction of reservoirs & dams. 3. Avoid seepage losses by lining the canals. 4. Adopt rain water harvest techniques. 5. Farmer's organizations, water users & private sectors should be involved in construction, operation & maintenance of irrigation system. 6. To make people aware about conservation of water. 7. Critical analysis of long range a Forecast data. 8. Storage of water. 9. A forestation program. 10. Conservation of rivers/reservoir/ponds. 11. Re-excavation of local canals and reservoirs.	1. Maintenance of dams & reservoirs to avoid leakage & to control theft of water. 2. Proper use of water resources on priority base. 3. Add water in shallow water pond. 4. Use stored water. 5. Use surface water flow. 6. Divert water from unutilized areas. 7. Utilize canal water. 8. Aeration of water in ponds/reservoirs.	1. Regular desiltation of reservoirs & dams. 2. Govt. should make laws on water conservation. 3. To develop demand oriented system. 4. Govt. should make laws to stop deforestation. 5. Need based monitoring through research plan. 6. Intensive forestation program. 7. Augmentation of surface water flow. 8. Strengthening of water reservoirs. 9. Rain water harvesting . 10. Compensation claims. 11. Prepare vulnerability map and place it to management committee
(ii) Changes in water quality	1. Storage of water disinfectant such as chlorine, alum etc. at district level. 2. Prohibit dumping of solid, liquid and waste	1. Provision of water filtration system for the ponds to overcome the water contamination- 2. Use disinfectants and therapeutic drugs.	1. Removal of runoff from land by proper means before decomposition. 2. Supply of water filtration system even after

	in water sources. 3. Preparedness with stocks of chemicals, disinfectants and therapeutic drugs.	3. Adoption of bio-remedial measures	the event & creating awareness in farmers. 3. Need based research data should be generated on water quality. 4. Dumping of solid, liquid and waste in water bodies should be stopped through enactment of legislation.
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	1. Available resources will be identified and need to be kept ready for each district on the basis of forecasting of insufficient rain. 2. To avoid loss due to seepage, infiltration & leakage by using bentonite, ash, polythene liners etc. 3. Maintain the level of water by pumping water into pond. 4. Critical analysis of long range Forecast data. 5. Storage of water. 6. A forestation program. 7. Conservation of rivers/reservoir/ponds. 8. Re-excavation of local canals and reservoirs.	1. Water resources of the areas will be exploited with planning of proper transport facilities in affected areas. 2. Maintain the level of water to the required depth. 3. Add stored water in shallow water depth. 4. Harvesting of fishes as early as possible to avoid mortality. 5. Use stored water. 6. Use surface water flow. 7. Divert water from unutilized areas. 8. Utilize canal water. 9. Aeration of ponds	1. Available resources need to be listed with adequate transport arrangement. 2. Desiltation of pond bottom. 3. Maintenance of tanks & ponds 4. Need based monitoring through research plan. 5. Intensive a forestation program. 6. Augmentation of surface water flow. 7. Construction of water reservoirs. 8. Adoption of rain harvesting methods. 9. Compensation claims. 10. Prepare vulnerability map and place it to management committee
(ii) Impact of salt load build up in ponds / change in water quality	1. Minimize evaporation losses. 2. Dilution of water if salt load is high. 3. Available resources will be identified & need to be kept ready for each district on the basis of forecasting of insufficient rain to reduce the salinity by trapping available water resources. 4. On the basis of forecasting advising fish farmers for harvesting of marketable fish. 5. Prohibit dumping of solid, liquid and waste in water sources. 6. Preparedness with stocks of chemicals, disinfectants and therapeutic drugs	1. Dilution of water or exchange water to avoid salt builds up. 2. Harvesting the marketable fish to reduce the density. 3. Use disinfectants and therapeutic drugs. 4. Adoption of bio-remedial measures	1. Trapping the water resources from other places for dilution to reduce salt load. 2. Need based research data should be generated on water quality. 3. Dumping of solid, liquid and waste should be stopped through enactment of legislation.

2) Floods			
A. Capture			
Marine			
Inland			
(i) Average compensation paid due to loss of human life	1. Fishermen will be given forewarning regarding heavy rains and advised not to go for fishing in rivers/reservoirs. 2. Areas need to be identified in each district prone for flood. 3. Maintenance of water drainages in proper way to avoid blockage. 4. Proper forecasting information should be available. 5. Be prepared to evacuate at a short notice. 6. Preparation of flood control action plan. 7. Warning dissemination and precautionary response. 8. Formation of flood management committee. 9. Enhancement in coping capabilities of common people. 10. Insurance for the life of people/fishermen.	1. Fishermen will be advised on use of Life saving jackets and life boats. The life saving appliances/machinery shall be kept ready for rescue operation. 2. Sufficient stock of food, medicine etc. should be available. 3. Govt. should take necessary action & provide trained people for rescue operation during flood. 4. Human evacuation from the area. 5. Coordination of assistance. 6. Damage and need assessment. 7. Immediate management of relief supplies. 8. Immediate help delivery.	1. The victim's family shall be provided with compensation up to Rs. 1, 00,000/- for the deaths occurring during the fishing. 2. Rehabilitation of people. 3. Identify the causes of flood affected area & take necessary preventive measures. 4. Arrangement for rescue and casualty care. 5. Arrangement for burial control room. 6. Restoration of essential services, security and protection of property. 7. Support to rehabilitation, logistics, training and awareness build up & testing and updating the plan. 8. Insurance and compensation claim.
(ii) No. of boats / nets/damaged	1. The prior information on safe keeping of boats and nets will be provided to the fishermen. 2. If prior information is given bring boats & nets towards the safer side. 3. Annual repair of boats/nets and gears. 4. Insurance of boats/nets/gears.	1. Fishermen will be advised to stop fishing during the floods and heavy rainfall. 2. Continuous monitoring on water level is required. 3. Coordination of assistance 4. Immediate management of relief supplies. 5. Govt. support and compensation.	1. The affected fishermen will provided with compensation up to Rs. 50,000/- for damaged boats or nets. 2. Education and training for the repair of boats/nets and gears. 3. Loss assessment & insurance claim.

(iii) No.of houses damaged	1. Forewarning regarding heavy rainfall, sudden downpour and floods will be spread in the fishermen villages on the banks of rivers. 2. Shift the people to safer places. 3. Proper maintenance of *Kaccha* houses. 4. Education and training for the repair of houses 5. Store raw material for emergency repair of houses. House insurance	1. Temporary shelter to the affected families will be provided. 2. Arrangement of temporary shelters for homeless people. 3. Damaged house enumeration and need assessment. 4. Coordination of assistance. 5. Immediate management of relief supplies.	1. The housing facilities on higher elevation shall be provided to affected families by the Government agencies. 2. Provide compensation from Govt. to build/repair houses. 3. Loss assessment & insurance claim. 4. Govt. assistance claim.
(iv) Loss of stock	1. Harvesting the existing fish stock 2. Keep boats, nets/gears ready for emergency use. 3. Store fuels, food/other item 4. Develop flood control management plans. 5. .Stock material insurance.	1. Search/locate the tock/input. 2. Mobilize local people for protection. 3. Hire stock/inputs from distant areas/company/ farmers who are not affected by flood	1. Provided subsidy on seeds by Govt. 2. Implementation of Insurance policy. 3. Locate backup stocks and verify its usability time. 4. Follow flood control management plan. 5. Notify utilities of the critical demand about loss of stock and inputs. 6. Loss assessment & insurance claim.
(v) Changes in water quality	1.Storage of water disinfectant such as chlorine, alum etc. at district level. 2. Provision to stop/close the effluent/sewerage discharge point in water odies 3. Store chemicals, disinfectants and therapeutic drugs. 4. Develop flood control management plan.	1.Provision of water filtration system for the ponds to overcome the water contamination- 2. Do not use contaminated water 3. Proper preparation and management through emergency aeration. 4. Use appropriate amount of disinfectants, chemicals and therapeutic drugs. 5. Immediate support of Govt./industrial organizations for maintaining the purity and quality of water bodies. 6. Need based bioremediation	1.Removal of runoff from land by proper means before decomposition. 2.Supply of water filtration system even after the event & creating awareness in farmers. 3. Need based research data should be generated to maintain water quality, 4. Dumping of solid, liquid and waste should be stopped through enactment of legislation. 5. Contact Govt. and industrial organization for immediate remedy and cleaning of the water bodies. 6. Regular water monitoring and bio-monitoring of water bodies for formulation of management plan

(vi) Health and diseases	1. Water filtration system & control measures for diseases should be available. 2. Advance planning and preparedness. 3. Store chemicals, disinfectants and therapeutic drugs. 4. Stock sufficient stores of medicines	1. Periodical checking particularly with respective fish mortality should be done during flood & dead fishes disposed properly. 2. Prompt action or immediate removal of disease causing agents/ dead fish, followed by sterile or landfill disposal. 3. Use appropriate amount of disinfectants, chemicals and therapeutic drugs. 4. Emergency aeration or splashing in water bodies.	1. Setting health & disease management training centre at district level for fisherman community by Govt. or with the help of NGO. 2. Laboratory diagnosis of diseased fish, generation of data about type or kind of disease spread. 3. Eradicating the disease where possible. 4. Follow up surveillance and monitoring after disease outbreak. 5. Need based research data should be generated. 6. Loss assessment & insurance claim.
B. Aquaculture			
(i) Inundation with flood water	1.In the flood prone areas proper draining system from ponds need to be developed and planned in flood situation before forecasting of flood. 2.Site should be away from flood prone area. 3.Dyke should be stable in all weather condition & not liable to collapse during heavy rains. 4.Proper channels to be provided to pass surplus water & to avoid breakage to the bundh. 5.Proper facility construction for ponds and its stock safety. 6. Development of flood control management plan. 7.Preparedness with emergency backup equipment on site. 8. Stock insurance. 9. Preventive measures against entry of alien/wild organisms through flood water.	1. On the basis of forecasting information to farmers for sale of marketable fish with sufficient transport facility through various media. Proper drainage should be adopted so that inundation with flood water should be minimized. 2. On the basis of forecasting, information to farmers for sale of marketable fish with sufficient transport facility through various media. 3. Proper drainage should be adopted so that inundation with flood water should be minimized. Excess water should be drained from pond by providing screen outlets or using pumps. 4. Arrangement for evacuation. 5. Arrangement for rescue and casualty care. 6. Arrangement for burial control room. 7. Restoration of essential services, security and protection of property. 8. Coordination of assistance. 9. Damage and need assessment. 10. Immediate management of relief supplies. 11. Release excess water from height of T.	1). Planning even after the event should be made for proper drainage and creating awareness and trainings in flood situations. 2). Pinning even after the event should be made for proper drainage & creating awareness & training in flood situation. 3) Support to rehabilitation, logistics, training and awareness build up & testing and updating the plan 4) Reallocate fish to maintain appropriate biomass so that waste assimilation capacity of pond is not exceeded. 5) Reduce or cease feeding because uneaten food and fish waste decreases the dissolved oxygen level. 6) Strengthening of water bodies/ponds. 7) Loss assessment & insurance claim.

		12. Lower the water level in culture facilities.	
(ii) Water contamination and changes in water quality	1. Availability of water purifier i.e., chlorine, alum etc at district level. 2. Availability of water disinfectant such as chlorine, alum etc at district level. 3. Use of calcium hydroxide @ 150 kg/ha 4. Store chemicals, disinfectants and therapeutic drugs 5. Develop flood control management plan	1). Supply of water purifier for the ponds to overcome the contamination and changes in BOD. 2). Supply of water filtration system for ponds to overcome the contamination. Use of $kmno_4$ for bath of fish as prophylactics 3) . Do not use contaminated water. 4) Proper preparation and management through emergency aeration (paddle wheel aerator/circulating aerator), that may improve water quality in affected areas. 5) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. 6) Maintaining the purity and quality of water bodies. 7) Need based bioremediation.	1). Supply of water purifier even after the event and creating awareness in farmers. 2). Supply of water filtration system even after the event & crating awareness in farmers. 3). Lime treatment for oxidation 4). To maintain water quality, need based research data should be generated 5). Dumping of solid, liquid and waste should be stopped through enactment of legislation. 6). Immediate remedy and cleaning of water bodies. 7). Regular water monitoring and bio-monitoring of water bodies for formulation of management plan.
(iii) Health and diseases	1. Storage of water purifiers and control measures for diseases should be available. 2. Personnel should be trained for health & disease management through training 3. & list of trained personnel should be available at each district level. 4. Adequate stock of medicine should be available at each district level. 5. Antibiotics fortified feeding as prophylactics 6. Advance planning and preparedness. 7. Store chemicals, disinfectants and therapeutic drugs. 8. Stock sufficient emergency medicines.	1. Periodical checking particularly with respective fish mortality should be done during flood. 2. Services of trained personnel need to be made available in affected areas with sufficient supply of life saving medicines. 3. Disinfectants formalin treatments as prophylactics 4. Identification of type of disease outbreak, immediate removal of disease causing agents/ dead fish. 5. Use appropriate amount of disinfectants, chemicals and therapeutic drugs. 6. Determination of nature and speed of transmission of diseases. 7. Emergency aeration or splashing in water bodies	1). Setting health and disease management training centre at district level for fishermen and government officials. 2). Routine training programmed as a refresher course need to be implemented in relation to health & disease management during flood. 3) .Lime treatment for oxidation 4). Laboratory diagnosis of diseased fish, generation of data about type or kind of disease spread. 5). Eradicating the disease. 6). Follow up surveillance and monitoring. 7). Proper disposal of dead fish. 8). Loss assessment & insurance claim
(iv) Loss of stock and inputs (feed,	1). Harvestable sized fishes shall be marketed before the event to avoid losses. The inputs like feed and chemical etc. shall be	1).The pond embankments will be fenced with netting to avoid fish losses. The store rooms for inputs like feed, chemicals etc. shall be	1) The fish farmers shall be provided with fish seed and feed at concessional rates. 2) Feeds, chemicals etc required for the culture

chemicals etc)	stored at safe places. 2).Flood situation going to exist then move the feed, chemicals & other accessories to safer places. 3). Keep the stock/input at safe place for emergency purpose. 4). Store fuels, food/other item. 5) .Develop flood control management plan. 6). Stock material insurance.	created. 2).Available fish stock should be recovered. Stock of inputs must be stored in well protected area. 3). Search/locate the stock/input. 4). Purchase/hire valuable stock/inputs from distant areas not affected by flood.	operation should be purchased. 3) Strengthening of stocks. 4) Assessment of total loss. 5) Insurance claims
(v) Infrastructure damage (pumps, aerators, huts etc)	1) Prior information regarding removal of Pumps and aerators shall be given to the fish farmers. 2) Flood situation going to exist then move the pumps, aerators & other accessories to safer places. 3) Educate and provide training for the repair of infrastructure. 4) Follow flood control management plan. 5) Store raw materials for repairing of pumps aerators, huts etc. 6) Infrastructure insurance.	1) Pumps, aerator and generators shall be removed from the pond before the event. 2) Use manual techniques for aeration or make substitute arrangement for the same. 3) Notify utilities of the critical demand. 4) Coordination of assistance. 5) Immediate management of relief supplies.	1. Suitable Compensation for the damaged machinery shall be given to the fish farmers. 2. Install the equipments during flood. 3. Damaged infrastructure enumeration and need assessment. 4. Locate backup equipment and verify its operation. 5. Repair of damaged infrastructure. 6. Loss assessment & insurance claim.
3. Cyclone / Tsunami			
A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives			
(ii) Avg. no. of boats / nets/damaged			
(iii) Avg. no. of houses damaged			
Inland			

B. Aquaculture			
(i) Overflow / flooding of ponds	1. If intensity of cyclone with heavy rain fall exists then harvest existing fish stock. 2. Dike should be stable in all weather condition & not liable to collapse during flood.	1. On the basis of forecasting information to farmers for sale of marketable fish with sufficient transport facility through various media. Proper drainage should be adopted so that inundation with storm water should be managed 2. Enhancement of dykes height by sand bags	1. Planning even after the event should be made for proper drainage & creating awareness & training in storm situation.
(ii) Changes in water quality (fresh water / brackish water ratio)	1. Supply of water for correcting the changes in fresh water & brackish water. 2. Maintain salinity by addition of fresh water up to 20-25 ppt.	1. Supply of water for correcting the changes in fresh water & brackish water. 2. Use euryhaline species	1. Water storage facility needs to be developed to overcome the problem of changes in fresh & brackish water ratio. 2. use Euryhaline species for culture
(iii) Health and diseases	1. Water filtration system & control measures for disease should be available. 2. Adequate stock of medicine should be available at each district level. 3. Liming and formalin treatment	1. Periodically checking particularly in respective of fish mortality & water parameter during flood. 2. Disinfectants treatments	1. Settling health & disease management training centre at district level for fishermen & Govt. official.
(iv) Loss of stock and inputs (feed, chemicals etc)	1. Cyclone with heavy rain fall situation going to exist then move the feed, chemicals & other accessories to safer places. 2. Stock cover under insurance	1. Available fish stock should be recovered.	1. Feeds, chemicals etc required for the culture operation should be purchased. 2. Seed and feed to be supplied through Deptt of fisheries,
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	1) Cyclone with heavy rain fall situation going to exist then shifted the pumps, aerators & other accessories to safer places.	1) Use manual techniques for aeration or make substitute arrangement for the same.	Compensation on assessment of actual losses & damage of pumps, aerators, shelters/huts given through RKVY, NCDC, NREGSui
4. Heat wave and cold wave			
A. Capture			
Marine			
Inland			

B. Aquaculture			
(i) Changes in pond environment (water quality)	1)If intensity of heat wave high, add water from other source. 2)Harvest existing fish stock. 3)Adequate facility should be ready for heat wave & system for changing water temperature during cold wave. 4)Listen to local weather forecasts and stay aware of upcoming temperature changes. 5) Arrange the aerators. 6) Ensure sufficient water quantity in water bodies. 7)Formulate strategic fishing management for the heat /cold waves. 8) Tree plantation around fish ponds	1) Adequate facility should be ready for heat wave & system for changing water temperature during cold wave. 2) Monitor fishing sites frequently to ensure that they are not affected by heat or cold waves. 3) Use dark materials to cover the water bodies during excessive heat waves. 4) Stay hydrated by drinking plenty of fluids during fishing/field work. 5) Adopt proper care and management during the fishing period of cold/heat wave like keeping stock of drinking water and extra cloths. 6) Educating the farmers through electronic or print media 7) Maintain Water level in pond	1)Adequate facility should be ready for heat wave & system for changing water temperature during cold wave. 2) Intensive afforestation program for reducing heat waves. 3) Collect basic weather data and incidence of extreme and physical data of water bodies, water chemistry and seasonal changes, plankton profile and seasonal blooms, topography and soil composition. 4) Gather information about history of catch per unit effort as well as fish yield rate during heat wave and cold wave and accordingly simulate future plan for sustainable fishing. 5) Loss assessment & insurance claim.
(ii) Health and Disease management	1) Adequate stock of medicine should be available at each district level. 2) Advance planning and preparedness. 3) Store chemicals, disinfectants and therapeutic drugs. 4) Develop heat/ cold wave control management plan. 5) Stock sufficient emergency medicines.	1) Periodical checking particularly with respective fish mortality should be done. 2) Identification of type of disease outbreak, immediate removal of disease causing agents/ dead fish. 3) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. 4) Determination of nature and speed of transmission of diseases. 5)Emergency aeration or splashing in water bodies 6)Bleaching powder 1 to 2 % , formalin treatment to prevent disease	1) Setting health & disease management training centre at district level for fishermen & Govt. official. 2) Laboratory diagnosis of diseased fish, generation of data about type or kind of disease spread. 3) Eradicating the disease. 4) Follow up surveillance and monitoring. 5) Proper disposal of dead fish. 6) Loss assessment & insurance claim. 7) KMNO4 2 % to maintain oxygen level