State: GUJARAT

Agriculture Contingency Plan for District: Morbi

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	Western Plain, Kachchh and Part Of Kathiawar Peninsula, Hot Arid Eco-Region (2.4)		
	Agro-Climatic Zone (Planning Commission)	Gujarat Plains & Hills Region (XIII)		
	Agro Climatic Zone (NARP)	North Saurashtra (GJ-6)		
	List all the districts or part thereof falling under the NARP Zone	Amreli, Jamnagar, Rajkot,Surendranagar, Morbi, Devbhumi Dwarka and part of Bhavnagar,		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		22°30' N	70.30° E	74.44 m
	Name and address of the concerned ZARS	Main Dry Farming Research Station, Junagadh Agricultural University, Targhadia (Rajkot)-360 003		
	Mention the KVK located in the district	There is no KVK in the Morbi district		

1.2	**Rainfall (Mentioned period-2002-12)**	Average (mm) (10 Years)	Normal Rainy days (number)	Normal Onset (week and month)	Normal Cessation (week and month)
	SW monsoon (June-Sep):	612	29	3 rd Week of June	3 rd Week of September
	NE Monsoon(Oct-Dec):	-	-	NA	NA
	Winter (Jan- March)	-	-	NA	NA
	Summer (Apr-May)	-	-	NA	NA
	Annual	612	29	NA	NA

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000ha)	481.9	313.3	28.9	29.9	31.5	7.0	0	59.0	11.8	0.5

(Source: Reports of Rajkot and Surendranagar District Panchayat)

1. 4	**Major Soil types**	Area ('000 ha)	% Area
	Medium black soil (Clayey)	202.4	64.6
	Alluvial soil (Sandy-loam, Loamy)	91.8	29.3
	Hilly soil (Light)	13.6	4.3
	Silty soil (Loamy)	5.5	1.8
	Total	313.248	

* Mention colour, depth and texture (heavy, light, sandy, loamy, clayey etc) and give vernacular name, if any, in brackets

1.5	**Agricultural land use**	Area (ha)	Cropping intensity %
	Net sown area	313.3	108.6
	Area sown more than one	27.0	
	Gross sown area	340.3	

(Source: Reports of Rajkot and Surendranagar District Panchayat)

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	87.6		
	Gross irrigated area	93.3		
	Rain fed area	225.7		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals		5.3	6.0
	Tanks	43	7.8	8.9
	Open wells	20661	73.0	83.4
	Bore wells	5821	-	-
	Lift irrigation schemes	-	-	-
	Micro-irrigation		-	-
	Other sources, Ponds & Check dams	424	1.5	1.7
	Total Irrigated Area		87.6	
	Pump sets	20380		
	No. of Tractors	6596		
	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	-	-	Moderate Saline
	Critical	-	-	-
	Semi- critical	1	22.36	Saline
	Safe	4	77.64	Moderate Saline
	Wastewater availability and use	-	-	-
	Ground water quality	Good quality water is available upto500-650 feet ,but more than that poor water quality		

*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%

(Source : Reports of Rajkot and Surendranagar District Panchayat)

1.7 Area under major field crops & horticulture (as per latest figures) (Specify year 2011-13)

1.7	**Major field crops cultivated**	**Area ('000 ha)**							
		Kharif			***Rabi***				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	a. Cotton Hybrid	-	148.3	148.3	-	-	-	-	160.1
	b. Cotton Desi	-	11.8	11.8	-	-	-	-	
	Groundnut	-	44.6	44.6	-	-	-	1.2	45.8
	Sesamum	-	17.4	17.4	-	-	-	2.4	19.8
	Castor	-	17.1	17.1	-	-	-	-	17.1
	Gum-guar	-	5.1	5.1	-	-	-	1.7	6.8
	Pearl millet	-	1.4	1.4	-	-	-	0.6	2.0
	Wheat				14.3	-	14.3	-	14.3
	Horticulture crops - Fruits	**Area ('000 ha)**							
		Total							
	Citrus	0.7							
	Mango	0.3							
	Ber	0.3							
	Papaya	0.3							
	Pomegranate	0.2							
	Anola	0.1							
	Horticulture crops - Vegetables	**Total**							
	Onion	1.2							
	Brinjal	1.0							
	Tomato	0.8							
	Ladies figure	0.8							
	Cluster bean	0.6							
	Cucumbers	0.6							
	Spices crops	**Total**							
	Cumin	31.2							
	Garlic	1.5							
	Coriander	1.2							
	Chilies	0.5							

	Fenugreek	0.3
	Fodder crops	**Total**
	Total fodder crop area	36.7
	Grazing land	31.5
	Sericulture etc	-
	Others (specify)	-

(Source: Reports of Rajkot and Surendranagar District Panchayat)

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	41.0	86.2	127.2
	Crossbred cattle	0.4	1.0	1.4
	Non descriptive Buffaloes (local low yielding)	9.5	126.0	135.5
	Graded Buffaloes	-	-	-
	Goat	-	-	93.5
	Sheep	-	-	115.3
	Others (Camel, Pig, Yak, horse etc.)	-	-	6.4
	Commercial dairy farms (Number)			
1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**	
	Commercial	-	115.6	
	Backyard	-	-	

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

A. Capture

i) Marine (Data Source: Fisheries Department)	**No. of fishermen**	**Boats**		**Nets**		**Storage facilities (Ice plants etc.)**
		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
	840	81	4	85	-	NIL

	ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
		-	**60**	**49**
	B. Culture			
		Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
	i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	6270		
	ii) **Fresh water** (Data Source: Fisheries Department)	21673.3	63.10	6646
	Others	-	-	-

(Source: Reports of Rajkot and Surendranagar District Panchayat)

1.11 Production and Productivity of major crops (Year 2011-12 to 2013-14)

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)										
	a. Cotton Hybrid b. Cotton Desi	302.746 14.810	2042 1256	-	-	-	-	317.556	1984	378.43 27.69
	Groundnut	77.558	1741	-	-	2.473	2082	80.031	1750	112.46
	Sesame	7.827	450	-	-	2.602	1091	10.428	527	24.46
	Castor	30.966	1810	-	-	-	-	30.966	1810	47.09
	Gum Guar	4.830	944	-	-	1.427	824	6.257	914	6.47
	Pearl millet	1.664	1192			1.897	2969	3.784	1859	5.25
	Cumin	-	-	27.423	880	-	-	27.423	880	29.89
	Wheat	-	-	52.032	3633	-	-	52.032	3633	98.34
Major Horticultural crops- Fruit (Crops to be identified based on total acreage)										
	Citrus	-	-	-	-	-	-	5805	8542	-
	Mango	-	-	-	-	-	-	1428	4118	-
	Ber	-	-	-	-	-	-	4396	13483	-

	Papaya	-	-	-	-	-	-	22680	90357	-
	Pomegranate	-	-	-	-	-	-	2042	8895	-
	Anola	-	-	-	-	-	-	1145	11561	-

Major Horticultural crops- Vegetable(Crops to be identified based on total acreage)										
	Onion	-	-	-	-	-	-	31042	25987	-
	Brinjal	-	-	-	-	-	-	15132	14503	-
	Tomato	-	-	-	-	-	-	14978	18292	-
	Ladies figure	-	-	-	-	-	-	6369	8016	-
	Cluster bean	-	-	-	-	-	-	3749	6465	-
	Cucumbers	-	-	-	-	-	-	7860	13599	-
Major Horticultural crops- Spices(Crops to be identified based on total acreage)										
	Cumin	-	-	-	-	-	-	20861	861	-
	Garlic	-	-	-	-	-	-	12092	8266	-
	Coriander	-	-	-	-	-	-	339	1527	-
	Chilies (Dry)	-	-	-	-	-	-	398	762	-
	Chilies (Green)	-	-	-	-	-	-	5451	10456	-
	Fenugreek	-	-	-	-	-	-	312	2142	-

(Source: Reports of Rajkot and Surendranagar District Panchayat)

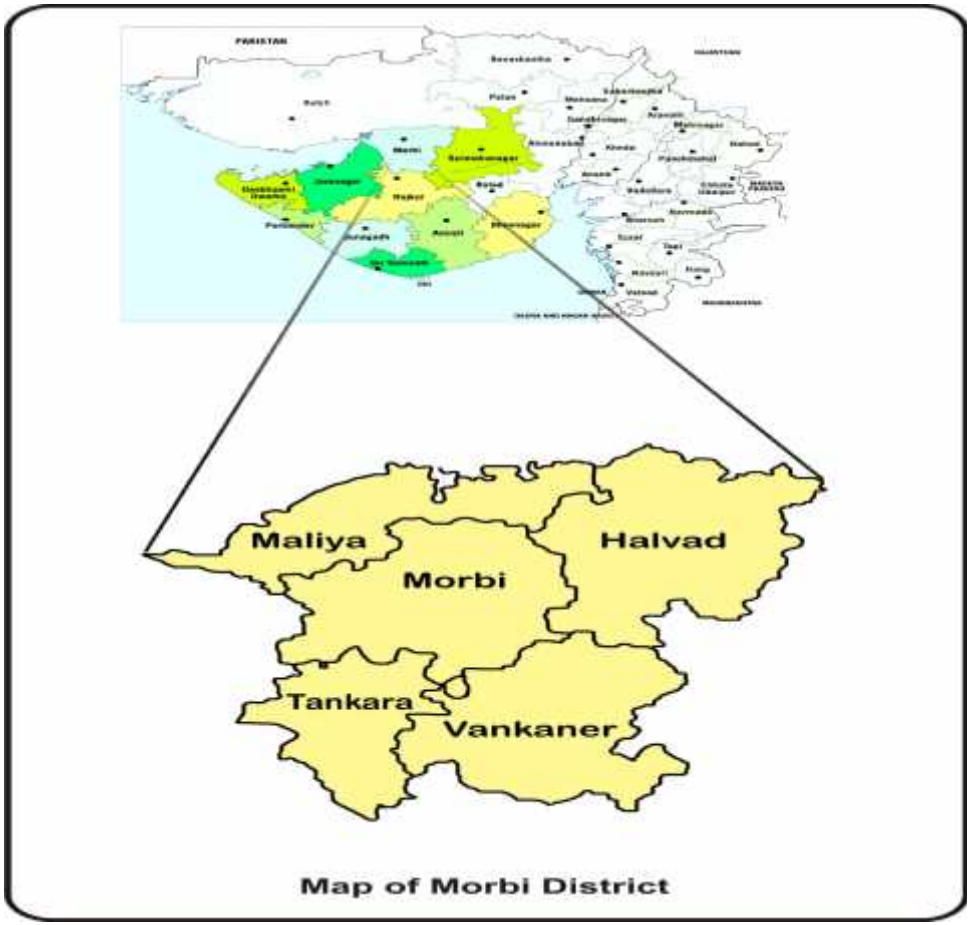
1.12	**Sowing window (start and end of sowing period)**	Cotton	Groundnut	Sesame	Castor	Wheat	Cumin
	Kharif- Rain fed	3rd week of June to 1st week of July	3rd week of June to 1st week of July	3rd week of June to 1st week of July	3rd week of June to 1st week of July	-	-
	Kharif-Irrigated	3rd week of May	3rd week of May	-	-	-	-
	Rabi-Irrigated	-	-	-	-	2nd week of Nov. to 4th week of Nov.	2nd week of Nov. to 4th week of Nov.

1.13	**What is the major contingency the district is prone to? (Tick mark)**	Regular	Sporadic	None
	Drought	-	√	-
	Flood	-	√	-
	Cyclone	-	√	-
	Hail storm	-	-	√
	Heat wave	-	√	-
	Cold wave	-	-	√
	Frost	-	-	√
	Sea water intrusion	-	-	-
	Pests and diseases Pests-Aphid, Jassids, Thrips, White fly &Fruit fly Diseases-Powdery Mildew, Rust, Leaf spot, Tikka & Downy Mildew	√	-	-

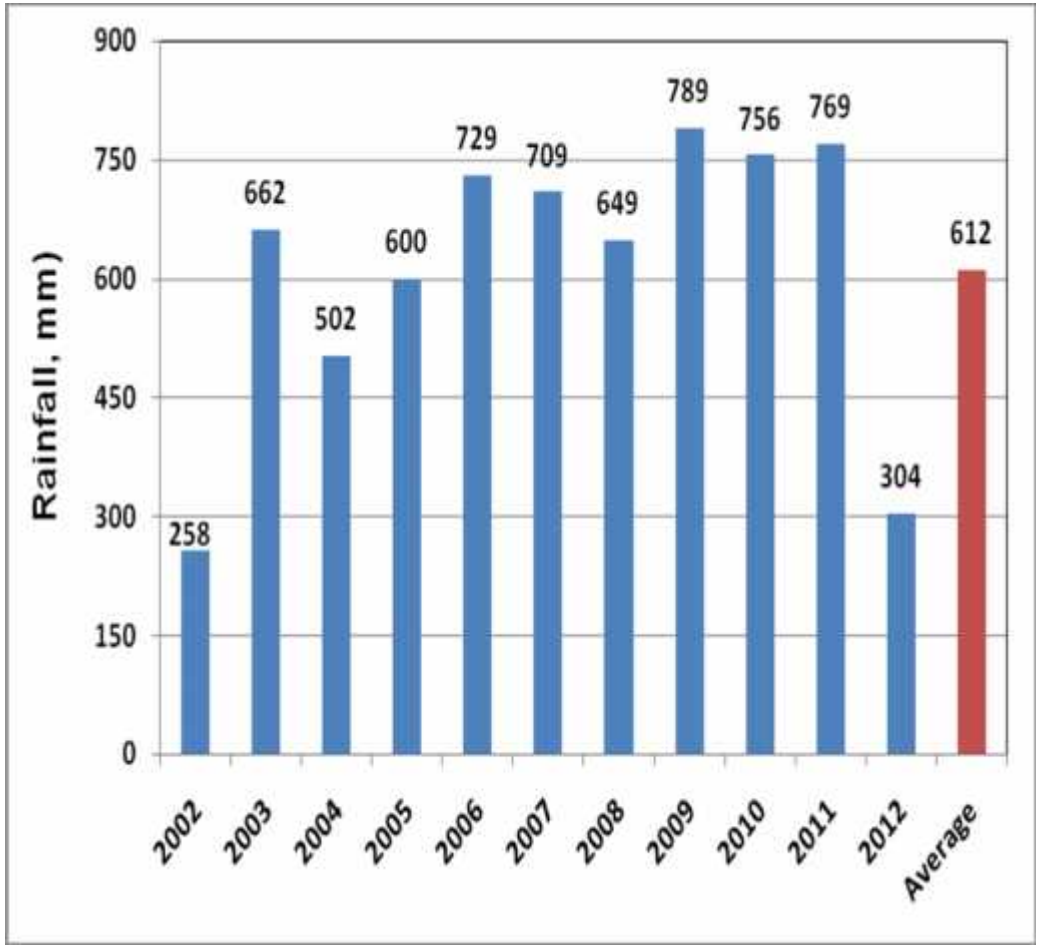
1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Enclosed: Yes
		Mean annual rainfall as Annexure II	Enclosed: Yes
		Soil map as Annexure III	Enclosed: Yes

Annexure I

Location map of district Morbi in Gujarat

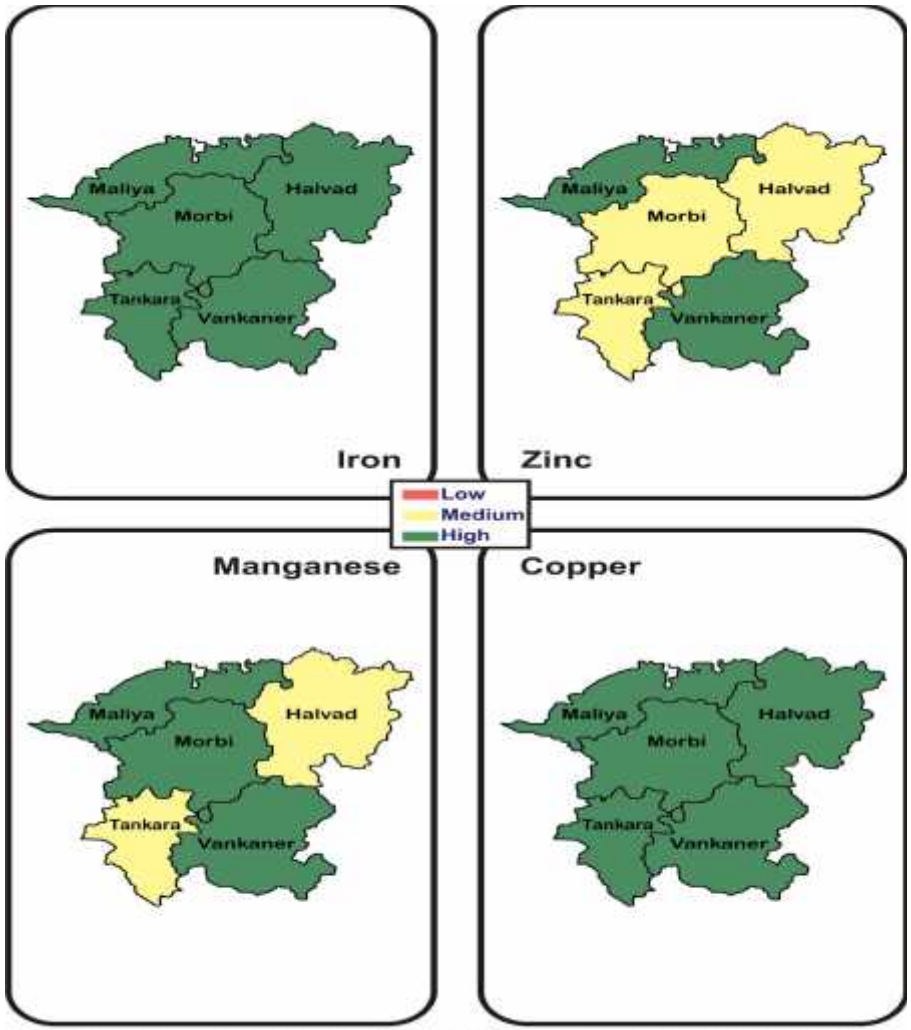


Annexure II



Average annual rainfall (mm) of Morbi district

Annexure III



Status of micronutrients in soils of Morbi District

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 **July 1st wk** **27th Std week**	Medium and shallow black Soils	Cotton	No change	Normal	NA
		Groundnut	No change	Normal	
		Sesame	No change	Normal	
		Castor	No change	Normal	
	Alluvial soils	Cotton	No change	Normal	
		Groundnut	No change	Normal	
		Castor	No change	Normal	
		Sesame	No change	Normal	
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 **July 3rd wk** **29th Std week**	Medium and shallow black Soils	Cotton	No change	-	Agencies for quality seed supply are National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujcomasol .
		Groundnut	Bunch variety GG-2/GG-5/ GG-7/GJG-9/TG37A Semi spreading variety GG-20/GJG-22 of groundnut	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	
		Castor	No change	-	
		Sesame	No change	-	
	Alluvial soils	Cotton	No change	-	
		Groundnut	Bunch variety GG-2/GG-5/ GG-7/GJG-9/TG37A Semi spreading variety GG-20/GJG-22 of groundnut	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	
		Castor	No change	-	
		Sesame	No change	-	

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 (Specify month)* **August 1st wk 31st Std week**	Medium and shallow black Soils	Cotton	Greengram GM-4, K-851/ Sesame GT-2, 3, 4, / Sorghum GFS-4 & 5, Gundhari, S-1049/ Castor GC-3,GCH-4 GCH-6, GCH-7/ Pigeon pea, BDN-2, Vaishali	As per crop change follow the package of practices	Agencies for quality seed supply are National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujcomasol. Supply of quality seed from NSC, GSSC, SAU, and zero till seed drill, seed dressing equipments, sprayers & dusters from Government Schemes (Implements like seed drill, seed dressing are available in Rajkot).
		Groundnut	-do-	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	
		Castor	No change	-	
		Sesame	No change	-	
	Alluvial soils	Cotton	Greengram GM-4, K-851/ Sesame GT-2, 3, 4, / Sorghum GFS-4 & 5, Gundhari, S-1049/ Castor GC-3,GC4-4 GCH-6, GCH-7/ Pigeon pea, BDN-2, Vaishali	As per crop change follow the package of practices.	
		Groundnut	-do-	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	
		Castor	No change	-	
		Sesame	No change	-	
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 **August 3rd wk 33rd Std week**	Medium and shallow black Soils	Cotton	Greengram GM-4, K-851/Sesame GT- 4, Purva-1 /Sorghum GFS-4 & 5, Gundhari, S-1049/ Castor GC-3, GCH-4, GCH-6, GCH-	As per crop change follow the package of practices	-

			7/ Pigeon pea, BDN-2, Vaishali/Soybean GM-4, JS-335		
		Groundnut	-do-	-do-	-
		Castor	No change	-	-
		Sesame	No change	-	-
	Alluvial soils	Groundnut	Greengram GM-4, K-851/Sesame GT- 4, Purva-1 /Sorghum GFS-4 & 5, Gundhari, S-1049/ Castor GC-3, GCH-4, GCH-6, GCH-7/ Pigeon pea, BDN-2, Vaishali/Soybean GM-4, JS-335	As per crop change follow the package of practices	-
		Cotton	-do-	As per crop change follow the package of practices	-
		Castor	No change	-	-
		Sesame	No change	-	-

Condition			**Suggested Contingency measures**		
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.	Medium and shallow black Soils	Cotton	Gap filling	Interculturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk Mulching (Plastic film 25 micron, ~200 kg/ha)	Supply of plastic film through Govt. Schemes. Cotton stock shredding machine which available in Jasdan town of Rajkot district to be supplied by Govt.
		Groundnut	-do-	-do-	-do-
		Castor	-do-	-do-	-do-
		Sesame	Thinning to maintain plant to plant distance	Interculturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	Supply of wheat straw or shredded cotton stalk
	Alluvial soils	Cotton	Gap filling	Interculturing to fill soil cracks, mulching with wheat straw or shredded	Supply of plastic film through Govt. Schemes. Cotton stock

				cotton stalk Mulching (Plastic film 25 micron, ~200 kg/ha)	shredding machine which available in Jasdan town of Rajkot district to be supplied by Govt.
		Groundnut	Gap filling with maize /sesame	-do-	-do-
		Castor	-do-	-do-	-do-
		Sesame	Thinning to maintain plant to plant distance	Interculturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	Supply of wheat straw or shredded cotton stalk
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 vegetable stage	Medium and shallow black Soils	Cotton	Weeding. Protection against sucking pests pests (control of jassid and aphid, spray imidachlopride 17.8 SL 4 ml/10 lit. water). Life saving irrigation if possible	Mulching with wheat straw or crushed cotton stalk or plastic mulching (Plastic film 25 micron, ~200 kg/ha.) Interculturing	Supply of plastic film and pesticides through Govt. Schemes. Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL)
		Groundnut	-do-	-do-	-do-
		Castor	-	-do-	-do-
		Sesame	Thinning to maintain plant to plant distance	Interculturing to fill soil cracks Spraying of 1 % N through urea after relief of drought	Supply of urea through Govt. Schemes
	Alluvial soils	Cotton	Weeding. Protection against sucking pests pests (control of jassid and aphid, spray imidachlopride 17.8 SL 4 ml/10 lit. water).	Mulching with wheat straw or crushed cotton stalk or plastic mulching (Plastic film 25 micron, ~200 kg/ha.) Interculturing	Supply of plastic film and pesticides through Govt. Schemes. Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL).
		Groundnut	-do-	-do-	-do-
		Castor	-	-do-	-do-
		Sesame	Thinning to maintain plant to plant distance	Interculturing to fill soil cracks Spraying of 1 % N through urea after relief of	Supply of urea through Govt. Schemes

				drought	
Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measure**	**Remarks on Implementation**
At flowering/ fruiting stage	Medium and shallow black Soils	Cotton	Supplemental irrigation if possible followed by weeding.	Interculturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd PGVCL).
		Groundnut	-do-	-	
		Castor	-do-	Interculturing to fill soil cracks	
		Sesame	-do-	-do-	
	Alluvial soils	Cotton	Supplemental irrigation if possible followed by weeding.	Interculturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd PGVCL).
		Groundnut	-do-	-	
		Castor	-do-	Inter-cultivation to fill soil cracks	
		Sesame	-do-	-do-	

Condition			**Suggested Contingency measures**	
Terminal drought (Early withdrawal of Monsoon)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**
	Medium Black Soils	Cotton	Harvest mature bolls. Supplemental irrigation if possible	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL).
		Groundnut	Life saving irrigation if possible.	-do-
		Castor	Harvest spikes. Supplemental irrigation if possible	-do-
		Sesame	Supplemental irrigation if possible	-do-
	Alluvial soils	Cotton	Harvest mature bolls. Supplemental irrigation if possible	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL).
		Groundnut	Life saving irrigation if possible.	-do-
		Castor	Harvest spikes. Supplemental irrigation if possible	-do-
		Sesame	Supplemental irrigation if possible	-do-

2.1.2 Drought - Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed/ limited release of water in canals due to low rainfall	Medium & shallow black soils	NA	NA	NA	NA
	Alluvial soils	NA	NA	NA	NA
Non release of water in canals under delayed onset of monsoon in catchments	Medium & shallow black soils	NA	NA	NA	NA
	Alluvial soils	NA	NA	NA	NA
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Medium & shallow black soils	NA	NA	NA	NA
	Alluvial soils canals)	NA	NA	NA	NA

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient ground water recharge due to low rainfall	Medium & shallow black soils	Wheat	Wheat	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL).
			Gram Guj 1, GJG-3 / Cumin Guj 2,3 & 4/ Coriander Guj 1 & 2/ Fenugreek GM-4,, Leafy Vegetables / Carrot.	Adoption of sprinkler irrigation system. Reduce area of irrigation.	

		Cotton	Cotton	Supply irrigation during night time to reduce transpiration.	
			Gram Guj 1, GJG-3 / Cumin Guj 2,3 & 4/ Coriander Guj 1 & 2/ Fenugreek GM-4,, Leafy Vegetables / Carrot.	Adoption of sprinkler irrigation system. Reduce area of irrigation.	
		Cumin	-do-	Adoption of drip, deficit irrigation, Reduce area of irrigation	
	Alluvial soils	Wheat	Wheat	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Panchim Gujarat Vij Company Ltd (PGVCL).
			Gram Guj 3 / Cumin Guj 2,3 & 4/ Coriander Guj 1 & 2/ Fenugreek Guj 1, Leafy Vegetables / Carrot.	Adoption of Sprinkler irrigation system. Reduce area of irrigation.	
		Cumin	-do-	Adoption of drip, deficit irrigation, Reduce area of irrigation	

2.2 Unusual rains (untimely, unseasonal etc) (for both rain fed 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	Surface drainage (for management of water logging, Apply 199 kg/ha ammonium sulphate	Surface drainage for management of water logging. Apply 199 kg/ha ammonium sulphate	Surface drainage for management of water logging. Harvesting mature bolls	Protect produce with plastic sheet (100 micron UV stabilized colour plastic) or shift produces to farm shed and protection against pest/disease damage in storage etc, Preparation of quick drying techniques to separate good lot and bad lot.
Groundnut	-	-	Delay harvesting of spreading groundnut if possible.	-do-

			Immediately harvest bunch groundnut. Quick surface drainage, Open channel around field.	
Castor	-	-	Surface drainage (for management of water logging), harvest spikes	-do-
Sesame	-	-	Surface drainage (for management of water logging), harvest crop	-do-
Wheat	Surface drainage (to control water logging condition).	Surface drainage (to control water logging condition).	Surface drainage for management of water logging, and spray mancozeb 0.2%.to control black point in grain.	-do-
Cumin/ Coriander	Surface drainage for management of water logging & diseases. To control cumin blight spray mancozeb 0.2% and 0.2% wettable sulphur for protection against powdery mildew disease	Surface drainage for management of water logging & diseases. To control cumin blight spray mancozeb 0.2% and 0.2% wettable sulpher for protection against powdery mildew disease	Surface drainage for management of water logging. Harvesting at physiological maturity immediately	-do-
Horticulture				
Citrus	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water). Collect mature fruits	-
Mango	Provision of drainage. Fertilizer application. Control leaf blight under unusual rains with cloudy weather.	Spray 0.2% wettable sulphur or 0.005% hexaconazole for protection against powdery mildew after cessation of heavy rain	Hang methyle euginol trap, one /acre for control of fruit fly.	Utilize unripe fruits for pickles
Ber	-	Spray 0.2 % wettable sulphur for protection against powdery mildew	-	-
Heavy rainfall with high speed winds in a short span[2]				

Cotton	Surface drainage for management of water logging. Apply 199 kg/ha ammonium sulphate. Upraised the plants and press soil around plants.	Surface drainage for management of water logging and apply 199 kg/ha ammonium sulphate	Surface drainage for management of water logging and harvesting mature bolls	Protect produce with plastic sheet (100 micron, UV stabilized colour plastic) or shift produces to farm shed and protection against pest /disease damage in storage etc, Preparation of quick drying techniques to separate good lot and bad lot.
Groundnut	-	-	Harvesting delay for spreading groundnut if possible. Immediately harvested bunch groundnut. Quick surface drainage, open channel around field.	-do-
Castor	-	-	Surface drainage (for management of water logging), Harvest mature spikes	-do-
Sesame	-	-	Surface drainage for management of water logging. Harvesting at physiological maturity. Spray mancozeb 0.2% or 0.005% hexaconazole to control stem and capsule spot.	-do-
Wheat	Surface drainage (to control water logging condition).	Surface drainage (to control water logging condition).	Surface drainage for management of water logging and lodging crop and spray mancozeb 0.2%.to control black point in grain.	-do-
Cumin/ Coriander	Surface drainage for management of water logging & diseases, mancozeb 0.2% to control cumin blight.	Surface drainage for management of water logging & diseases, mancozeb 0.2% to control cumin blight.	Surface drainage (for management of water logging) harvesting at physiological maturity immediately	-do-
Horticulture				
Citrus	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water). Collect mature fruits.	-

Mango	-	Spray 0.2% wettable sulphur or 0.005% hexaconazole for protection against powdery mildew.	Collect fallen fruits	Utilized unripe fruits for pickles
Ber	-	Spray 0.2 % wettable sulphur for protection against powdery mildew	-	-

Outbreak of pests and diseases due to unseasonal rains				
Cotton	-	-	-	-
Groundnut	Spray 0.005 % hexaconazole for rust & tikka disease control.	Spray 0.005 % hexaconazole for rust & tikka disease control.	Spray 0.005 % hexaconazole for rust & tikka disease control.	-
Castor	-	-	-	-
Sesame	-	-	-	-
Horticulture				
Citrus	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water).	Control citrus canker by spray of copper oxychloride 0.2 % + streptocycline 100 ppm (1 gram in10 lit water). Collect mature fruits	-
Mango	Provision of drainage, fertilizer application, Control leaf blight under unusual rains with cloudy weather	Spray 0.2% wettable sulphur or 0.005% hexaconazole for protection against powdery mildew after cessation of heavy rain.	Hang methyle euginol trap, one /acre for control of fruit fly.	-
Ber	-	Spray 0.2 % wettable sulphur for protection against powdery mildew	Spray 0.2 % wettable sulphur for protection against powdery mildew.	-

2.3 Floods

Condition	Suggested contingency measure			
Transient water logging/ partial inundation[1]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Cotton	NA	As a preventive step open drainage channel.	As a preventive step open drainage channel.	-
Groundnut	NA	As a preventive step open drainage channel.	As a preventive step open drainage channel.	-
Castor	NA	As a preventive step open drainage channel.	As a preventive step open drainage channel.	-
Sesame	NA	As a preventive step open drainage channel.	As a preventive step open drainage channel.	-
Horticulture				
Citrus	Shift to safe place with proper drainage	Surface drainage	Surface drainage	Surface drainage
Mango	Proper Surface drainage	Surface drainage	Surface drainage	Surface drainage
Ber	Shift to safe place & Surface drainage	Surface drainage	Surface drainage	Surface drainage
Continuous submergence for more than 2 days				
Cotton	As a preventive step open drainage channel and apply 199 kg/ha ammonium sulphate.	As a preventive step open drainage channel and apply 199 kg/ha ammonium sulphate.	As a preventive step open drainage channel. Harvesting mature bolls	-
Groundnut	As a preventive steps open drainage channel followed by spray of 0.05 % carbendazim for control of leaf spot.	As a preventive steps open drainage channel followed by spray of 1 % FeSO4 + 0.1 % citric acid for control yellowing, 0.0025% hexaconazole for rust & leaf	As a preventive steps open drainage channel followed by spray of 1 % FeSO4 + 0.1 % citric acid for control yellowing.	-

		spot management.		
Sesame	As a preventive step open drainage channel	As a preventive step open drainage channel.	As a preventive step open drainage channel.	Harvest mature plants
Castor	As a preventive step open drainage channel	-	-	Harvest mature spikes
Horticulture				
Citrus	Shift grafts to safe place proper surface drainage.	Surface drainage	Surface drainage	Surface drainage
Mango	Shift grafts to safe place proper surface drainage.	-do-	-do-	-do-
Sea water inundation				
	NA	NA	NA	NA

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

Extreme event type	**Suggested contingency measure[r]**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave	Light & frequent irrigation to all crops	Light & frequent irrigation to all crops	Light & frequent irrigation to all crops	-
Cold wave	NA	NA	NA	NA
Frost	NA	NA	NA	NA
Hailstorm	NA	NA	NA	NA
Cyclone				
Cotton	Earthing up, quick drainage	Earthing up, quick drainage	Earthing up, quick drainage	Shift produce at safer place
Groundnut	Quick drainage	Quick drainage	Quick drainage	
Wheat	Quick drainage	Quick drainage	Quick drainage and spray mancozeb 0.2% to control black point in grain.	
Cumin/ Coriander	Quick drainage	Quick drainage	Quick drainage	
Horticulture				

Mango	Shift seeding to safe place if possible & build cyclone proof nursery houses	Reduce canopy & tying plants diagonally if possible. Grow wind barrier trees around field.	Reduce canopy & tying plants diagonally if possible	Early harvesting of crop
Citrus	Shift seeding to safe place if possible & build cyclone proof nursery houses	Reduce canopy & tying plants diagonally if possible. Grow wind barrier trees around field.	Reduce canopy & tying plants diagonally if possible	Early harvesting of crop
Ber	-	-	Reduce canopy	Early harvesting of crop

2.5 Contingent 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	Store fodder (silage and hay), Conventional feeds are used for feeding (Roughages & concentrates) of maize, sorghum, groundnut fodder and wheat straw	Stored feed & fodder in silage & hay. Treated wheat straw with 4 % urea solution. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder	Feed little green fodder along with unconventional feed, 5 kg green feed/mature animal
Drinking water	Rain water harvesting and create water bodies/watering points. When water is scarce use only for drinking water for animals.	Avoid wallowing. Judicious use of drinking water. Establish and arrange the community based drinking water facilities. In coastal area community based R.O. plant to be established for drinking water. Add bleaching powder to drinking water (1%)	Give sufficient water as per the animal requirement
Health and disease management	Foot & Mouth disease vaccination in June, Vaccination for Bacterial diseases e.g. ,	Add mineral mixtures 25 g/Animal/day along with feed,	Add vitamin mineral mixtures 25 g/animal/day along with feed, quarantine diseased animals and

	HS,BQ Deworming of the animals (cattle & buffaloes). Add mineral mixtures 25 g/animal/day along with feed. Animals to be covered cover under insurance schemes.	Deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. Science students for health management of animal. Carry out disease diagnosis camps.	deworming of the animals.
Floods			
Feed and fodder availability	Harvest available fodder and store it at safe place if floods forecast. Shift animals to safe place. Identify rescue places for safety of animals	Give stored fodder with mineral mixture. Fodder should be stored at safe place. In severe rain and flood unteather animals.	Feed silage & hay material along with concentrate feed. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation. Establish community based shelter houses for animals. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder.
Drinking water	Add bleaching powder (1%) to drinking water when heavy rains occur and flood expected.	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).
Health and disease management	Provide insurance cover to the animals.	Vaccination of animals against HS, BQ Add mineral mixtures 25 g/Animal/day along with feed, deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. Science students for health management of animal. Carry out disease diagnosis camps.	Disposal of dead animals by burning the carcas and sanitation measures to control spread of diseases. Health checking to diseases outbreak.

Cyclone			
Feed and fodder availability	Early harvesting & storage of fodder,	Shift animals to safe place. Give stored fodder with mineral mixture along with concentrated feed. In severe rain and flood unteather animals.	Feed silage & hay material along with concentrated feed. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation. Establish community based shelter houses for animals. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder.
Drinking water	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).
Health and disease management	Provide insurance cover to the animals.	Vaccination of animals against HS& BQ. Add mineral mixtures 25 g/animal/day along with feed, deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. Science students for health management of animal. Carry out disease diagnosis camps.	Disposal of dead animals by burning the carcas and sanitation measures to control spread of diseases. Health checking to diseases outbreak.
Heat wave and cold wave	NA	NA	NA
Heat wave	NA	NA	NA

[a] based on forewarning wherever available

2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event	**During the event**	**After the event**	
Drought				
Shortage of feed ingredients	Use stored feed, conventional feed, antibiotics and probiotics	Use stored feed, conventional feed, antibiotics and probiotics	Use conventional feed, Vaccination for viral diseases –Marek's and Ranikhet diseases (MD & RD).	Linkage Govt. schemes with public/NGOs at grass root levels.
Drinking water	Rain water harvesting	Give water for drinking only	Give sufficient water as per the bird's requirement	Linkage Govt. schemes with public/NGOs at grass root levels.
Health and disease management	Vaccination for viral diseases –against MD & RD, cover birds under insurance	Provide ventilation. Add more calcium with feed. Assure supply of electric power.	Routine practices are followed, culling affected birds disposal by burning.	Vaccination for viral diseases – against MD & RD.
Floods				
Shortage of feed ingredients	Use conventional feed, ingredients	Use stored feed, antibiotics, pro biotic, and assure supply of electric power.	Routine practices are followed	Linkage Govt. schemes with public/NGOs at grass root levels.
Drinking water	-	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).	Linkage Govt. schemes with public/NGOs at grass root levels.
Health and disease management	Cover birds under insurance	For suspected cases, give antibiotic in the feed, prevent water logging surrounding sheds. Assure supply of electric power.	Dispose dead birds by burning.	Vaccination for viral diseases – against MD & RD.

Cyclone				
Shortage of feed ingredients	Use stored feed ingredients.	Use stored feed & use conventional feed, antibiotics, pro biotic	Routine practices are followed.	Use stored feed ingredients.
Drinking water	-	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).	-
Health and disease management	Cover birds under insurance	For suspected cases give antibiotics.	Dispose dead birds by burning.	-
Heat wave and cold wave				
Heat wave				
Shelter/environment management.	Arrangement of good ventilation by fan, foggers.	Operate fans, foggers; keep open ventilators in night and cool period.	Routine practices are to be followed.	
Health and disease management	Cover birds under insurance	Viral vaccination add calcium in the poultry feed.	Routine practices are to be followed.	-
Cold wave				
Shelter/environment management	NA	NA	NA	-
Health and disease management	NA	NA	NA	-

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event[a]	**During the event**	**After the event**
1)Drought			
A. Capture			
Marine	NA	NA	NA
Inland	NA	NA	NA
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	Desilting/deepening of pond so that more water can be stored	Provision of additional bore wells. Use Euryhaline species.	Maintaining pond water level at least 1 m depth.
(ii) Impact of salt load build up in ponds / change in water quality	Replenishment of water in pond with fresh water.	30 % exchange of water.	10 % exchange of water.
(iii) Any other	-	-	-
2) Floods			
A.Capture			
Marine	NA	NA	NA
Inland	NA	NA	NA
B. Aquaculture			
(i) Inundation with flood water.	Deepening of ponds, repair, strengthening of dykes	Enhancement of dykes height by sand bags.	-
(ii) Water contamination and changes in water quality.	Use of calcium hydroxide @ 150 kg/ha.	Use of $KMnO_4$ for bath of fish as prophylactics.	Lime treatment for oxidation.
(iii) Health and diseases.	Antibiotics fortified feeding as prophylactics.	Disinfectants formalin treatments as prophylactics.	-do-
(iv) Loss of stock and inputs (feed, chemicals etc).	Stock cover under insurance	-	-

(v) Infrastructure damage (pumps, aerators, huts etc.)	-	-	Repaire & maintenance of aqua structures to be given.
(vi) Any other	-	-	-
3. Cyclone / Tsunami			
A.Capture	-	-	-
Marine	-	-	-
(i) Average compensation to be paid due to loss of fishermen lives	Forwarning systems to be installed. Insurance & communication instruments supplied to fisher man. Warning systems to be installed.	Warning systems to be installed.	Compensations to be paid for repair & maintenance of boats & gears on actual survey basis.
(ii) Avg. no. of boats / nets/damaged			Compensation on assessment of actual losses & damage of boats & nets to be given.
(iii) Avg. no. of houses damaged	-	-	Compensation on assessment of actual losses & damage of houses to be given.
Inland	NA	NA	NA
B. Aquaculture			
(i) Overflow / flooding of ponds	Strengthening of dykes.	Enhancement of dykes height by sand bags.	-
(ii) Changes in water quality (fresh water / brackish water ratio)	Maintain salinity by addition of fresh water up to 20-25 ppt.	Use euryhaline species.	Use Euryhaline species for culture.
(iii) Health and diseases	Liming and formalin treatment.	Disinfectants treatments.	-
(iv) Loss of stock and inputs (feed, chemicals etc).	Stock cover under insurance.	-	Seed and feed to be supplied through Deptt of fisheries,
(v) Infrastructure damage (pumps, aerators, shelters/hutsetc)	-	-	Compensation on assessment of actual losses & damage of pumps, aerators, shelters/huts to be given.

(vi) Any other	-	-	-
4. Heat wave and cold wave			
A. Capture			
Marine	NA	NA	NA
Inland	NA	NA	NA
B. Aquaculture			
(i) Changes in pond environment (water quality)	Plantation of leafy trees on dyke, increase depth.	To maintain water level in pond. Use of fountain and peddle wheel aerator.	-
(ii) Health and disease management	-	Bleaching powder 1 to 2 %, formalin treatment to prevent diseases.	KMnO4 2 % to maintain oxygen level
(iii) Any other	-	-	-

[a] based on forewarning wherever available