State: GUJARAT

Agriculture Contingency Plan for District: BHAVNAGAR

1.0 District Agriculture profile					
1.1	**Agro-Climatic/Ecological Zone**				
	Agro Ecological Sub Region (ICAR)	Central Highlands (Malwa), Gujarat Plain (5.1)			
	Agro-Climatic Zone (Planning Commission)	Gujarat Plains and hills region (XIII)			
	Agro Climatic Zone (NARP)	North Saurashtra, South Saurashtra (GJ-6,GJ-7)			
	List all the districts or part thereof falling under the NARP Zone	Junagdh, Porbandar, Bhavnagar and part of Amreli			
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude	
		21° 46'10.93" N	$72^0$08'36.93"E	30m	
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Agricultural Research Station (Fruit Crops), Junagadh Agricultural University, Mahuva-364290, Dist.-Bhavnagar, Gujarat, (India)			
	Mention the KVK located in the district	Krishi Vigyan Kendra, At- Lok Bharati Sanosara, Ta- Sinhor, Dist.-Bhavnagar, Gujarat, India			
1.2	**Rainfall**	Normal RF(mm)	Normal Rainy days (number)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
	SW monsoon (June-Sep):	519	28	2nd week of June	2nd week of September
	NE Monsoon(Oct-Dec):	-	-		
	Winter (Jan- Feb)	-	-		
	Summer (Mar-May)	-	-		
	Annual	519	28		

(Data Source: Reports of District Panchayat, Bhavnagar)

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	857.9	548.5	26.9	59.7	61.1	24.9	-	98.5	36.9	1.0

(Data source : Reports of Statistics Branch, District Panchayat, Bhavnagar)

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area ('000 ha)**	**Percent (%) of total**
	1. Medium to shallow black soils	357.1	58.40
	2. Coastal alluvial soils	254.4	41.60
	Others (specify):		
1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	548.5	106
	Area sown more than once	33.4	
	Gross cropped area	581.9	

(Data Source : Reports of Statistics Branch, District Panchayat, Bhavnagar)

1.6	**Irrigation**	Area ('000 ha)		
	Net irrigated area	179.0		
	Gross irrigated area	194.0		
	Rainfed area	369.5		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals		10.1	5.2
	Tanks	666	13.3	6.7
	Open wells	73220	170.6	88.1
	Bore wells	-	-	-

	Lift irrigation schemes	-	-	-
	Micro-irrigation			
	Other sources (please specify)	-		
	Total Irrigated Area		194.0	100.00
	Pump sets	52708		
	No. of Tractors	-		
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc), *GW Development =64 %,Safe
	Over exploited	-	-	Saline (with sea water intrusion)
	Critical	-	-	Saline
	Semi- critical	5	49.4	Moderate saline
	Safe	6	50.5	-
	Wastewater availability and use	-	-	-
	Ground water quality	Saline groundwater with higher TDS, Sea water intrusion problem in coastal aquifers		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

(Data source : Irrigation Branch, District Panchayat, Bhavnagar and reports of Gujarat water resources development corporation (GWRDC))

1.7 Area under major field crops & horticulture (as per latest figures) (Specify year 2008-09)

1.7	S.No.	Major field crops cultivated	Area ('000 ha)							
			Kharif			*Rabi*				
			Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Summer	Grand total
		Cotton	239.4	66.8	306.2	-	-	-	-	306.2
		Groundnut	-	102.7	102.7	-	-	-	22.5	125.2
		Bajra	-	44.4	44.4	-	-	-	3.5	47.9

		Wheat	-	-	-	33.9	-	33.9	-	33.9
		Pulses	-	7.0	7.0	3.0	-	3.0	-	10.0
	Others (specify)	-	-	-	-	-	-	-	-	-

	S. No.	**Horticulture crops - Fruits**	**Area ('000 ha)**
			Total Area
		Mango	5.5
		Citrus	5.4
		Sapota (Chiku)	2.7
		Banana	1.8
	Others (specify)	Others	6.2
		Horticulture crops - Vegetables	**Total Area ('000 ha)**
		Onion	32.3
		Garlic	0.6
	Others (specify)	-	-
		Medicinal and Aromatic crops	**Total Area ('000 ha)**
	1	Cumin	5.6

	Others (specify)	-	-
		Plantation crops	**Total Area ('000 ha)**
	1	Coconut	3.8
	Others (Specify)	Eg., industrial pulpwood crops etc.	-
		Fodder crops	**Total Area ('000 ha)**
		Sorghum	21.8
		Maize	1.6
		Lucerne	0.7
	Others (Specify)	-	-
		Total fodder crop area	24.1
		Grazing land	61.1
		Sericulture etc	-
		Others (specify)	-

(Data source: Reports of Statistics Branch, District Panchayat, Bhavnagar)

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	138.8	201.2	340.0
	Crossbred cattle			
	Non descriptive Buffaloes (local low yielding)	317.4	16.7	334.1
	Graded Buffaloes			
	Goat	1.8	0.1	2.0
	Sheep	2.4	0.1	2.5
	Others (Camel, Pig, Yak etc.)	67.3	25.0	92.3
	Commercial dairy farms (Number)	-	-	-

1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**
	Commercial	175	1248.9
	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)	
	10620	179	20	19895	12331	-

ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
	-	12	35

B. Culture

	Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	20.0	0.8	0.02
ii) **Fresh water** (Data Source: Fisheries Department)	-		
Others			

(Source : Reports of Bhavnagar District Panchayat, Deptt. of Agriculture , Fisheries and Animal husbandry , Govt. of Gujarat)

1.11 Production and Productivity of major crops (Average of last 5 years: 2004- 09; specify years)

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)										
	Ground nut	129.8	1184	-	-	337	1556	163.5	274.0	303.6
	Cotton	1077.2	68.9	-	-	-	-	1077.2	68.9	2289.2
	Wheat	-	-	89.6	288.2	-	-	89.6	288.2	109.5
	Bajra	114.1	219.4	-	-	6.0	229.9	120.1	449.3	233.1
	Pulses	2.6	56.2	1.5	95.2	-	-	4.1	151.4	6.1
	Others	-	-	-	-	-	-	-	-	-
Major Horticultural crops (Crops to be identified based on total acreage)										
	Mango	-	-			33.1		6000		-
	Citrus	-	-			54.3		10000		-
	Guava	-	-			68.7		20000		-
	Sapota	-	-			37.8		14000		-
	Banana	-	-			89.1		49000		-
	Others: Coconut	-	-			33.2		9000 (nuts)		-

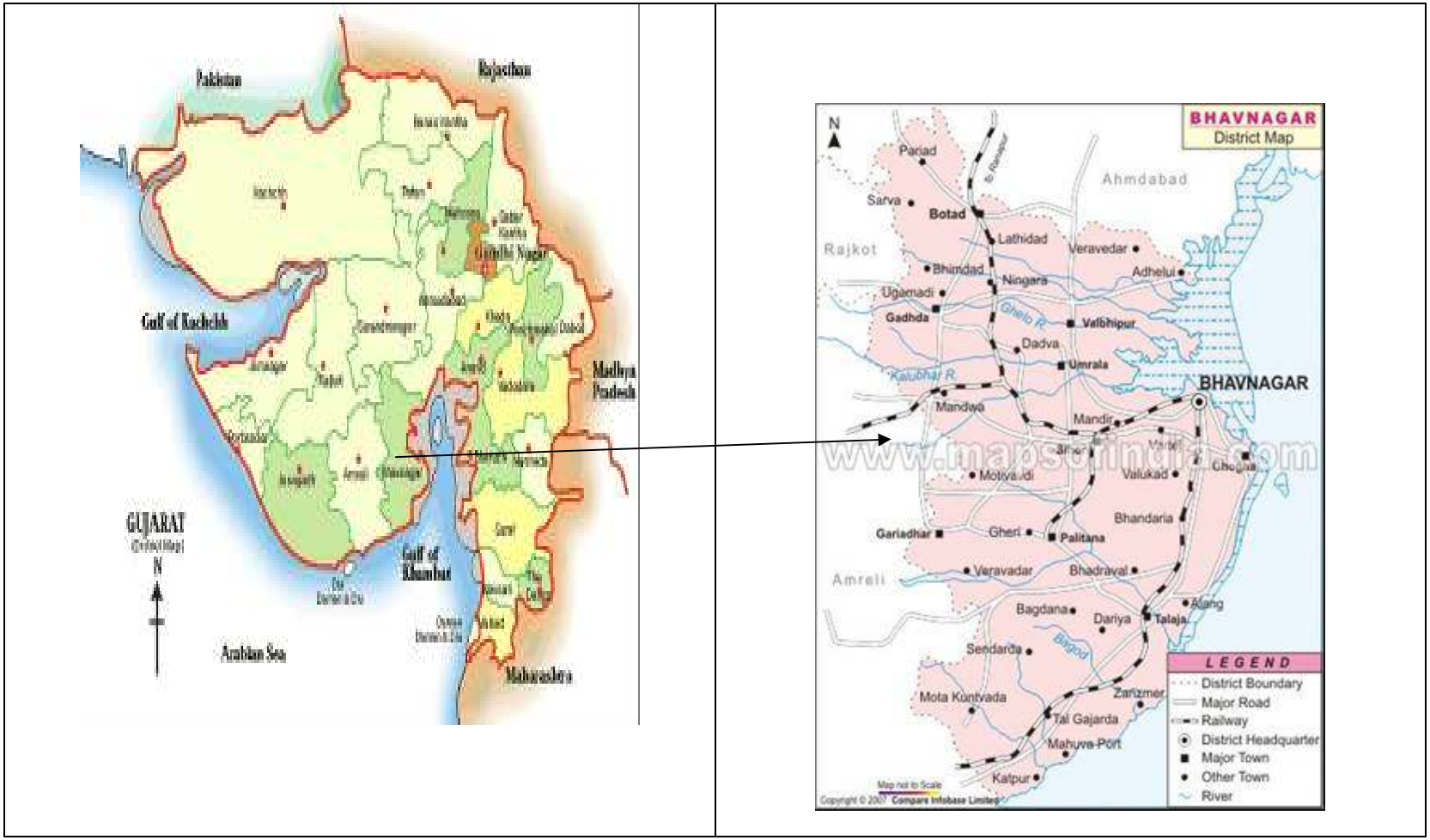
(Data source : Reports of Department of Agriculture, Govt. of Gujarat and District Panchayat, Bhavnagar)

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	Groundnut	Cotton	Wheat	Bajra	Greengram
	Kharif- Rainfed	2nd week of June to 1st week of July	2nd week of June to 2nd week of July	-	2nd week of June to 2nd week of July	2nd week of June to 2nd week of July
	Kharif-Irrigated	1st week of June	1st week of June	-	-	-
	Rabi- Rainfed	-		-	-	-
	Rabi-Irrigated	-		2nd week of Nov. to 4th week of Nov.	-	3rd week of Oct to 4th week of Nov.

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 (Vallabhipur, Ghogha, Talaja, Mahuva)	√		
	Pests and disease outbreak (specify) Pests- Cotton: Aphid, Jasid, Thrips, Whitefly; Citrus: Fruit fly Diseases- Mango: Powdery Mildew; Groundnut: Rust, Leaf spot, Tikka; Bajra: Downy Mildew	√		
	Others (specify)			

1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Yes
		Mean annual rainfall as Annexure 2	Yes
		Soil map as Annexure 3	Not available

Annexure 1


Pakistan
Rajasthan
Gulf of Kachchh
Madhya Pradesh
GUJARAT
Gulf of Khambhat
Arabian Sea
Maharashtra
BHAVNAGAR
District Map
Ahmdabad
Rajkot
Amreli
Pariad
Sarva
Botad
Lathidad
Veravedar
Bhimdad
Adhelai
Ugamadi
Ningara
Gadhda
Valbhipur
Dadva
Umrala
BHAVNAGAR
Mandva
Mandir
Motiyavadi
Valukad
Bhandaria
Gariadhar
Gheri
Palitana
Veravadar
Bhadraval
Bagdana
Dariya
Talaja
Sendarda
Mota Kuntvada
Zarizmer
Tal Gajarda
Mahuva Port
Katpur
LEGEND
District Boundary
Major Road
Railway
District Headquarter
Major Town
Other Town
River
Map not to Scale
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Annexure-II

Mean annual Rainfall (mm) During Monsoon- 2010 of Bhavnagar District (2010-11)

Sr. No.	Taluka	Rainy Days	Rainfall (Regualr) Seasonal (mm)	Unseasonal Rain 10-24 November 2010
1	Bhavnagar	43	952	47
2	Botad	34	667	39
3	Gadhada	39	800	104
4	Gariyadhar	43	618	32
5	Ghogha	36	595	17
6	Mahuva	50	763	94
7	Palitana	39	715	104
8	Sihor	43	865	71
9	Talaja	43	850	117
10	Umrala	41	651	51
11	Vallabhipur	46	882	57
Average		42	**760**	**66.6**

Mean annual rainfall is 760+66.6=826.6 mm

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 (June 4th week)	Medium Black to Shallow Black soils	Groundnut	No change	Normal	NA
		Cotton			
		Bajra			
		Greengram			
	Coastal alluvial soils	Bajra			
		Cotton			

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks (July 2nd week)	Medium Black to Shallow Black soils	Groundnut (Spreading & Semi spreading)	Groundnut: Bunch varieties: GG-2/GG-5/ GG-7; Semi spreading variety: G-20	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively	Seed sources: National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujcomasol.
		Cotton	No change	-	
		Bajra	Castor : GAUCH-1, GCH-6 / Pigeonpea : GT-100, BDN-2 / Sorghum: GFS-4&5, Gundhari, S-1049	-	
		Greengram	Greengram short duration varieties: Guj. Mug-4 / Blackgram: Guj. Udad-1, T-9	-	
	Coastal alluvial	Bajra	Castor :GAUCH-1, GCH-6 / Pigeonpea: GT-100, BDN-2/	-	

			Sorghum : GFS-4&5, Gundhari, S-1049		
		Cotton	No change	-	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks (July 4th week)	Medium Black to Shallow Black soils	Groundnut (Spreading & Semi spreading)	Greengram: Guj. Mag-4, K-851 / Sesame: Purva-1 / Sorghum: GFS-4&5, Gundhari, S-1049 / Castor :GAUCH-1, GCH-6 / Pigeonpea: BDN-2 / Cotton : G cot 13,15,21	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively	Seed sources: National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujcomasol Linkage with Government schemes for supply of implements: Zero till seed drill, seed dressing equipments, sprayers & dusters
		Cotton	- do -	-	
		Bajra	- do -	-	
		Greengram	Blackgram:Guj. Udad-1, T-9	-	
	Coastal alluvial soils	Bajra	Greengram: Guj. Mug-4 / Blackgram: Guj. Udad-1, T-9 / Sorghum :GFS-4&5, Gundhari, S-1049/ Castor : GAU-CH-1, GCH-6 / Pigeonpea: GT-100, BDN-2/ Cotton : G cot 13,15,21	-	
		Cotton	- do -		

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks (Aug. 2nd week)	Medium Black to Shallow Black soils	Groundnut(Spreading & Semi spreading)	Sesame: Purva-1/ Sorghum : GFS-4 & 5, Gundhari, S-1049/ Castor :GAUCH-1, GCH-5	Keep 45 cm and 60 cm row spacing for bunch and	Seed sources: National Seed Corporation(NSC), Gujarat State Seed Corporation(GSSC),

				semi spreading groundnut, respectively. Other practices will be as such.	University, Gujcomasol . Linkage with Government schemes for supply of implements: Zero till seed drill, seed dressing equipments, sprayers & dusters
		Cotton	-do-		
		Bajra	-do-		
		Green gram	-do-		
	Coastal alluvial soils	Bajra	Sorghum : GFS-4&5, Gundhari, S-1049/ Castor :GAUCH-1, GCH-5		
		Cotton	-do-		

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Medium Black to Shallow Black soils	Groundnut	Gap filling	Inter tilling 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 is available in Jasdan Village of Rajkot district to be supplied by Govt..
		Cotton			
		Bajra	Thinning to maintain 10 cm plant to plant spacing	Inter-culturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	
		Greengram	-	-do-	
	Coastal alluvial soils	Bajra	Thinning to maintain 10 cm	Mulching with wheat straw or shredded cotton stalk.	

			plant to plant spacing		
		Cotton	Gap filling	Inter tilling to fill soil cracks, mulching with wheat straw or shredded cotton stalk Mulching (Plastic film 25 micron, ~200 kg/ha.)	

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	Medium Black to Shallow Black soils	Groundnut	Weeding, Protection against sucking pests (To control Jassid spray methyl-o-demeton @ 10 ml / 10 lit of water or dimetheote @10 ml/ 10 lit water). Life saving irrigation if possible	Mulching with wheat straw or crushed cotton stalk or mulching with Plastic film 25 micron, ~200 kg/ha.) Inter tilling	Supply of plastic film and pesticides through Govt. schemes. Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Cotton	Weeding, Protection against sucking pests (To control Jassid, aphid & thrips spraying methyle-o-demeton @ 10 ml / 10 lit. Water or dimetheote @10 ml/ 10 lit water). Life saving irrigation if possible	-do-	-do-
		Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing. Life saving irrigation if possible.	Inter tilling, Spray 1 % N in the form of urea after relief of drought.	Supply of urea through Govt. schemes
		Greengram	Weeding, Protection against sucking pests_(To control Jassid spraying of methyle-o-demeton @ 10 ml /10 lit. Water or dimetheote @10 ml/ 10 lit water). Life saving irrigation if possible.	Inter tilling	Supply of pesticides through Govt. schemes.
	Coastal Alluvial soils	Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing.	Inter tilling	Ensure electric supply for life saving irrigation by

			Life saving irrigation if possible		Electricity Supply Board of State
		Cotton	Weeding, Protection against sucking pests (To control Jassid, aphid & thrips spraying methyle-o-demeton @ 10 ml / 10 lit. water or dimetheote @10 ml/ 10 lit water). Life saving irrigation if possible	Mulching with wheat straw or crushed cotton stalk or mulching with Plastic film 25 micron, ~200 kg/ha. Inter tilling	Supply of plastic film and pesticides through Govt. schemes.

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At flowering/ fruiting stage	Medium Black to Shallow Black soils	Groundnut	Supplemental irrigation if possible followed by weeding.		Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Cotton	Supplemental irrigation if possible followed by weeding.		-do-
		Bajra	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available		
		Greengram	Supplemental irrigation if possible followed by weeding.		
	Coastal alluvial Soils	Bajra	Supplemental Irrigation if possible. Harvest non flowering plants for fodder purpose if water is not	Inter tilling, Spray 1 % N through urea after relief of drought	Supply of urea through Govt. schemes

			available.		
		Cotton	Supplemental irrigation if possible followed by weeding.	-	Ensure electric supply for life saving irrigation by Electricity Supply Board of State

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**
	Medium Black to Shallow Black soils	Groundnut	Life saving irrigation if possible.	-	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Cotton	Harvest mature bolls. Supplemental irrigation if possible	-	- do -
		Bajra	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available.		
		Greengram	Supplemental irrigation if possible. Thin out plant population. Harvest mature plants.	-	-do -
	Coastal alluvial soils	Bajra	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available.		
		Cotton	Harvest mature bolls. Supplemental irrigation if possible		

2.1.2 Drought - Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed release of water in canals due to low rainfall	NA				

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	NA				

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	NA				

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	Medium Black to Shallow Black soils	Wheat	No change	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
			Wheat/ Gram: ICCC 4, Guj 1 &2 / Cumin: Guj 1,2,3 & 4 / Coriander: Guj 1 & 2/ Fenugreek: Guj1/ Leafy vegetables / Carrot.	Adopt sprinkler irrigation	Construction of Well recharge structures, Timely supply of MIS and seeds through govt. schemes.
		Cotton	No change	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Electricity Supply Board of State.
			Wheat/ Gram: ICCC 4, Guj 1 &2 / Cumin: Guj 1,2,3 & 4 / Coriander: Guj 1 & 2/ Fenugreek: Guj1/ Leafy vegetables / Carrot.	Adoption of drip irrigation system. Mulching with 50 µ plastic film, @370 kg/ha. Reduce area of irrigation.	Supply of MIS and plastic film through Govt. schemes.
	Coastal alluvial soils	Wheat	No change	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Electricity Supply Board of State.

			Wheat/ Gram: ICCC 4, Guj 1 &2 / Cumin: Guj 1,2,3 & 4 / Coriander: Guj 1 & 2/ Fenugreek: Guj1/ Leafy vegetables / Carrot.	Adopt sprinkler irrigation	Construction of Well recharge structures, Timely supply of MIS and seeds through Govt. schemes
		Cotton	Cotton	Supply irrigation during night time to reduce transpiration.	Ensure electric supply for life saving irrigation by Electricity Supply Board of State.
			Gram ICCC 4, Guj 1 &2 / Cumin (Guj 1,2,3 & 4)/ Coriander (Guj 1 & 2)/ Fenugreek (Guj 1) Leafy vegetables / Carrot	Adoption of drip irrigation system. Mulching of 50 µ, @370 kg/ha. Reduce area of irrigation.	Supply of MIS and plastic film through Govt. schemes.
Sea water intrusion	Coastal Alluvial, Medium land	Wheat	Leafy vegetables Carrot, Beet, Lucerne	Adoption of drip irrigation system, limited area under irrigation, Light frequent irrigations, to reduce over exploitation some extent & limit depth of pumping	The policy should decide for limiting the depth of well in coastal area.

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**
Wheat	-	-	Surface drainage (for management of water logging, lodging crop and to control black point in grain.) spray mancozeb 0.2 %	Protect produce with plastic sheet (100 µm, UV stabilized color 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.
Cotton	Surface drainage (for management of water logging, Apply Ammonium Sulphate)	Surface drainage (for management of water logging, Apply Amonium Sulphate)	Surface drainage (for management of water logging) harvesting mature bolls	-do-
Greengram	-	-	Harvest mature ear heads.	-do-
Groundnut	-	-	Harvesting delay for spreading groundnut if possible. Immediately harvest bunch Groundnut. Quick surface drainage	-do-
Horticulture				
Mango	Provision of drainage. Fertilizer application. Control leaf blight under unusual rains with cloudy weather.	-	Hang Methyle euginol trap, one /acre for control of fruit fly.	Utilize unripe fruits for pickles.
Citrus	Control Citrus canker by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm collect mature fruits			-
Heavy rainfall with high speed winds in a short span				
Wheat	Surface drainage (to control water logging condition).	Surface drainage (To control water logging condition).	Surface drainage (for management of water logging, and to control black point in grain, spray mancozeb 0.2%.	Protect produce with plastic sheet (100 µm, UV stabilized colour plastic) or shift produce to farm shed And protection against pest/disease damage in storage etc, Preparation of quick drying techniques to separate good lot and bad lot.
Onion	Surface drainage(For management of water logging)	Surface drainage(For management of water logging & diseases,, Spray Mancozeb 0.2%	Surface drainage (for management of water logging) harvesting at physiological maturity	Protect produce with plastic sheet (100 µm, UV stabilized colour plastic) or shift produces to farm shed and protection against pest/disease damage in storage etc,

Cotton	Surface drainage (for management of water logging After drainage apply Ammonium sulphate)	Surface drainage (for management of water logging After drainage apply Ammonium sulphate)	Surface drainage (for management of water logging). Harvesting mature bolls.	-do-
Groundnut	-	-	Harvesting delay for spreading groundnut if possible. Immediately harvest bunch groundnut. Quick surface drainage, Open channel around field.	-do-
Bajra	-	-	Harvest mature ear heads, Quick surface drainage.	-do-
Green gram	-	-	Arrange drainage, Harvest mature pods.	-do-
Horticulture				
Mango	-	Spray 0.2% wettable sulphur or 0.005% Hexaconazole for protection against powdery mildew.	Collect fallen fruits.	Utilize unripe fruits for pickles.
Citrus	Control citrus canker by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm, collect mature fruits			-
Outbreak of pests and diseases due to unseasonal rains				
Wheat	-	-	-	
Onion	-	Spray Mancozeb 0.2% (To control purple leaf blotch)	Spray Mancozeb 0.2% (To control purple leaf blotch)	-
Cotton	-	Control cotton	Control cotton angular leaf spot	-

		angular leaf spot by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm.	by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm.	
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.	-
Bajra	-	-	Spray Mancozeb 0.2% (To control rust).	-
Green gram	-	-	-	-
Horticulture				
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.	-
Citrus	Control citrus canker by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm	Control citrus canker by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm	–Control citrus canker by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm, collect mature fruits	-

2.3 Floods

Condition	Suggested contingency measure			
Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Groundnut	NA	As a preventive step, open drainage channel.	As a preventive step, open drainage channel.	-
Cotton	-	-do-	-do-	-
Bajra	-			
Greengram	-			
Horticulture				
Mango	Proper surface drainage	Surface drainage	Surface drainage	-
Citrus				
Continuous submergence for more than 2 days				
Groundnut	As a preventive step, drainage channel followed by spray 0.05 % carbendazim for control of leaf spot.	As a preventive step, open drainage channel followed by spray 1 % $FeSO_4$ + 0.1 % citric acid for control yellowing, 0.0025% hexaconazole for rust & leaf spot management.	As a preventive step, open drainage channel followed by spray 1 % $FeSO_4$ + 0.1 % citric acid for control yellowing.	-
Cotton	As a preventive step, open drainage channel and apply Amonium sulphate.		As a preventive step, open drainagechannel. Harvesting mature bolls.	-
Bajra	As a preventive step open drainage channel and spray mancozeb 0.2% (To control downy mildew)		As a preventive step, open drainage channel and spray mancozeb 0.2% (To control rusts).	Harvest Mature ear heads.
Green gram	As a preventive step, open drainage channel and spray 0.05 % carbendazim for powdery mildew.	As a preventive step, open drainage channel and spray 0.005% hexaconazole or 0.025 % carbendazim for leaf spot & powdery mildew.		Picking of Mature pods.
Horticulture				

Mango	Shift grafts to safe place & proper surface drainage.	Surface drainage
Citrus	Shift to safe place & with proper surface drainage	-do-
Sea water intrusion	NA	

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	Light & frequent irrigation to all crops	Light & frequent irrigation to all crops	Light & frequent irrigation to all crops	-
Cold wave	NA			
Frost	NA			
Hailstorm	NA			
Cyclone	NA			
Wheat	Quick drainage	Quick drainage	Quick drainage and spray mancozeb 0.2% to control black point in grain.	Shift produce to a safer place
Cotton	Earthing up , quick drainage	Earthing up, quick drainage	Earthing up, quick drainage	
Groundnut	Quick drainage	Quick drainage	Quick drainage	
Horticulture				
Mango	Shift grafts to safe place if possible & build Cyclone proof nursery, Grow wind barrier trees around nursery.	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 to safe place if possible & Build Cyclone proof nursery, Grow wind barrier trees around nursery	Reduce canopy & tying plants diagonally if possible, Grow wind barrier trees around field.	Reduce canopy	-do-

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	As the district is occasionally prone to drought the following measures to be taken to ameliorate the fodder deficiency Avoid burning of wheat straw Collection of groundnut haulms, soya meal waste and groundnut cake for use as feed supplement during drought Establishment of fodder bank at village level with available dry fodder (groundnut haulms, wheat straw and sorghum stover) Increase area under perennial fodder cultivation with high yielding Hybrid Napier varieties. Conservation of maize/bajra green fodder as silage Sowing of cereals (Sorghum/Bajra) and leguminous crops (Lucerne, Berseem, Horse gram, Cowpea) during early monsoon under dry land system for fodder production Encourage fodder production with Maize, Jowar, Bajra , Cowpea, Barseem, Lucerne etc., Processing & storage of feed/fodder and roughages in the form of complete feed/blocks.	Harvest and use biomass of dried up crops (wheat/bajra/ groundnut /maize/mungbean etc.,) material as fodder Use of unconventional and locally available cheap feed ingredients especially soya meal waste and groundnut cake as supplement for livestock during drought Utilizing fodder from fodder bank reserves. Utilizing stored silage/hay. Transporting complete feed/fodder and dry roughages to the affected areas. 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 Continuous supplementation of mineral mixture to prevent infertility. Encourage mixing available kitchen waste with dry fodder while feeding to the milch animals	Training/educating farmers for feed & fodder storage. Maintenance / repair of silo pits and feed/fodder stores. 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 etc., Supply of quality fodder seed (multi cut sorghum/bajra/maize varieties) and fodder slips of Napier, guinea grass well before monsoon 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.	Adequate supply of drinking water. Restrict wallowing of animals in water	Watershed management practices shall be promoted to conserve the rainwater.

	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	bodies/resources Add alum in stagnated water bodies	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 Vaccination for HS & FMD 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 Drainage of water from and around animal sheds, pasture areas. 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			
Feed and fodder	In case of early forewarning (EFW), harvest all the crops (wheat/bajra/ groundnut /sorghum//maize/mungbean etc.) that	Transportation of animals to elevated areas	Repair of animal shed

availability	can be useful as feed/fodder in future (store properly) Keeping sufficient of dry fodder to transport to the flood affected villages Don't allow the animals for grazing if severe floods are forewarned Keep stock of bleaching powder and lime Carry out Butax spray for control of external parasites Identify the Clinical staff and trained paravets and indent for their services as per schedules Identify the volunteers who can serve in need of emergency Arrangement for transportation of animals from low lying area to safer places and also for rescue animal health workers to get involve in rescue operations	Proper hygiene and sanitation of the animal shed In severe storms, un-tether or let loose the animals Use of unconventional and locally available cheap feed ingredients for feeding of livestock. Avoid soaked and mould infected feeds / fodders to livestock Emergency outlet establishment for required medicines or feed in each village Spraying of fly repellants in animal sheds Control of mosquitoes (1) Treatment of animals for entritis etc. (2) Special care and treatment of young animals for enteric diseases like calf scour, pneumonia	Bring back the animals to the shed Cleaning and disinfection of the shed Bleach (0.1%) drinking water / water sources Encouraging farmers to cultivate short-term fodder crops like sunhemp, Lucerne, berseem, maize etc.,. Deworming with broad spectrum dewormers Proper disposable of the dead animals / carcasses by burning / deep burying (4-8 feet) with lime powder (1kg for small ruminants and 5kg for large ruminants) in pit Drying the harvested crop material and proper storage for use as fodder.
Cyclone	In case of early forewarning (EFW), harvest all the crops (wheat/bajra/ groundnut /sorghum/maize/mungbean etc.) that can be useful as feed/fodder in future (store properly) Keeping sufficient of dry fodder to transport to the flood affected villages Don't allow the animals for grazing if severe floods are forewarned	Transportation of animals to elevated areas Proper hygiene and sanitation of the animal shed In severe storms, un-tether or let loose the animals Use of unconventional and locally available cheap feed ingredients for feeding of livestock. Avoid soaked and mould infected feeds / fodders to livestock	Repair of animal shed Bring back the animals to the shed Cleaning and disinfection of the shed Bleach (0.1%) drinking water / water sources Encouraging farmers to

	Keep stock of bleaching powder and lime Carry out Butax spray for control of external parasites Identify the Clinical staff and trained paravets and indent for their services as per schedules Identify the volunteers who can serve in need of emergency Arrangement for transportation of animals from low lying area to safer places and also for rescue animal health workers to get involve in rescue operations	Emergency outlet establishment for required medicines or feed in each village Spraying of fly repellants in animal sheds	cultivate short-term fodder crops like sunhemp, Lucerne, berseem, maize etc.,. Deworming with broad spectrum dewormers Proper disposable of the dead animals / carcasses by burning / deep burying (4-8 feet) with lime powder (1kg for small ruminants and 5kg for large ruminants) in pit Drying the harvested crop material and proper storage for use as fodder.
Cold wave	**Not applicable**		
Heat 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 Feed green fodder/silage / concentrates during day time and roughages / hay during night time in case of heat waves Put on the foggers / sprinkerlers/fans during heat weaves in case of high yielders (Jersey/HF crosses) 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

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	Stored feed, conventional feed, Antibiotics and probiotics	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, covers birds under insurance.	Provide ventilation. Add more calcium with feed. Assure supply of electric power.	Routine practices are to be 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 biotics, and Assure supply of electric power.	Routine practices are to be 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 to be 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 fitting fan and 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	N.A			
Health and disease management	-			

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	NA		
Inland			
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		
Inland			
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	Infected fishes to be treated with $KMno_4$ 1 % 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 paid due to loss of fishermen lives	For warning 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		
B. Aquaculture			
(i) Overflow / flooding of ponds	Strengthing 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	-	-
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	-	-	Compensation on assessment of actual losses & damage of pumps, aerators, shelters/huts to be given

(vi) Any other	-	-	-
4. Heat wave and cold wave			
Heat wave			
A. Capture			
Marine	NA		
Inland			
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	Prophylactic measures
(ii) Health and Disease management	-	Bleaching powder 1 to 2 % , formalin treatment to prevent disease	$KMnO_4$ 2 % to maintain oxygen level
(iii) Any other	-	-	-
cold wave			
A. Capture			
Marine	NA		
Inland			
B. Aquaculture			
(i) Changes in pond environment (water quality)	-	To maintain Water level in pond ,	Prophylactic measures
(ii) Health and Disease management	-	Bleaching powder 1 to 2 % , formalin treatment to prevent disease	$KMnO_4$ 2 % to maintain oxygen level
(iii) Any other	-	-	-