

State: GUJARAT

Agriculture Contingency Plan for District: Devbhumi Dwarka

1.0 District Agriculture profile				
1.1	Agro-Climatic/Ecological Zone			
	Agro Ecological Sub Region (ICAR)	Arid Western Plains, Kachchh and Part of Kathia (2.4)		
	Agro-Climatic Zone (Planning Commission)	Gujarat Plain & Hill Region (XIII)		
	Agro Climatic Zone (NARP)	North Saurashtra Zone (GJ-6)		
	List all the districts or part thereof falling under the NARP Zone	Devbhumi Dwarka, Jamnagar, Rajkot, Morbi, Surendranagar, Bhavnagar & Amreli		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		22.12 ⁰ N	69.39 ⁰ E	18 MSL
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Main Dry Farming Research Station, Junagadh Agricultural University, Targhadia (Dist. Rajkot) - 360003		
Mention the KVK located in the district	At present there is no KVK in Devbhumi Dwarka district.			

1.2	Rainfall (Average of 2005-14)	Normal RF (mm)	Normal Rainy days (number)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
	SW monsoon (June-Sep):	921	30	2 nd week of June	2 nd week of September
	NE Monsoon (Oct-Dec):	-	-		
	Winter (Jan-March)	-	-		
	Summer (Apr-May)	-	-		
	Annual	921	30		

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)	407.5	238.4	17.4	65.6	28.5	32.2	0	12.1	12.5	0.9

(Source: Comprehensive District Agricultural plan, Jamnagar District)

1.4	Major Soils (common names like red sandy loam deep soils (etc.,))*	Area ('000 ha)	Percent (%) of total
	1 Medium Black	50.1	17.7
	2.Shallow Black	111.7	39.6
	3.Coastal Alluvial	75.1	26.6
	4. Red soil	39.7	14.1
	5. Hills soils	5.7	2.0
	6. Others (specify):	-	-

* 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 ('000 ha)	Cropping intensity %
	Net sown area	238.4	106.0 %
	Area sown more than once	14.3	
	Gross cropped area	252.7	

(Source: Comprehensive District Agricultural plan, Jamnagar District)

1.6	Irrigation	Area ('000 ha)		
	Net irrigated area	30.05		
	Gross irrigated area	35.65		
	Rain fed area	208.32		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals		6.15	17.25
	Tanks	-		
	Open wells	32073	5.80	16.27
	Bore wells	2825	20.39	57.19
	Lift irrigation schemes			

Micro-irrigation			
Other sources, Ponds & Check dams		3.31	9.28
Total Irrigated Area		35.65	
Pump sets	25475		
No. of Tractors	2708		
Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
Over exploited	-	-	-
Critical	-	-	-
Semi- critical	1	17.59	Moderate saline
Safe	3	82.41	-
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%

(Source : Reports of District Panchayat, Jamnagar and Comprehensive District Agricultural plan, Jamnagar District)

1.7 Area under major field crops & horticulture (as per latest figures) (2008-09 to 2012-13)

1.7	Sr.No.	Major field crops cultivated	Area ('000 ha)							
			Kharif			Rabi			Summer	Grand total
			Irrigated	Rainfed	Total	Irrigated	Rainfed	Total		
1	Groundnut	25	80.4	105.4	-	-	-	3.9	109.3	
2	Cotton	54.4	-	54.4	-	-	-	-	54.4	
3	Castor	4.4	-	4.4	-	-	-	-	4.4	
4	Wheat	-	-	-	17.6	-	17.6	-	17.6	
5	Bajra (Pearl millet)	-	3.02	3.02	-	-	-	0.6	3.62	
6	Pulses	-	3.7	3.7	-	8	8	1.2	12.9	
Others (specify)	Others	-	-	-	-	-	-	-	-	
	Sugarcane	-	-	-	-	-	-	-	-	
	Other Oil seed crops	-	-	-	-	-	-	-	-	

S. No.	Horticulture crops - Fruits	Area (*000 ha)	
			Total
1	Mango		0.061
2	Sapota (Chiku)		0.101
3	Papaya		0.198
4	Citrus		0.069
5	Pomegranate		0.109
6	Banana		0.007
7	Guava		0.005
8	Ber		0.179
9	Custard Apple		0.012
10	Aonla		0.011
Others (specify)			0.015
	Horticulture crops - Vegetables		Total
1	Garlic		1.25
2	Onion		1.05
3	Tomato		0.995
4	Brinjal		0.77
5	Potato		0.352
6	Cabbage		0.179
7	Lady finger (okra)		0.9
8	Cauliflower		0.054
9	Cluster been		0.949
10	Cowpea		0.308
11	Watermelon		0.602
12	Other cucurbits		0.252
Others (specify)	Others		0.035
	Medicinal and Aromatic crops		Total
1	Fenugreek		0.004
2	Cumin		21.73
3	Coriander		2.84
4	Ajwain		0.009
5	Pamarosa		0.013
6	Citronell		0.001

	7	Guggl	0.005
	Others (specify)	Others	
		Plantation crops	Total
	1	Coconut	0.335
	2	Date palm	0.011
	3	Rayan (Manilkara hegxandra)	0.008
		Cordia (Gonda)	0.032
	Others (Specify)	eg., Industrial pulpwood crops etc.	
		Fodder crops	Total
	1	Sorghum	
	Others (Specify)		
		Total fodder crop area	24.441
		Grazing land	28.452
		Sericulture etc	0
		Others (specify)	0.93

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (local low yielding)	68.55	78.88	147.43
	Crossbred cattle		0.618	
	Non descriptive Buffaloes (local low yielding)	1.082	138.07	139.152
	Graded Buffaloes			
	Goat	6.65	50.85	57.50
	Sheep	22.72	52.29	75.01
	Others (Camel, Pig, Yak, horse etc.)	4.79	6.388	11.178
	Commercial dairy farms (Number)	1		
1.9	Poultry	No. of farms	Total No. of birds ('000)	
	Commercial	10	16	
	Backyard	1384	25.323	

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)	
		25752	1636	299	58995	263802	20
	ii) Inland (Data Source: Fisheries Department)	No. Farmer owned ponds		No. of Reservoirs		No. of village tanks	
-		-		-			
B. Culture							
		Water Spread Area (ha)	Yield (t/ha)		Production ('000 tons)		
i) Brackish water (Data Source: MPEDA/ Fisheries Department)		-	-		67146		
ii) Fresh water (Data Source: Fisheries Department)		12218.35	36.66		448		
Others							

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

1.11 Production and Productivity of major crops (2009-2014 specify years)

1.11	Name of crop	<i>Kharif</i>		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)										
	Groundnut	171.38	1626	-	-	7.90	2025	179.3	1826	268
	Cotton	42.49	781	-	-	-	-	42.5	781	-
	Castor	11.52	2618	-	-	-	-	11.5	2618	-
	Wheat	-	-	42.87	2436	-	-	42.9	2436	43
	Bajra	4.08	1350	-	-	1.31	2180	5.4	1765	8
	Pulses	1.76	475	-	1168	0.72	603	11.8	749	-
Major Horticultural crops (Crops to be identified based on total acreage)										

Mango	-	-	-	-	0.502	8570	0.502	8570	-
Sapota	-	-	-	-	1.098	10993	1.098	10993	-
Papaya	11.997	59051	-	-	-	-	11.997	59051	-
Citrus	0.359	5355	-	-	-	-	0.359	5355	-
Coconut	2.833	8525	-	-	-	-	2.833	8525	-
Pomegranate	0.322	7992	-	-	-	-	0.322	7992	-
Ber	-	-	1.269	7153	-	-	1.269	7153	-

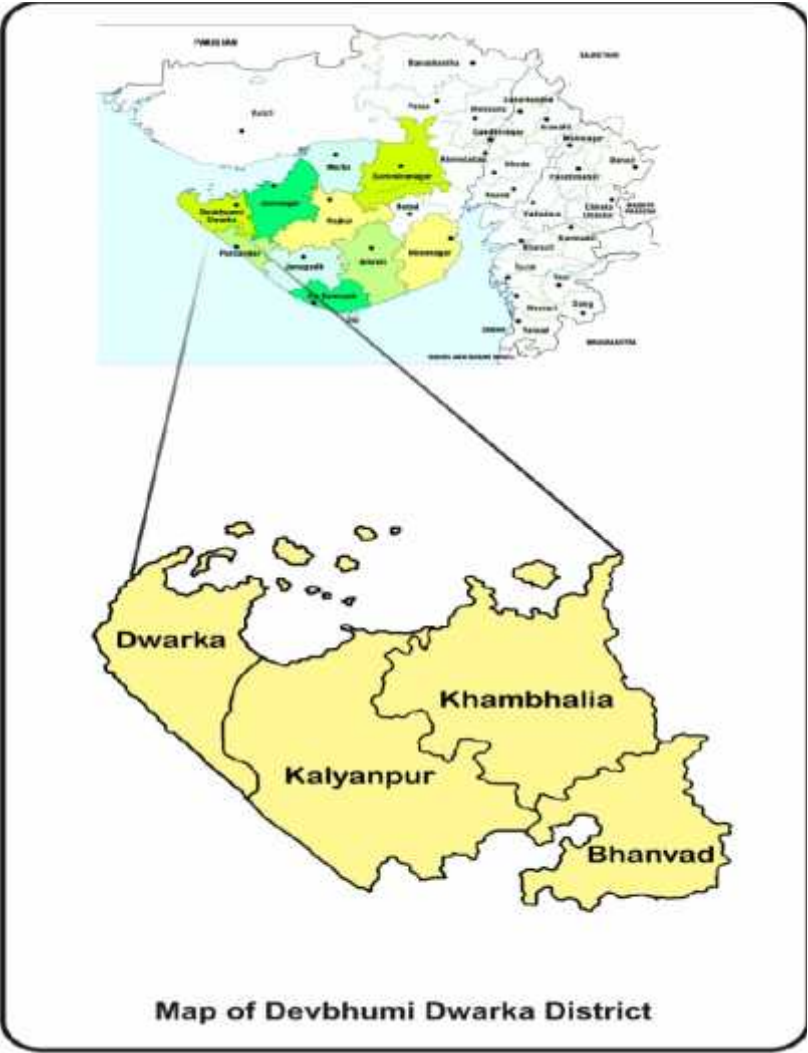
(Source: Reports of Jamnagar District Panchayat, Department of Agriculture and Horticulture, Government of Gujarat)

1.12	Sowing window for major field crops (start and end of normal sowing period)	Groundnut	Cotton	Wheat	Bajra	Castor	Cumin
	<i>Kharif</i> - Rainfed	June 2 nd wk to July 1 st wk	June 2 nd wk to July 1 st wk	-	June 4 th wk to July 3 rd wk	July 2 nd wk to August 2 nd wk	
	<i>Kharif</i> -Irrigated		May 4 th wk to June 2 nd wk	-	-	July 2 nd wk to August 2 nd wk	
	<i>Rabi</i> - Rainfed	-	-	-	-	-	
	<i>Rabi</i> -Irrigated	-	-	November 2 nd wk to November 4 th wk	-	-	November 2 nd wk to November 4 th wk

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 (Okha)				
	Pests and disease outbreak (specify) Pests- Cotton: Aphid, Jassid, thrips; Acid lime: White fly & fruit fly; Diseases- Mango: Powdery mildew; Groundnut: Rust, leaf spot, tikka & downy Mildew				
	Others (specify)	-	-	-	

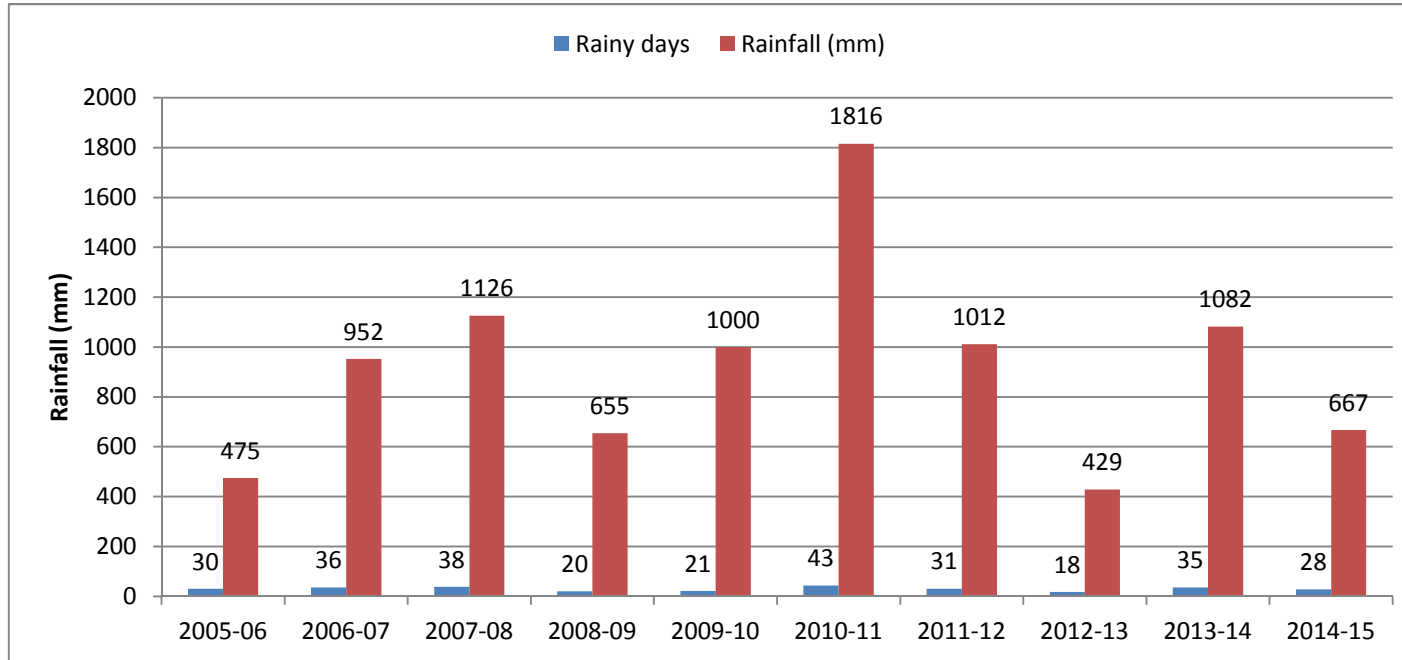
1.14	Include Digital maps of the district for	Location map of district within State as Annexure I	Enclosed : Yes
		Mean annual rainfall as Annexure 2	Enclosed : Yes
		Soil map as Annexure 3	Enclosed : Yes

Anneure-1: Location map of Devbhumi Dwarka district

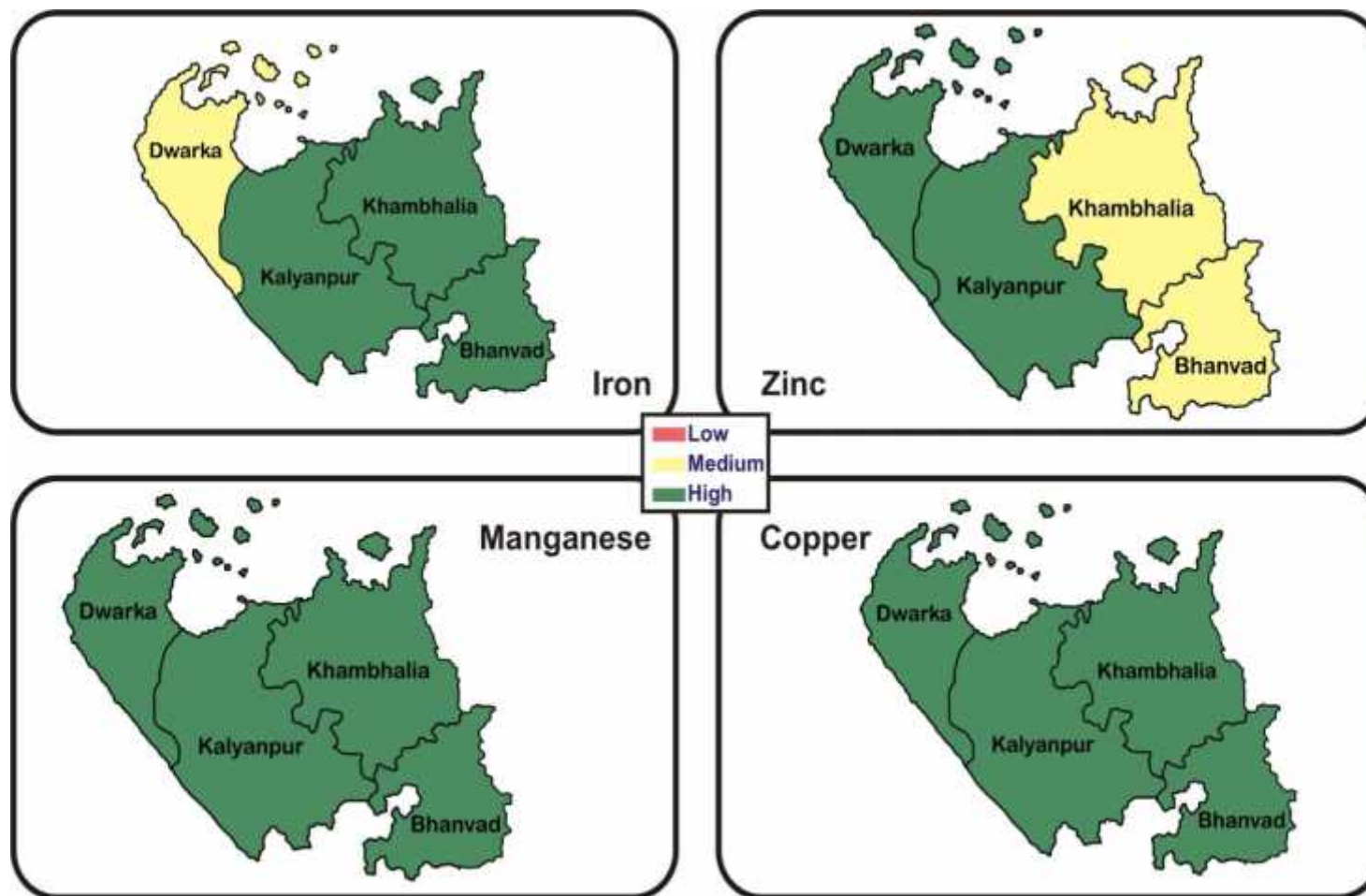


Annexure-II

Mean annual rainfall of Devbhumi Dwarka District



Annexure-III



Status of micronutrients in soils of Devbhumi Dwarka 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 (June 4 th wk)	1 Medium & shallow Black to Mixed Red & Black	Groundnut	No change	Follow standard package of practices	-
		Cotton	No change		
		Bajra	No change		
		Castor	No change		
	2.Coastal Alluvial	Groundnut	No change	Follow standard package of practices	-
		Cotton	No change		
		Bajra	No change		
		Castor	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 4 weeks (July 2 nd wk)	1 Medium & shallow black to mixed red & black	Groundnut (spreading & Semi spreading)	Bunch variety - GG-2/GG-5/GG-7/GJG-9/TG37A Semi spreading variety of groundnut GG-20/GJG-22	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such	Seed sources: National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujarat State Cooperative Marketing Federation Ltd. (Gujcomasol)
		Cotton	No change	-	
		Bajra	GHB 538	-	

		Castor	No change	-	
	2.Coastal Alluvial	Groundnut	GHB 538	Keep 45 cm row spacing for bunch groundnut, Other practices will be as such	
		Bajra	No change	-	
		Cotton	No change	-	
		Castor	No change	-	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)					
Delay by 6 weeks (July 4th wk)	Medium & shallow Black to Mixed Red & Black	Groundnut	Greengram (GM-4, K-851)/ sesame (G.Til.-2, 3, 4)/ sorghum (GFH-4, 5 gundari, S-1049)/castor (GC-3, GCH-4, 6, 7)/pigeonpea (BDN-2, Vaishali)/ cotton (G cot 13, 15, 21, 23)/bajra (GHB-538)	Keep 45 cm and 60 cm row spacing for bunch and semi spreading ground nut respectively As per crop follow package of practices (other than groundnut)	Seed sources: National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujarat State Cooperative Marketing Federation Ltd. (Gujcomasol) Linkage with Government schemes for supply of implements: Zero till seed drill, seed dressing equipments, sprayers & dusters
		Cotton	-do-	As per crop follow the package of practices	
		Bajra	-do-	As per crop follow the package of practices	
		Castor	No change	-	
	Coastal Alluvial	Groundnut	Greengram (GM-4, K-851)/ sesame (G.Til.-2, 3, 4)/ sorghum (GFH-4, 5 gundari, S-1049)/castor (GC-3, GCH-4, 6, 7)/pigeonpea (BDN-2, vaishali)/cotton (G cot 13, 15, 21, 23)/bajra (GHB-538)	Keep 45 cm and 60 cm row spacing for bunch and semi spreading ground nut respectively As per crop follow	

			package of practices (other than groundnut)	
		Bajra	-do-	
		Cotton	-do-	
		Castor	No change	-

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 8 weeks (Aug 2nd wk)	Medium & shallow Black to Mixed Red & Black	Groundnut	Greengram (GM-4, K-851)/ sesame (G.Til.-2, 3, 4)/ sorghum (GFH-4, 5 gundari, S-1049) /castor (GC-3, GCH-4, 6, 7)/pigeonpea (BDN-2, Vaishali)/cotton (G cot 13, 15, 21, 23)/bajra (GHB-538)	As per crop follow the package of practices	Seed sources: National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujarat State Cooperative Marketing Federation Ltd. (Gujcomasol) Linkage with Government schemes for supply of implements: Zero till seed drill, seed dressing equipments, sprayers & dusters
		Cotton	-do-		
		Bajra	-do-		
		Castor	No change	-do-	
	Coastal Alluvial	Groundnut	Greengram (GM-4, K-851)/ sesame (Purva 1, GT.-2, 3, 4) sorghum (GFH-4, 5 gundari, S-1049)/ maize (fodder)/castor (GC-3, GCH-4, 6, 7)/pigeonpea (BDN-2, Vaishali)/cotton (G cot 13, 15, 21, 23)/bajra (GHB-538)	-do-	
		Bajra	-do-		
		Cotton	-do-		
		Castor	No change	-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 & shallow Black to Mixed Red & Black	Groundnut	Gap filling	Weeding, inter-culturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk or mulching with plastic film 25 micron 200 kg/ha or dust mulching	Supply of plastic film through Govt. schemes, cotton stock shredding machine which is available in Jasdan town of Rajkot district to be supplied by Govt.
		Cotton	Gap filling	Normal	
		Bajra	Thinning to maintain 10 cm plant to plant spacing	Weeding, inter-culturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk	
		Castor	No change	Normal	
	Coastal Alluvial	Groundnut	Gap filling	Weeding, inter-culturing to fill soil cracks, mulching with wheat straw or shredded cotton stalk, mulching with plastic film 25 micron 200 kg/ha	Supply of plastic film through Govt. schemes, cotton stock shredding machine which is available in Jasdan town of Rajkot district to be supplied by Govt.
		Bajra	Thinning to maintain 12 cm plant to plant spacing		
		Cotton	Gap filling		
		Castor	Gap filling		
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 & shallow Black to Mixed Red & Black	Groundnut	Weeding / thinning protection against sucking pests (control of jassid and aphid, spray Imidacloprid 17.8 SL 4 ml/10 L. water). Life saving irrigation if possible through well water	Mulching with wheat straw or crushed cotton stalk, mulching with plastic film 25 micron 200 kg/ha, Inter culturing, spray of anti-transparent, Avoid top dressing of urea	Supply of plastic film and pesticides through Govt. schemes. Ensure electric supply for life saving irrigation by PGVCL
		Cotton	-do-		

		Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing	Inter culturing; spray 1% N through urea after relief of drought.	Supply of urea through Govt. schemes
		Castor	Weeding protection against sucking pest (to control Jassid spray dimethoate @ 10 ml/10 L water)	Inter culturing, avoid top dressing of urea	
	Coastal Alluvial	Groundnut	Weeding/ removal of excess plants & inter culturing	Mulching, Inter culturing spray of anti-transparent	Supply of urea through Govt. schemes
		Bajra	Weeding, thinning to maintain 10 cm plant to plant spacing	Inter culturing	Ensure electric supply for life saving irrigation by PGVCL
		Cotton	Weeding protection against sucking pest	Inter culturing, avoid top dressing of urea	
		Castor	-do-		

Condition	Major Farming situation	Normal Crop/cropping system	Suggested contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
At flowering/ fruiting stage	1. Medium & shallow Black to Mixed Red & Black	Groundnut	Supplement irrigation if possible through MIS followed by weeding	-	Ensure electric supply for life saving irrigation by PGVCL Supply of urea through Govt. schemes
		Cotton	Weeding, interculturing protection against sucking pests life saving irrigation through drip system, plastic mulch, straw mulch etc for retention of moisture.	Avoid top dressing of urea -	
		Bajra	Supplement irrigation if possible. harvest non flowering plants for fodder purpose if water is not available	-	
		Castor	Weeding, supplement irrigation if possible & protection against sucking pest (to control Jassid spray dimethoate @ 10ml/10L water)	Avoid top dressing of urea	

	2. Coastal Alluvial	Groundnut	Supplement irrigation if possible through MIS followed by weeding, protection against sucking pests,	Avoid top dressing of urea	Ensure electric supply for life saving irrigation by PGVCL Supply of urea through Govt. schemes
		Cotton	Weeding. Supplemental irrigation if possible.		
		Castor	-do-		
		Bajra	Supplement irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available	Inter culturing, spray 1% N through urea after relief of drought	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Rabi Crop planning	Remarks on Implementation
Terminal drought (Early withdrawal of monsoon)	Medium & shallow Black to Mixed Red & Black	Groundnut	Harvest mature plants thin out to reduce plant population, life saving irrigation if possible	Sesame (Purva-1) Sorghum (fodder) Gram	Ensure electric supply for life saving irrigation by PGVCL
		Bajra	Supplementary irrigation if possible. Harvest plants for fodder purpose if water is not available		
		Castor	Harvest mature spike, remove dry plants, life saving irrigation if possible	-	
	Coastal Alluvial	Groundnut	Harvest mature plants & supplementary irrigation through MIS	Sesame (Purva-1) Sorghum (fodder) Gram	-do-
		Bajra	Supplementary irrigation if possible. Harvest plants for fodder purpose if water is not available		
		Castor	Harvest mature spike, remove dry plants, life saving irrigation if possible		

2.1.2 Drought - Irrigated situation

Condition	Major Farming situation	Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed/ limited release of water in canals due to low rainfall	1. Medium & shallow Black to Mixed Red & Black	Wheat	No change	-	-
		Cumin			
		Garlic			
		Onion			
		Chickpea			
	2. Coastal Alluvial	Wheat	-do-	-	
Isabgul					
Chickpea					

Note: Very limited canal irrigation facility exists in Jamnagar

Condition	Major Farming situation	Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Non release of water in canals under delayed onset of monsoon in catchment	1. Medium & shallow Black to Mixed Red & Black				NA
	2. Coastal Alluvial				

Condition	Major Farming situation	Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	1. Medium & shallow Black to Mixed Red & Black				NA
	3.Coastal Alluvial, Medium land				

Condition	Major Farming situation	Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall	1. Medium & shallow Black to Mixed Red & Black	Wheat	No change	Supply irrigation during night time to reduce transpiration	Ensure electric supply for life saving irrigation by PGVCL
			Greengram (GG-1, GJG-3)/ cumin (GC-3, 4)/ coriander (GC-1, 2)/ fenugreek (GM-2)/ leafy vegetables/carrot	Adoption of sprinkler irrigation system	Construction of well recharge structures, timely supply of MIS and seeds through Govt. schemes.
		Cotton	No change	Irrigation during night time to reduce transpiration	Ensure electric supply for life saving irrigation by PGVCL
			Greengram (GG-1, GJG-3)/ cumin (GC-3, 4)/ coriander (GC-1, 2)/ fenugreek (GM-2)/ leafy vegetables/Carrot	Adoption of drip irrigation system, Mulching of 50 micron -370 kg/ha. Reduce area of irrigation	Construction of well recharge structures, timely supply of MIS and seeds through Govt. schemes.
2.Coastal Alluvial, Medium land	Wheat	No change	Supply irrigation during night time to reduce transpiration	Ensure electric supply for life saving irrigation by PGVCL	
		Greengram (GG-1, GJG-3)/ Cumin (GC-3, 4)/ coriander (GC-1, 2)/ fenugreek (GM-2)/ leafy vegetables/carrot	Adoption of sprinkler irrigation system	Construction of well recharge structures, timely supply of MIS and seeds through Govt. schemes.	
Sea water intrusion	2.Coastal Alluvial, Medium land				

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

Condition	Suggested contingency measure			
	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
Continuous high rainfall in a short span leading to water logging				
Wheat	-	-	Surface drainage (for management of water logging and lodging of crop).To control black point in grain spray mancozeb 0.2%.	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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 after drainage		Surface drainage (for management of water logging) Harvesting of mature bolls	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.
Castor	-	-	Surface drainage (for management of water logging) Harvesting at physiological stage,	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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 for spreading groundnut if possible Harvesting is done immediately for	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) or shift produces

			bunch ground nut	to farm shed and protection against pest /disease damage in storage etc Preparation of quick drying techniques to separate good lot and bad lot.
Bajra	-	-	Harvest mature earhead	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.
Horticulture				
Cumin/ Coriander	Surface drainage (for management of water logging) Mancozeb 0.2% to control cumin blight), 0.2% wettable sulphur for protection against powdery mildew	Surface drainage (for management of water logging) Mancozeb 0.2% to control cumin blight), 0.2% wettable sulphur for protection against powdery mildew	Surface drainage (for management of water logging)	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.
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.	Utilized unripe fruits for pickles

Heavy rainfall with high speed winds in a short span	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
Wheat	Surface drainage (to control water logging condition)	Surface drainage (to control water logging condition)	Surface drainage (for management of water logging and lodging of crop), for control the black point in grain spray mancozeb 0.2%)	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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 after drainage	Surface drainage (for management of water logging) . Apply ammonium sulphate after drainage	Surface drainage (For management of water logging). Harvest mature balls	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.
Castor	-	-	Surface drainage (for management of water logging). Harvesting at physiological stage.	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.
Ground nut	-	-	Delay harvesting for spreading ground nut if possible harvesting is done immediately for bunch ground nut	To protect produce with plastic sheet (100 micron, UV stabilized colour plastics) 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.

Bajra	-	-	Harvest mature earhead	
Horticulture				
Cumin/Coriander	Surface drainage (for management of water logging & diseases, mancozeb 0.2% to control cumin blight), 0.2% wettable sulphur for protection against powdery mildew	Surface drainage(for management of water logging & diseases, mancozeb 0.2% to control cumin blight), 0.2% wettable sulphur for protection against powdery mildew	Surface drainage (for management of water logging)	-do-
Mango	-	Spray 0.2% wettable sulphur or 0.005% hexaconazole for protection against powdery mildew.	Collect fallen fruits. Harvest physiologically matured fruits	Unripe fruit may be used for pickles

Outbreak of pests and diseases due to unseasonal rains	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
Wheat	Spray mancozeb 0.2% (To control leaf blight and rust)	Spray mancozeb 0.2% (To control leaf blight and rust)	Spray mancozeb 0.2% (To control leaf blight and rust)	-
Cotton	-	Control cotton angular leaf spot		-
Castor	-	-	Harvest the crop at physiological maturity stage, No measure for seed shattering	-
Groundnut	Spray 0.005% hexaconazole for rust & tikka disease control			-
Bajra	-	-	-	-
Horticulture				
Cumin	Spray mancozeb 0.2% to control cumin blight	Spray mancozeb 0.2% to control cumin blight	Spray 0.2% wettable sulphur to control powdery mildew	-
Mango	Provision of drainage, fertilizers application Control of leaf blight under unusual rains with cloudy weather	Spray 0.2% wettable sulphur for protection against powdery mildew after cessation of heavy rain	Hang methyl eugenol poison trap. one/acre for control of fruit fly	-

2.3 Floods

Condition	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation				
Groundnut	NA	Surface drainage	Surface drainage	Surface drainage
Cotton	NA	Surface drainage	Surface drainage	Surface drainage
Bajra	NA	Surface drainage	Surface drainage	Surface drainage
Green gram	NA	Surface drainage	Surface drainage	Surface drainage
Horticulture				
Mango	Shift to safe place & surface drainage	Surface drainage	Surface drainage	Surface drainage
Continuous submergence for more than 2 days				
Groundnut	As preventive step open drainage channel followed by spray 0.05% carbendazim for control of leaf spot.	As 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 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	Surface drainage
Cotton	As preventive step open drainage channel and apply ammonium sulphate	As preventive step open drainage channel and apply ammonium sulphate	As preventive step open drainage channel and harvest mature bolls	Surface drainage
Bajra	As preventive step open drainage channel.	As preventive step open drainage channel.	As preventive step open drainage channel.	Harvest Mature ear heads
Pulses	As preventive step open drainage channel and spray 0.05% carbendazim for powdery mildew.	As preventive step open drainage channel and spray 0.005% hexaconazole or 0.025% carbendazim for leaf spot & powdery mildew.	As 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 to safe place & Surface drainage	Surface drainage	Surface drainage	Surface drainage
Cumin	As a preventive step open drainage channel, spray	As a preventive step open drainage channel, spray	As a preventive step open drainage channel, spray mancozeb 0.2% to	-

	mancozeb 0.2% to control cumin blight and 0.2 % wettable sulphur for control of powdery mildew	mancozeb 0.2% to control cumin blight and 0.2 % wettable sulphur for control of powdery mildew	control cumin blight and 0.2 % wettable sulphur for control of powdery mildew	
Sea water intrusion	NA	NA	NA	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	Lift & frequent irrigation to all crops	Lift & frequent irrigation to all crops	Lift & frequent irrigation to all crops	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	
Castor	Earthing up, quick drainage	Earthing up, quick drainage	Earthing up, quick drainage	
Horticulture				
Mango	Shifted to poly house	Additional irrigation may be given & vegetative barrier	Additional irrigation may be given & vegetative barrier	-
Cumin	Quick drainage	Quick drainage	Quick drainage	Shift produce at safer place

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., 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.	Add mineral mixtures 25 g/animal/day along with feed, Deworming of the animals. Arrange mobile dispensary for animal health 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.	Add vitamin mineral mixtures 25 g/animal/day along with feed, quarantine diseased animals and 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.	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 health 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 carcass 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	Add bleaching powder to drinking water	Add bleaching powder to drinking water

	(1%).	(1%).	(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 health 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

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 assures supply of	Routine practices are followed	Linkage Govt. schemes with public/NGOs at grass root levels.

		electric power.		
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	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 begiven.
(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	Warning systems to be installed.	Compensations to be paid for repair & maintenance of boats & gears on

	instruments supplied to fisher man. Warning systems to be installed.		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	-	-	-