State: GUJARAT

Agriculture Contingency Plan for District: PORBANDAR

<table>
<tr><td colspan="8">1.0 District Agriculture profile</td></tr>
<tr><td rowspan="7">1.1</td><td>Agro-Climatic/Ecological Zone</td><td colspan="6"></td></tr>
<tr><td>Agro Ecological Sub Region (ICAR)</td><td colspan="6">Arid Western Plains (2.4)</td></tr>
<tr><td>Agro-Climatic Zone (Planning Commission)</td><td colspan="6">Gujarat Plains & Hills Region (XIII)</td></tr>
<tr><td>Agro Climatic Zone (NARP)</td><td colspan="6">South Saurashtra Zone (GJ-7)</td></tr>
<tr><td>List all the districts or part thereof falling under the NARP Zone</td><td colspan="6">Porbandar, Junagadh, Bhavnagar</td></tr>
<tr><td>Geographic coordinates of district headquarters</td><td colspan="2">Latitude</td><td colspan="2">Longitude</td><td colspan="2">Altitude</td></tr>
<tr><td></td><td colspan="2">21°38’38.02” N</td><td colspan="2">69°36’41.06” E</td><td colspan="2">7 m</td></tr>
<tr><td>Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS</td><td colspan="6">Asstt. Research Scientist, Cotton Research Station, Khapat Farm, Khapat –Porbandar PIN-360 579</td></tr>
<tr><td>Mention the KVK located in the district</td><td colspan="6">Krishi Vigyan Kendra, JAU, Khapat Farm, Khapat-Porbandar PIN-360 579</td></tr>
<tr><td rowspan="6">1.2</td><td>Rainfall</td><td>Normal RF(mm)</td><td>Normal Rainy days</td><td colspan="2">Normal Onset</td><td colspan="2">Normal Cessation</td></tr>
<tr><td>SW monsoon (June-Sep):</td><td>660</td><td>25</td><td colspan="2">2nd Week of June</td><td colspan="2">2nd Week of September</td></tr>
<tr><td>NE Monsoon(Oct-Dec):</td><td>-</td><td>-</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td>Winter (Jan- March)</td><td></td><td></td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Summer (Apr-May)</td><td></td><td></td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Annual</td><td>660</td><td>25</td><td colspan="2">-</td><td colspan="2">-</td></tr>
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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)	229.5	119.4	24.4	15.4	25.5	4.7	-	18.6	21.5	-

(Source: Report on Statistics of District, District Panchayat, Porbandar

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area ('000 ha)**	**Percent (%) of total**
	Shallow to Medium Black Depth 30cm to 60 cm Texture: sandy clay to clay loam Calcareous soil	172.5	75.2
	Deep Black (Ghed area) Depth 80cm to few meters Texture: clay Saline -sodic type soil	57.0	24.8
	Others (specify):		

1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	119.4	105
	Area sown more than once	6.0	
	Gross cropped area	125.4	

Source : Reports on Statistics of District , District Panchayat, Porbandar

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	19.5		
	Gross irrigated area	19.5		
	Rainfed area	99.9		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals		0.008	0.007
	Tanks	-	-	-
	Open wells	20058	19.5	14.3
	Bore wells	-	-	-
	Lift irrigation schemes	-	-	-
	Micro-irrigation		8.9	**Ø Source GGRC**
	Other sources (please specify)	-	-	-
	Total Irrigated Area		28.4	
	Pump sets	-		
	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 =89 %, Semi critical**
	Over exploited	1	49.2	saline water
	Critical	-		
	Semi- critical	2	50.8	Fluoride, Nitrate content , saline water
	Safe	-	-	-
	Wastewater availability and use	0	-	-
	Ground water quality	Saline water with high TDS, Sea water intrusion		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				
(Source : (Report on Statistics of District , District Panchayat, Porbandar *and Reports on GWR&IP in Gujarat, NWR,WS & Kalpsar Deptt., Govt. of Gujarat*)				

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

1.7	Major field crops cultivated	Area ('000 ha)							
		Kharif			*Rabi*				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Groundnut		91.8	91.8	-	-	-	0.1	91.9
	Gram	-	-	-	-	14.1	14.1		14.1
	Cotton	3.8	1.0	4.8	-	-	-	-	4.8
	Wheat		1.1	1.1	-	-	-	-	1.1
	Pearl Millet	1.2	-	-	1.2	-	-	-	1.2

S. No.	Horticulture crops - Fruits	Area ('000 ha)
		Total
	Papaya	0.2
	Mango	0.2
	Sapota(Chiku)	0.2
	Ber	0.05
	Citrus	0.02
	Horticulture crops - Vegetables	**Total**
	Onion	1.0
	Chilly	0.7
	Brinjal	0.5
	Medicinal and Aromatic crops	**Total**
	Fenugreek	0.1
Spices	Cumin	25.8
	Coriander	1.0
	Plantation crops	**Total**

	Coconut	0.6
Others (Specify)	Eg., industrial pulpwood crops etc.	-
	Fodder crops	**Total**
	Sorghum, Maize, Lucerne	17.6
	Total fodder crop area	17.6
	Grazing land	25.5
	Sericulture etc	-
	Others (specify)	-

Data Source: ***Jillani Ankdakiya Ruprekha*** **(Report on Statistics of District, District Panchayat, Porbandar and DAO and Dy. Director of Horticulture, Porbandar**

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	51.6	31.5	83.1
	Crossbred cattle	-	-	-
	Non descriptive Buffaloes (local low yielding)	5.7	66.6	72.3
	Graded Buffaloes	-	-	-
	Goat	0.5	21.8	22.3
	Sheep	0.5	22.1	22.6
	Others (Camel, Pig, Yak etc.)	-	-	7.7
	Commercial dairy farms (Number)			105
1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**	
	Commercial	9	29	
	Backyard	0	1	

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)	
	33035	4449	133	95970	-	97

	ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
		-	7	25
	B. Culture			
	i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	**Water Spread Area (ha)**	**Yield (t/ha)**	**Production ('000 tons)**
		0.7	1.5	0.001
	ii) **Fresh water** (Data Source: Fisheries Department)			
	Others			

Source: ***Jillani Ankdakiya Ruprekha*** **(Report on Statistics of District , District Panchayat, Porbandar and Reports of Department of Animal Husbandry and Fisheries, Govt. of Gujarat.**

1.11 Production and Productivity of major crops (Average of last 5 years: 2004 to 2009)

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)										
	Groundnut	126.4	1375	-	-	-	-	126.4	1375	189.7
	Gram	-	-	20.1	1417	-	-	21.0	1417	25.7
	Cotton	9.0	1875	-	-	-	-	9.0	1875	-
	Wheat			3.3	2875	-	-	3.3	2875	4.0
	Sorghum	8.7	1287	-	-	-	-	8.7	1287	10.6
Major Horticultural crops (Crops to be identified based on total acreage)										
	Cumin	-	-	25.8	858	-	-	25.8	858	-
	Coriander	-	-	1.0	1500	-	-	1.0	1500	-
	Onion	-	-	1.0	3600	-	-	1.0	3600	-

Data Source: ***Jillani Ankdakiya Ruprekha*** **(Report on Statistics of District, District Panchayat, Porbandar and DAO and Dy. Director of Horticulture, Porbandar**

1.12	**Sowing window for 5 major field crops**	Groundnut	Cotton	Wheat	Cumin	Gram
	Kharif- Rainfed	2nd week of June to 1st week of July	2nd week of June to 2nd week of July	-	-	-
	Kharif-Irrigated	4th week of May to 2nd week of June	4th week of May to 2nd week of June	-	-	
	Rabi- Rainfed	-	-	-	-	3rd week of Oct. to 4th week of Nov.
	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?**	**Regular**	**Occasional**	**None**
	Drought	-	√	-
	Flood	-	√	-
	Cyclone	-	√	-
	Hail storm	-	-	√
	Heat wave	-	√	-
	Cold wave	-	-	√
	Frost	-	-	√
	Sea water intrusion (in Porbandar Taluka)	√	-	-
	Pests and disease outbreak (specify) Pests-Aphid, Jasid, 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 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes

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 wk)*	Shallow to Medium Black	Groundnut	No Change	Normal	NA
		Pearl millet	No Change	Normal	
		Sorghum	No Change	Normal	
	Deep Black (Ghed area)	Cotton Dhumad	No Change	Normal	NA
		Sorghum (Gundhari)	No Change	Normal	

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 wk)	Shallow to Medium Black	Groundnut(Spreading & Semi spreading)	Bunch variety GG-2/GG-5/ GG-7/Semi spreading variety G-20 of groundnut	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	Agencies for quality seed supply are National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University, Gujcomasol.
		Pearl millet	Castor GAU-CH-1, GCH-6 / Pigeon pea GT-100, BDN-2 / Sorghum GFS-4 &5, Gundhari, S-1049	(As per crop change, follow the package of practices.)	
		Sorghum	No Change	Normal	

	Deep Black (Ghed area)	Cotton Dhumad	No Change	Normal	-
		Sorghum (Gundhari)	No Change	Normal	

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 4th Week of July	Shallow to Medium Black	Groundnut(Spreading & Semi spreading)	Green Gram (Guj. Mag-4, K-85/ Sesame Purva-1/Sorghum GFS-4&5, Gundhari, S-1049/ Castor GAU-CH-1, GCH-6 / Pigeon pea, BDN-2, Cotton G cot 13,15,21	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	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, Spayers & dusters from government schemes (Implements like seed drill, seed dressing are available in Rajkot).
		Pearl millet	Green Gram (Variety Guj. Mug-4) / Black Gram (Guj. Udad-1, T-9)	(As per crop change, follow the package of practices.)	
		Sorghum (Gundhari)	As such and/or Sorghum (Fodder GFS 4,5)	-do-	
	Deep Black (Ghed area)	Cotton (Dhumad)	No Change	-	
		Sorghum (Gundhari)	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 8 weeks 2nd Week of August	Shallow to Medium Black	Groundnut (Spreading & Semi spreading)	Sesame Purva-1/Sorghum GFS-4&5, Gundhari, S-1049/ Castor GAU-CH-1, GCH-5	Keep 45 cm and 60 cm row spacing for bunch and semi spreading groundnut, respectively. Other practices will be as such.	Agencies for quality seed supply are National Seed Corporation (NSC), Gujarat State Seed Corporation (GSSC), University,

		Pearl millet	Sorghum GFS-4&5, Gundhari, S-1049/ Castor GAU-CH-1, GCH-5	(As per crop change, follow the package of practices.)	Gujcomasol. Supply of quality seed from NSC, GSSC, SAU, and zero till seed drill, seed dressing equipments, Spayers & dusters from government schemes(Implements like seed drill,seed dressing are available in Rajkot).
		Sorghum (Gundhari)	No change	-	
	Deep Black (Ghed area)	Cotton Dhumad	Sorghum(Fodder GFS 4,5) Sorghum(Gundhari)	(As per crop change, follow the package of practices.)	
		Sorghum(Gundhari)	No change	-	

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.	Shallow to Medium Black	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 available in Jasdan Village of Rajkot district to be supplied by Govt.
		Pearl millet	Thinning to maintain 10 cm plant to plant spacing	-do-	
		Sorghum	-do-	-do-	
	Deep Black (Ghed area)	Cotton	Gap filling	-do-	
		Sorghum	Thinning to maintain 10 cm plant to plant spacing	-do-	

Condition			Suggested Contingency measures		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At vegetative stage	Shallow to Medium Black	Groundnut	Weeding/ Thinning Protection against sucking pests (To control Jassid 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. Mulching (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
		Pearl millet	Weeding/ Thinning to maintain 10 cm plant to plant spacing life saving irrigation if possible	Inter tilling. Spray 1 % N through urea after relief of drought.	-do-
		Sorghum	-do-	Inter tilling. Spray 1 % N through urea after relief of drought.	-do-
	Deep Black (Ghed area)	Cotton	Weeding / Life saving Irrigation if possible Protection against sucking pests (To control Jassid spraying methyle-o-demeton @ 10 ml / 10 lit. water or dimetheote @10 ml/ 10 lit water)	Mulching@ 5t/ha Bio waste if possible Avoid top dressing of urea	
		Sorghum	Weeding/ Thinning to maintain 10 cm plant to plant spacing life saving irrigation if possible	Inter tilling. Spray 1 % N through urea after relief of drought.	Supply of plastic film and pesticides through govt. schemes. Ensure electric supply for life saving irrigation by Electricity Supply Board of State

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[c]**
At flowering/ fruiting stage	Shallow to Medium Black	Groundnut	Supplemental irrigation if possible followed by weeding.	-	Ensure electric supply for irrigation by Electricity Supply Board of State
		Pearl millet	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available	Inter tilling, Top dressing of N through urea after relief of drought	-do-
		Sorghum	-do-	Inter tilling, Top dressing of N through urea after relief of drought	-do-
	Deep Black (Ghed area)	Cotton	Weeding Supplemental Irrigation Protection against sucking pests (To control Jassid spraying methyle-o-demeton @ 10 ml / 10 lit. water or dimetheote @10 ml/ 10 lit. water)	Avoid top dressing of urea	-do-
		Sorghum	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available	Inter tilling, Top dressing of N through urea after relief of drought	-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**	**Remarks on Implementation**
	Shallow to Medium Black	Groundnut	Life saving irrigation if possible.	-	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Pearl millet	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available.	-	-do-
		Sorghum	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available.	-	-do-
	Deep Black (Ghed area)	Cotton	Harvest mature bolls Irrigation if possible	Inter tilling Avoid top dressing of urea	
		Sorghum	Supplemental irrigation if possible. Harvest non flowering plants for fodder purpose if water is not available.	-	-do-

Drought - Irrigated situation:

Note: Reservoirs have not adequate irrigation water to supply for Growth period of any crop.

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	Shallow to Medium Black Medium Depth Soil Upland area	-	-	-	-
	Deep Black (Ghed area) Deep Soil Lowland Area	-	-	-	-

Condition			Suggested Contingency measures		
	Major Farming situation	**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	Shallow to Medium Black Medium Depth Soil Upland area	-	-	-	-
	Deep Black (Ghed area) Deep Soil Lowland Area	-	-	-	-

Condition			Suggested Contingency measures		
	Major Farming situation	**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	Shallow to Medium Black Medium Depth Soil Upland area	NA	NA	NA	NA
	Deep Black (Ghed area) Deep Soil Lowland Area	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 groundwater recharge due to low rainfall	Medium Black Medium Depth Soil Upland area	**Wheat**	No change	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 Sprinkler irrigation system. Reduce area of 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.
		Cumin	No change	Adoption of drip, deficit irrigation, Reduce area of irrigation	-do-

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Deep Black (Ghed area) Deep Soil Lowland Area	Gram	Gram ICCC 4, Guj 2	Adoption of Sprinkler irrigation system, deficit irrigation, Reduce area of irrigation	-
		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 2	Adoption of Sprinkler irrigation system, deficit irrigation, Reduce area of irrigation	-
		Sorghum (Gundhari)	No Change	-do-	-
Sea water intrusion	Medium Black Medium Depth Soil Upland area	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 decided for limiting the depth of well in coastal area.
	Deep Black (Ghed area) Deep Soil Lowland Area	Wheat	Leafy vegetables carrot, beet, lucerne	-do-	-do-

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 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.
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 µm, UV stabilized colour plastic) or shift produces to farm shed and protection against pest/disease damage in storage etc,
Groundnut	-	-	Harvesting delay for spreading groundnut if possible. Immediately harvested bunch groundnut.Quick surface drainage , Open channel around field.	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, Preparation of quick drying techniques to separate good lot and bad lot.
Pearl millet	-	-	Harvest mature ear heads.	-do-
Gram	-	-	Quick drainage , Harvest mature pods	-do-
Horticulture				
Cumin/	Surface drainage (For management of water logging & diseases. Spray Mancozeb 0.2% to control Cumin blight, 0.2% wettable sulphur for	Surface drainage (For management of water logging & diseases, Spray Mancozeb 0.2% to control	Surface drainage (for management of water logging)	-do-

	protection against PM	Cumin blight)), 0.2 % wettable sulphur for protection against PM		
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				
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 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. After drainage apply 199 Kg/ha ammonium sulphate.	Surface drainage (for management of water logging. After drainage apply 199 Kg/ha ammonium sulphate.	Surface drainage (for management of water logging). Harvesting mature bolls.	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
Groundnut	-	-	Harvesting delay for spreading groundnut if possible. Immediately harvested bunch groundnut. Quick surface drainage, Open channel around field.	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, Preparation of quick drying techniques to separate good lot and bad lot.
Pearl millet	-	-	Harvest mature ear heads, Quick surface drainage.	-do-
Gram	-	-	Arrange drainage, Harvest mature pods.	-do-
Horticulture				
Cumin	Surface drainage (For management of	Surface drainage (For	Surface drainage (for	-do-

	water logging & diseases. Spray Mancozeb 0.2% to control Cumin blight, or 0.2% wettable sulphur for protection against PM	management of water logging & diseases, Mancozeb 0.2% to control Cumin blight)), or 0.2% wettable sulphur for protection against PM	management of water logging)	
Mango	-	Spray 0.2% wettable sulphur or 0.005% Hexaconazole for protection against PM	Collect fallen fruits	Unripe fruit may be used for pickles.
Outbreak of pests and diseases due to unseasonal rains				
Cotton	Spray mancozeb 0.2% (To control leaf Blight & rusts).	Spray mancozeb 0.2% (To control leaf Blight & rusts).	Spray mancozeb 0.2% to control black point in grain.	-
Wheat	-	Control cotton angular leaf spot by spray of Copper Oxy chloride 0.2 % & streptocycline 100 ppm.	Control cotton angular leaf spot 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.	-
Bajara	-	-	Spray Mancozeb 0.2% (To control rust).	-
Gram	-	-	-	-
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 PM	-
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.	-

2.3 Floods

Condition	Suggested contingency measures			
Transient water logging/ partial inundation[1]	**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	NA	-do-	-do-	-
Pearl millet	NA	-do-	-do-	-
Gram	NA	-do-	-do-	-
Horticulture				
Mango	Proper drainage	Surface drainage	Surface drainage	Surface drainage
Continuous submergence for more than 2 days[2]				
Groundnut	As a preventive steps open drainage channel followed by spray 0.05 % carbendazim for control of leaf spot.	As a preventive steps 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 steps open drainage channel followed by spray 0.05 % carbendazim for control of leaf spot.	As a preventive steps open drainage channel followed by spray 1 % $FeSO_4$ + 0.1 % citric acid for control yellowing, 0.0025% hexaconazole for rust & leaf spot management.
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 and apply 199 Kg/ha ammonium sulphate.	As a preventive step open drainage channel and apply 199 Kg/ha ammonium sulphate.
Pearl millet	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 downy mildew.)	As a preventive step open drainage channel and spray mancozeb 0.2% (To control	As a preventive step open drainage channel and spray mancozeb 0.2% (To control

			downy mildew)	downy mildew.)
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.	As a preventive step open drainage channel and spray 0.005% hexaconazole or 0.025 % carbendazim for powdery mildew.	Picking of Mature pods.
Horticulture				
Mango	Shift to safe place & 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**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave	Light & frequent irrigation to all the crops	Light & frequent irrigation to all the crops	Light & frequent irrigation to all the crops	Light & frequent irrigation to all the crops
Hailstorm	NA	NA	NA	NA
Cyclone	NA	NA	NA	NA
Wheat	Quick drainage	Quick drainage	Quick drainage and spray mancozeb 0.2% to control black point in grain.	Shift produce at safer place
Cotton	Earthing up , quick drainage	Earthing up, quick drainage	Earthing up, quick drainage	
Groundnut	-do-	-do-	-do-	
Gram	-do-	-do-	-do-	
Horticulture				

Cumin	-do-	-do-	-do-	Shift produce at safer place
Mango	Shift to safe place if possible & Build Cyclone proof nursery houses, Grow wind bearer trees around nursery	Reduce canopy & tying plants diagonally if possible, Grow wind bearer trees around field	Reduce canopy & tying plants diagonally if possible	-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 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.,	Harvest and use biomass of dried up crops (wheat/bajra/maize/groundnut/mungbean etc.,) material as fodder 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

	Processing & storage of feed/fodder and roughages in the form of complete feed/blocks.		
Drinking water	Adopt various water conservation methods at village level to improve the ground water level for adequate water supply. Identification of water resources Desilting of ponds Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals) Construction of drinking water tanks in herding places/village junctions/relief camp locations Community drinking water trough can be arranged in shandies /community grazing areas	Adequate supply of drinking water. Restrict wallowing of animals in water bodies/resources Add alum in stagnated water bodies	Watershed management practices shall be promoted to conserve the rainwater. Bleach (0.1%) drinking water / water sources Provide clean drinking water
Health and disease management	Procure and stock emergency medicines and vaccines for important endemic diseases of the area All the stock must be immunized for endemic diseases of the area 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	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	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

	mixture	Rescue of sick and injured animals and their treatment Organize with community, daily lifting of dung from relief camps	
Floods			
Feed and fodder availability	In case of early forewarning (EFW), harvest all the crops (wheat/bajra/sorghum//maize/ groundnut /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 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	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 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	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 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/sorghum/maize groundnut /mungbean etc.)	Transportation of animals to elevated areas	Repair of animal shed Bring back the animals to the

	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 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	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.
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)	Feed the animals as per routine schedule Allow the animals for grazing (normal timings)

		In severe cases, vitamin 'C' and electrolytes should be added in H_2O during heat waves.	
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, cover 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	Routine practices are to be followed.	Linkage Govt. schemes with public/NGOs at grass root levels.

		biotics, and Assure supply of 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 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.	-do-	-
Cold wave				
Shelter/environment management	NA			
Health and disease management	NA			

2.5.2 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	NA		
Inland	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			

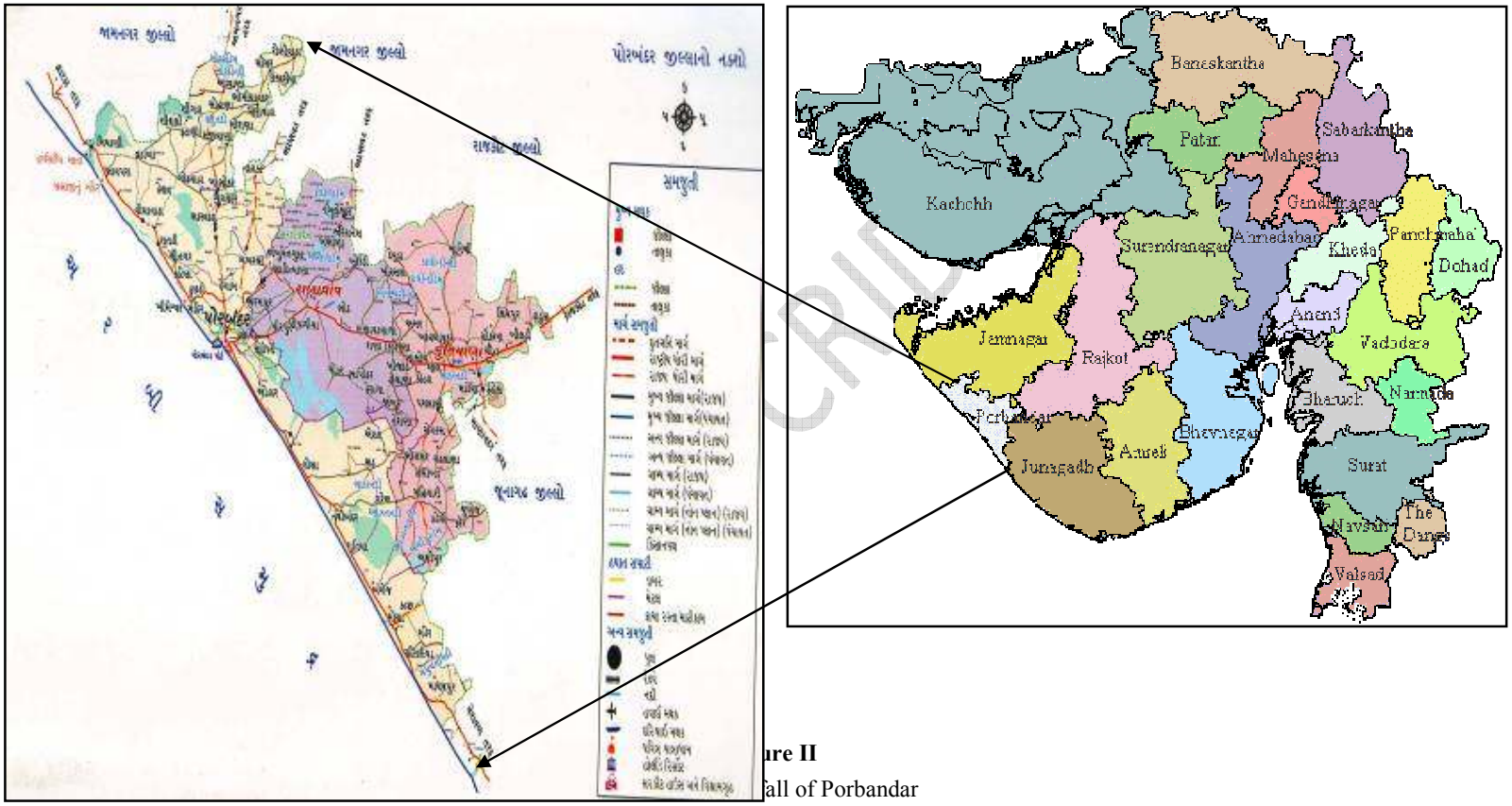
Marine	NA		
Inland	NA		
B. Aquaculture			
(i) Inundation with flood water	Deepening of ponds, Repair, strengthening of dykes	Enhancement of dykes height by sand bags	-
(ii) Water contamination and changes in water quality	Use of calcium hydroxide @ 150 kg/ha	Infected fishes to be treated with $KMno_4$ 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			-do-
(iii) Avg. no. of houses damaged	-	-	-do-
Inland	NA		
B. Aquaculture	NA		

(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	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	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	NA		
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	-	-	-

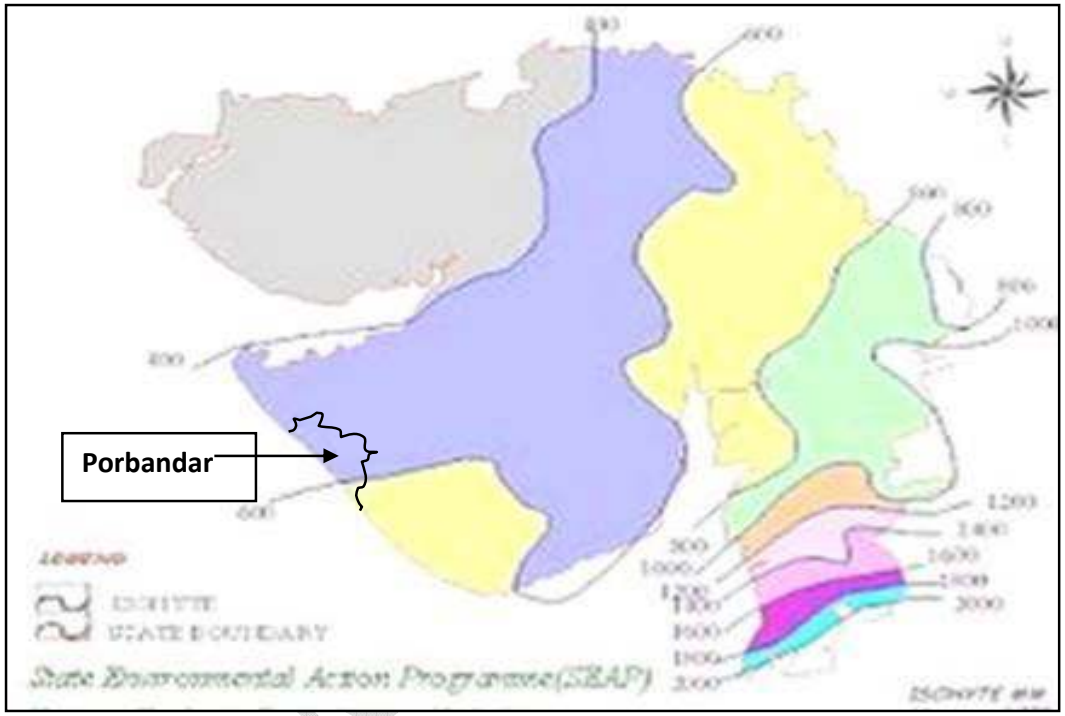
Annexure I

Location map of district within State



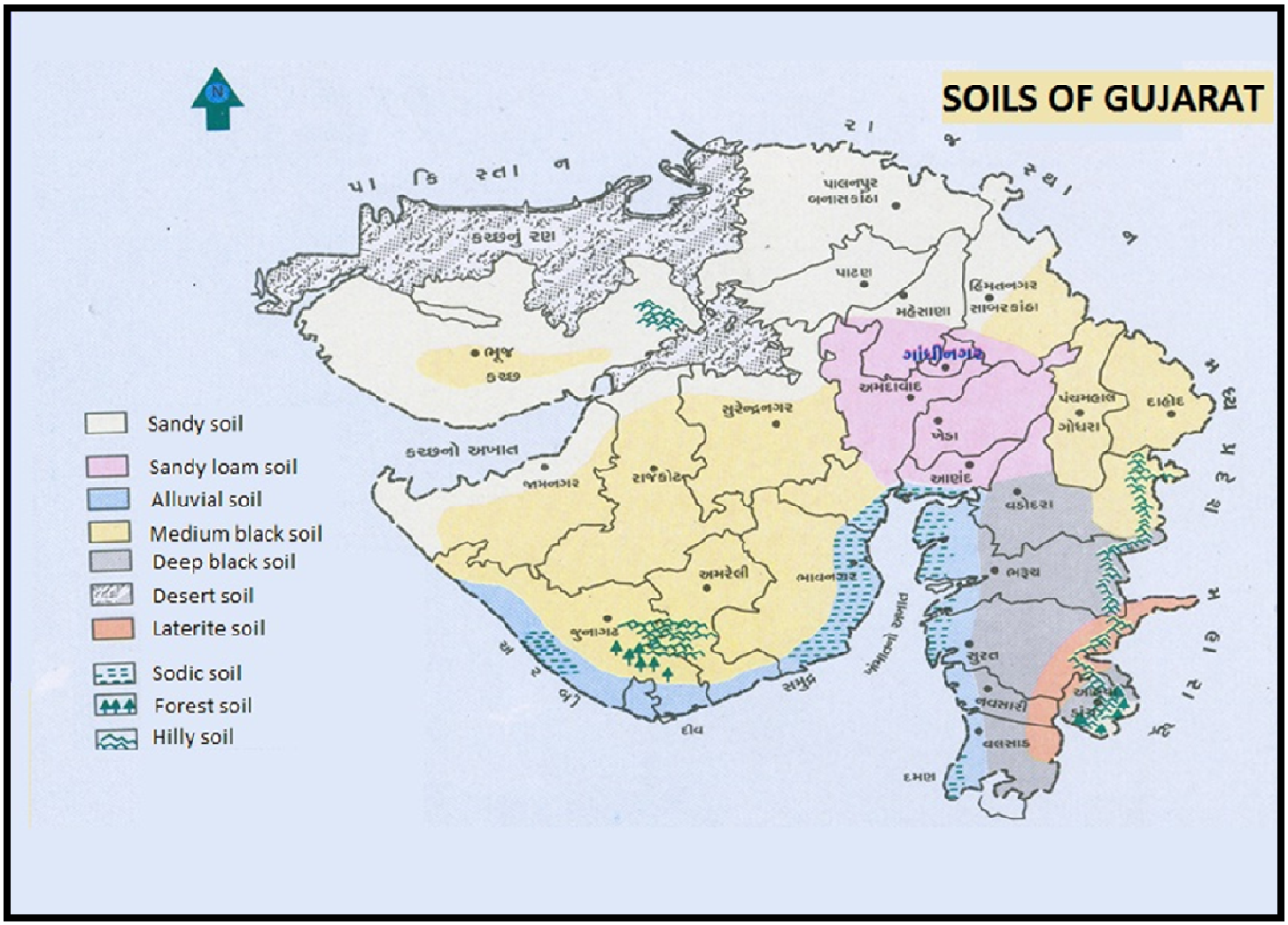
ure II

all of Porbandar


Porbandar
State Environmental Action Programme(SEAP)

Annexure III

Soil Map of Porbandar district



Source: Gujarat Remote Sensing and Service Centre, Department of Agriculture, Gujarat