State: GUJARAT

Agriculture Contingency Plan for District: SURENDRANAGAR

1.0 District Agriculture profile					
1.1	**Agro-Climatic/Ecological Zone**				
	Agro Ecological Sub Region (ICAR)	Western Plain, Kachchh And Part Of Kathia (2.4, 2.3)			
	Agro-Climatic Zone (Planning Commission)	Gujarat Plains & Hills Region (XIII)			
	Agro Climatic Zone (NARP)	North West Zone (GJ-5) North Saurashtra (GJ-6)			
	List all the districts or part thereof falling under the NARP Zone	Amreli,Bhavnagar,Jamnagar,Rajkot,Surendranagar			
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude	
		22º43'07.42" N	71º38'15.61" E	74M	
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Agricultural Research Station, Targhadia(Rajkot) - 360 003			
	Mention the KVK located in the district	Krishi Vigyan Kendra,Nanakanthasar, Ta.-Chotila,Distt. Surendranagar-363520			
1.2	**Rainfall**	Normal RF(mm)	Normal Rainy days (number)	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	597	28	3rd week of June	3rd week of September
	NE Monsoon(Oct-Dec):	-	NA	NA	NA
	Winter (Jan- March)	-	NA		
	Summer (Apr-May)	-	NA		
	Annual	597	28		

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)	1046	704.7	50.2	52.3	54.7	46	0	57.7	76.8	3.5

(Source : District Agriculture Officer, Agriculture department, Surendranagar)

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)**	**Area ('000 ha)**	**Percent (%) of total**
	Medium black Soils	633.4	60.5
	Sandy Soils	252.5	24.1
	Saline & Alkaline Soils	160.2	15.3

1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	704.7	105
	Area sown more than once	32.4	
	Gross cropped area	737.1	

(Source : : District Agriculture Officer, Agriculture department, Surendranagar

1.6	**Irrigation**	Area ('000 ha)		
	Net irrigated area	123.7		
	Gross irrigated area	130.2		
	Rainfed area	581.0		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals		4.8	3.7
	Tanks	161	3.6	2.8
	Open wells	28944	24.5	18.8
	Bore wells			-
	Lift irrigation schemes	-	-	-
	Micro-irrigation		-	-
	Other sources (Pvt.Tubewell)	17771	97.4	74.8
	Total Irrigated Area	-	130.2	

	Pump sets	15716		
	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 = 65 %**
	Over exploited	3	34.3	Saline
	Critical	0	0	-
	Semi- critical	3	25.6	Moderate saline
	Safe	4	40.2	-
	Wastewater availability and use	0	0	-
	Ground water quality	Saline groundwater with higher TDS		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: District Agriculture Officer, Agriculture department, Surendranagar

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**
	Cotton	138.8	310	448.7	-	-	-	-	448.7
	Sesame	-	76.6	76.6	-	-	-	-	76.6
	Cumin	-	-	-	64.5	-	64.5	-	64.5
	Bajra (Pearl Millet)	-	39.0	-	-	-	-	2.2	41.2
	Wheat	-	-	-	31.9	4.6	36.5	-	36.5
	Castor	-	28.0	28.0	-	-	-	-	28.0
	Groundnut	-	21.4	21.4	-	-	-	0.40	21.8
	Pulses	-	7.3	7.3	9.3	-	-	-	16.6

	Horticulture crops - Fruits	Area ('000 ha)
		Total
	Ber	1.7
	Citrus	1.0
	Mango	0.6
	Amla	0.2

	Horticulture crops - Vegetables	**Total**
	Brinjal	3.2
	Lady's finger	2.4
	Cluster bean	1.7
	Tomato	1.5
	Medicinal and Aromatic	**Total**
	Isabgul	0.5
	Sowa	0.5
	Plantation crops	**-**
	Fodder crops	**Total**
	Jowar	56
	Maize	0.4
	Total fodder crop area	56.4
	Grazing land	54.6
	Sericulture etc	**-**
	Others (specify)	**-**

(Source: District Agriculture Officer, Agriculture department, Surendranagar)

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)			342.0
	Crossbred cattle			4.8
	Non descriptive Buffaloes (local low yielding)			290
	Graded Buffaloes			
	Goat			191
	Sheep			134
	Others (Camel, Pig, Yak etc.)			2
	Commercial dairy farms (Number)	N.A	N.A	-

1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**
	Commercial	-	10
	Backyard	-	-

1.10 Fisheries (Data source: Chief Planning Officer)

A. Capture

i) Marine (Data Source: Fisheries Department)	**No. of fishermen (household)**	**Boats**		**Nets**		**Storage facilities (Ice plants etc.)**
		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
	11854	0	380	0	NA	0

ii) Inland (Data Source: Fisheries Department)	**No. farmer owned pond**	**No of Reservoirs**	**No. of village**
	-	175	24

B. Culture

	Water Spread Area ('000 ha)	**Yield (t/ha)**	**Production ('000 tons)**
i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	33.0	-	

	ii) **Fresh water** (Data Source: Fisheries Department)	8.0	-	4721.6
	Others	-	-	-

(Source: District Agriculture Officer, Agriculture department, Surendranagar and Report (2008) of commissioner of fisheries, Govt. of Gujarat, Gandhinagar)

1.11 Production and Productivity of major crops (Average of last 5 years: (2004 - 08)

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	40.5	2104	-	-	0.8	1766	41.3	3870	62.0
	Cotton Irrigated	9.3	682	-	-	-	-	9.3	682	9.3
	Unirrigated	8.1	264	-	-	-	-	8.1	264	8.2
	Wheat Irrigated	-	-	88.6	2869	-	-	88.6	2869	183.3
	Unirrigated	-	-	4.467	761	-	-	4.5	761	9.3
	Bajra	64.6	1364	-	-	3.3	2376	68.0	3740	203.7
	Pulses	5.03	501	10.9	1035	-	-	16.0	1536	18.2
	Sesame	35.4	414.7	-	-	-	-	35.4	414.7	83.2
	Castor	63.8	2516	(Semi-Rabi)	-	-	-	63.8	2516	95.7
Major Horticultural crops (Crops to be identified based on total acreage)										
	Citrus	-	-	-	-	-	-	8.9	8592	-
	Ber	-	-	-	-	-	-	24.2	14560	-
	Mango	-	-	-	-	-	-	2.5	4415	-

	Amla	-	-	-	-	-	-	2.27	14452	-

(Source: District Agriculture Officer, Agriculture department, Surendranagar)

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	**Cotton**	**Sesame**	**Bajra**	**Cumin**	**Wheat**
	Kharif- Rainfed	3rd week of June to 1st week of July	3rd week of June to 1st week of July	3rd week of June to 1st week of July	-	-
	Kharif-Irrigated	-	-		-	-
	Rabi- Rainfed	-		-	-	-
	Rabi-Irrigated	-			October to November	October to November

1.13	**What is the major contingency the district is prone to?** (Tick mark)	**Regular**	**Occasional**	**None**
	Drought	-	√	-
	Flood	-	√	-
	Cyclone	-	√	
	Hail storm	-		√
	Heat wave	-	√	-
	Cold wave	-	-	√
	Frost	-	-	√
	Sea water intrusion.	-	-	√
	Pests and disease outbreak (specify) Pests-Citrus : Aphid, Jasid, Thrips, White fly & Fruit fly Diseases- Mango: Powdery Mildew, Groundnut: Rust, Tikka Leaf spot	√	-	-
	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 Table - 2	Enclosed: Yes
		Soil Map Annexure-3	Enclosed : No

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition	**Suggested Contingency measures**				
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks (July 1st wk)	Medium Black Soils	Cotton	No change	Adopt recommended package of practices	-
		Sesame	-do-	-do-	
		Bajra	-do-	-do-	
	Sandy Soils	Cotton	-do-	-do-	
		Sesame	-do-	-do-	
		Bajra	-do-	-do-	
	Saline-Alkali Soils (Heavy texture)	Cotton	-do-	-do-	
		Bajra	-do-	-do-	

Condition	Suggested Contingency measures				
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks July 3rd week	Medium Black soils	Cotton	Cotton G-Cot 13,15,21		Linkage with National Seed Corporation(NSC), Gujarat State Seed Corporation(GSSC), University, Gujcomasol.
		Bajra	Castor GAUCH-1, GCH-6 / Sorghum GFS-4&5, Gundhari, S-1049		
		Sesame	Castor GAUCH-1, GCH-6 / Sorghum GFS-4&5, Gundhari, S-1049		
	Sandy soils	Cotton	Cotton G cot 13,15,21		
		Sesame	Cotton G cot 13,15,21		
		Bajra	Castor GAUCH-1, GCH-6 / Sorghum GFS-4&5, Gundhari, S-1049		
	Saline-Alkali soils (Heavy texture)	Cotton	Cotton G cot 13,15,21		
		Bajra	Castor GAUCH-1, GCH-6 / Sorghum GFS-4&5, Gundhari, S-1049		

Condition	Suggested Contingency measures				
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks (August 1st week)	Medium Black soils	Cotton	Cotton G cot 13,15,21,V-797, Sesame Purva-1 /Sorghum GFS-4&5, Gundhari, S-1049/ Castor GAUCH-1, GCH-6		Linkage with 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
		Sesame	-do-		
		Bajra	-do-		
	Sandy soils	Cotton	-do-		
		Sesame	-do-		
		Bajra	-do-		
	Saline-Alkali soils	Cotton	-do-		

	(Heavy texture)	Bajra	-do-		schemes(Implements like seed drill,seed dressing are available in Rajkot). Soil amelioration/ amendments through RKVY

Condition	**Suggested Contingency measures**				
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks (August 3rd week)	Medium Black soils	Cotton	Cotton G.Cot.-15,21 and V-797 / Sesame Purva-1/ Sorghum GFS-4 & 5, Gundhari, S-1049/ Castor GAUCH-1, GCH-5		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).
		Sesame	-do-		
		Bajra	-do-		
	Sandy soils	Cotton	-do-		
		Sesame	-do-		
		Bajra	-do-		
	Saline-Alkali soils (Heavy texture)	Cotton	-do-		
		Bajra	-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 soils	Cotton	Gap filling	Intercultivation 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.
		Sesame	Thinning to maintain plant to plant distance(5 cm)	Intercultivation to fill soil cracks, mulching with wheat straw or shredded cotton stalk	
		Bajra	Thinning to maintain 10 cm plant to plant spacing	Intercultivation to fill soil cracks, mulching with wheat straw or shredded cotton stalk	
	Sandy soils	Cotton	Gap filling	-do-	-do-
		Sesame	Thinning to maintain plant to plant distance(5 cm)		
		Bajra	Thinning to maintain 10 cm plant to plant spacing		
	Saline-Alkali soils (Heavy texture)	Cotton	Gap filling	Intercultivation to fill soil cracks, mulching with Wheat straw or shredded Cotton stalk Mulching (Plastic film 25 micron, ~200 kg/ha.)	-do-
		Bajra	Thinning to maintain 10 cm plant to plant spacing	Intercultivation to fill soil cracks, mulching with wheat straw or shredded cotton stalk	

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**
At vegetative stage	Medium Black soils	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	Mulching with wheat straw or shredded Cotton stalk Mulching (Plastic film 25 micron, ~200 kg/ha.) Intercultivation	Supply of plastic film and pesticides through Govt. schemes. Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Sesame	Weeding/ thinning to maintain 5 cm plant to plant spacing. Life saving irrigation	Inter cultivation Spray 1 % N through urea after relief of drought.	Supply of urea through Govt. schemes
		Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing. Life saving irrigation	-do-	-do-
	Sandy soils	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	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
		Sesame	Weeding/ thinning to maintain 5 cm plant to plant spacing. Life saving irrigation if possible.	Inter cultivation Spray 1 % N through urea after relief of drought.	Supply of urea through Govt. schemes
		Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing. Life saving irrigation if possible.	-do-	-do-
	Saline-Alkali soils	Cotton	Weeding, Protection against sucking pests (To control	Mulching with Wheat straw or shredded Cotton stalk Mulching	Supply of plastic film and pesticides through Govt.

	(Heavy texture)		Jassid, aphid & thrips spraying methyle-o-demeton @ 10 ml / 10 lit. water or dimetheote @10 ml/ 10 lit water). Life saving irrigation if possible	(Plastic film 25 micron, ~200 kg/ha.) Inter tilling	schemes. Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Bajra	Weeding/ thinning to maintain 10 cm plant to plant spacing. Life saving irrigation	Intercultivation Spray 1 % N through urea after relief of drought.	Supply of urea 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 soils	Cotton	Supplemental irrigation followed by weeding.	-	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Sesame	Supplemental irrigation	-	
		Bajra	• Supplemental irrigation. • Harvest non flowering plants for fodder purpose if water is not available	-	
	Sandy soils	Cotton	Supplemental irrigation followed by weeding.	-	
		Sesame	Supplemental irrigation	-	
		Bajra	• Supplemental irrigation • Harvest non flowering plants for fodder	-	

			purpose if water is not available		
	Saline-Alkali soils (Heavy texture)	Cotton	Supplemental irrigation followed by weeding.	-	
		Bajra	• Supplemental irrigation • Harvest non flowering plants for fodder purpose if water is not available		

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 soils	Cotton	• Harvest mature bolls. • Supplemental irrigation if available	-	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Sesame	Supplemental irrigation	-	
		Bajra	• Supplemental irrigation • Harvest non flowering plants for fodder purpose if water is not available.	-	
	Sandy soils	Cotton	• Harvest mature bolls. • Supplemental irrigation	-	
		Sesame	Supplemental irrigation	-	
		Bajra	• Supplemental irrigation	-	

			• Harvest non flowering plants for fodder purpose if water is not available.		
	Saline-Alkali soils (Heavy texture)	Cotton	Harvest mature bolls. Supplemental irrigation	-	
		Bajra	• Supplemental irrigation • Harvest non flowering plants for fodder purpose if water is not available.		

2.1.2 Drought - Irrigated situation

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

Note :Very limited canal irrigation facility exists in Surendranagar

Condition			**Suggested Contingency measures**		
Non release of water in canals under delayed onset of monsoon in catchment	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
	NA				

Condition			Suggested Contingency measures		
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
	NA				

Condition			Suggested Contingency measures		
Insufficient groundwater recharge due to low rainfall	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Medium Black Soils	Wheat	Wheat- Arnej-206, Lok-1,GW-1&2	Supply irrigation during night time	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	Adoption of Sprinkler irrigation system. Reduce area of irrigation.	Construction of Well recharge structures, Timely supply of MIS and seeds through Govt. schemes.
		Cumin	No change	Adoption of drip, deficit irrigation, Reduce area of irrigation	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Cotton	No change	Supply irrigation during night	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	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.

	Sandy soils	Wheat	Same as medium black soils	Same as medium black soils	Same as medium black soils
		Cumin	No change	-do-	-do-\
		Cotton	No change	Supply irrigation during night	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	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.
	Saline-Alkali soils (Heavy texture)	Wheat	Gram ICCC- 4, Guj-1 &2 / Cumin Guj- 1,2,3 & 4/ Coriander Guj- 1 & 2/ Fenugreek Guj- 1	Adoption of Sprinkler irrigation system, deficit irrigation, Reduce area of irrigation	Ensure electric supply for life saving irrigation by Electricity Supply Board of State
		Cotton	Cotton	Supply irrigation during night	-do-
			Gram ICCC- 4, Guj- 1 &2/ Cumin Guj- 1,2,3 & 4/ Coriander Guj- 1 & 2/ Fenugreek Guj- 1	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.

2.2 Un-timely (unseasonal) rains (for both rainfed and irrigated situation)

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 Amonium Sulphate after draining excess water	Surface drainage (for management of water logging, Apply Amonium Sulphate after draining excess water	Surface drainage (for management of water logging) harvesting mature bolls	-do-
Bajra	-	-	Quick surface drainage, Open channel around field.	-do-
Cumin	Surface drainage (For management of water logging & diseases. Spray Mancozeb 0.2% to control Cumin blight, 0.2% wettable sulphur for protection against PM	Surface drainage(For management of water logging & diseases, Spray Mancozeb 0.2% to control Cumin blight)), 0.2 % wettable sulphur for protection against PM	Surface drainage (for management of water logging)	-do-
Sesame	-	-	Surface drainage (for management of water logging) Harvesting at Physiological maturity	-do-

Horticulture				
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	-
Ber	-	Spray 0.2 % wettable sulphur for protection against PM	-	-
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.
Cumin	Surface drainage (For management of water logging & diseases. Spray Mancozeb 0.2% to control Cumin blight, or 0.2% wettable sulphur for protection against PM	Surface drainage (For management of water logging & diseases, Mancozeb 0.2% to control Cumin blight), or 0.2% wettable sulphur for protection against PM	Surface drainage (for management of water logging)	-do-
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-
Bajra	-	-	Harvest mature ear heads, Quick surface drainage.	-do-
Sesame	-	-	Surface drainage (for management of	-do-

			water logging) Harvesting at Physiological stage, Spray Mancozeb 0.2% or 0.005% Hexaconazole to control stem and capsule spot.	
Horticulture				
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	-
Ber	-	Spray 0.2 % wettable sulphur for protection against PM	-	-
Outbreak of pests and diseases due to unseasonal rains				
Wheat	Spray Mancozeb 0.2% (To control leaf blight & rust)	Spray Mancozeb 0.2% (To control leaf blight & rust)	To control black point in grain Spray Mancozeb 0.2%	-
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	-
Cotton	-	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	-
Bajra	-	-	Spray Mancozeb 0.2% (To control rust)	-
Sesame	-	-	Surface drainage (for management of water logging) Harvesting at Physiological maturity, Spray Mancozeb 0.2% or 0.005% Hexaconazole to control stem and capsule spot.	

Horticulture				
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	-
Ber	-	Spray 0.2% wettable sulphur to control PM	Spray 0.2% wettable sulphur to control PM	-

2.3 Floods

Condition	**Suggested contingency measures**			
Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Cotton	NA	As a preventive step open drainage channel.	As a preventive step open drainage channel.	-
Bajra	NA	-do-	-do-	-
Sesame	NA	-do-	-do-	-
Horticulture	-	-	-	-
Citrus	Proper surface drainage	Surface drainage	Surface drainage	-
Ber	-do-	-do-	-do-	-
Continuous submergence for more than 2 days				
Cotton	As a preventive step open drainage channel and apply Amonium sulphate.	As a preventive step open drainage channel and apply Amonium sulphate	As a preventive step open drainage channel. 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 downy mildew.)	As a preventive step open drainage channel and spray mancozeb 0.2% (To control rusts).	Harvest Mature ear heads.
Sesame	As a preventive step open	As a preventive step open	As a preventive step open	Harvest mature plants

	drainage channel	drainage channel. Spray of copper oxychloride 0.2% to control phytophthora blight	drainage channel and spray propiconazole 0.025% (To control leaf/ stem spot disease)	
Horticulture				
Citrus	Shift to safe place & with proper surface drainage	Surface drainage.	Surface drainage.	Surface drainage.
Ber	Shift to safe place & proper Surface drainage	-do-	-do-	-do-
Sea water intrusion	NA	NA	NA	NA

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

Extreme event type	**Suggested contingency measurer**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave	Light & frequent irrigation	Light & frequent irrigation	Light & frequent irrigation	-
Cold wave	NA			
Frost	NA			
Hailstorm	NA			
Cyclone				
Wheat	Quick drainage	Quick drainage	Quick drainage and spray mancozeb 0.2% to control black point in grain.	Shift produce at safer place
Cumin/ Coriander	-do-	-do-	Quick drainage	
Cotton	Earthing up , Quick drainage	Earthing up, Quick drainage	Earthing up, Quick drainage	
Bajra	Quick drainage	Quick drainage	Quick drainage	
Sesame	-do-	-do-	-do-	
Horticulture				
Citrus	Grow wind breaks around nursery	Reduce canopy, Grow wind breaks around field	Reduce canopy	-do-
Ber	-	-	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	Store fodder (silage and hay). Conventional feeds are used for feeding (Roughages & concentrates) of maize, sorghum, groundnut fodder & 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. Vaccination for bacterial diseases e.g. , HS,BQ	Add mineral mixtures 25 g/Animal/dayalong with feed, deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. science students for health management of animal. Carry out decease 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 forcast. Shift animals to safe place. Identify rescue places for safety of animals.	Give stored fodder with mineral mixture. Fodder should be stored at safe place. In severe rain and flood unteather animals.	Feed silage & hay material along with concentrate feed. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation. Establish community based shelter houses for animals. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder.
Drinking water	Add bleaching powder (1%) to drinking water when heavy rains occur and flood expected.	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).
Health and disease management	Provide insurance cover to the animals.	Vaccination of animals against HS, BQ Add mineral mixtures 25 g/Animal/day along with feed, deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. science students for health management of animal. Carry out decease diagnosis camps.	Disposal of dead animals by burning the carcas and sanitation measures to control spread of diseases. Health checking to diseases out break.
Cyclone			
Feed and fodder availability	Early harvesting & storage of fodder.	Shift animals to safe place, give stored fodder with mineral mixture along with concentrated feed. In severe rain and flood unteather animals.	Feed silage & hay material along with concentrated feed. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation.

			Establish community based shelter houses for animals. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder.
Drinking water	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).	Add bleaching powder to drinking water (1%).
Health and disease management	Provide insurance cover to the animals.	Vaccination of animals to HS & BQ. Keep animal free. Add mineral mixtures 25 g/Animal/day along with feed, deworming of the animals. Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/Veterinary University for animal health. Involve vet. science students for health management of animal. Carry out decease diagnosis camps.	Disposal of dead animals by burning the carcas and sanitation measures to control spread of diseases. Health checking to diseases out break.
Heat wave and cold wave	NA	NA	NA
Heat wave	NA	NA	NA
	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Feed and fodder availability	To store fodder (silage and hay), Conventional feeds are used for feeding (Roughages & concentrates) of Maize, Sorghum, Groundnut fodder & wheat straw)	Feed stored fodder-silage & Hay Urea treated wheat straw 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	Feed little green fodder along with unconventional feed, 5 kg green feed/mature animal

		preparation facilities for animals. Arrange bulk transportation of fodder	
Drinking water	Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals)	Avoid wallowing Judicious use of drinking water, Establish and arrange the community based drinking water facilities. In costal area community based R.O. Plant to be established for drinking water.	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 for cattle & Buffaloes, Add mineral mixtures 25 g/Animal/day along with feed, animals cover under insurance , Vaccination for Bacterial diseases e.g. , HS,BQ	Add mineral mixtures 25 g/Animal/day along with feed, Deworming of the animals list out dead animals and submit for insurance claim, Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/veterinary University for animal health Involve vet. Science students for health management of animal. Carry out decease diagnosis camps.	Add vitamin mineral mixtures 25 g/Animal/day along with feed, quarantine disease animals Deworming of the animals
Floods			
Feed and fodder availability	Harvest available fodder and store it if floods are warned Shift animals to safe place, Identify rescue places for safety of animals	Give stored fodder with mineral mixture. Fodder should be stored at safe place. In severe rains and floods unteather the animals	Feed silage & Hay 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 floods are 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 list out dead animals and submit for insurance claim Arrange mobile dispensary for animal heath in the region. Establish link with Agricultural/veterinary University for animal health Involve vet. Science students for health management of animal. Carry out decease diagnosis camps.	Disposal of dead animals by burning the carcas and sanitation measures to control spread of diseases
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 rains and floods unteather the animals	Feed silage & Hay along with concentrated feed. Use chaff cutter for fodder. Use press for making compact bundles of fodder for easy transportation. Establish community based shelter houses for animals. Establish feed block preparation facilities for animals. Arrange bulk transportation of fodder
Drinking water	Add bleaching powder to drinking water (1%)	Add bleaching powder to drinking water (1%)	Add bleaching powder to drinking water (1%)
Health and disease management	Provide insurance cover to the animals	Vaccination of animals to HS & BQ, keep animal free list out dead animals and submit for insurance claim Arrange mobile dispensary for animal heath in the region. Establish link with	Disposal of dead animals by burning the carcass and sanitation measures to control spread of diseases

		Agricultural/veterinary University for animal health Involve vet. Science students for health management of animal. Carry out decease diagnosis camps.	
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	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 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	Operate fans, foggers, keep open ventilators in	Routine practices are to be	

	foggers	night and cool period.	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.	N.A.	N.A.	-
Health and disease management	N.A.	N.A.	N.A.	-

2.5.3 Fisheries

	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	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	NA	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	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	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	NA	NA
Inland	NA	NA	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	-	-	-

Table 2. Rainfall and rainy days of different talukas of Surendranagar

Sr.	Name Of Taluka	Years	Total		Sr.No	Name Of Taluka	Years	Total	
			Rainy Day	Rain mm				Rainy Day	Rain mm
1	2	3	4	5	1	2	3	4	5
1	Halvad	2004-05	17	494	6	Muli	2004-05	28	595
		2005-06	20	539			2005-06	30	932
		2006-07	27	641			2006-07	27	598
		2007-08	48	985			2007-08	34	875
		2008.09	18	916			2008.09	26	1002
		2009-10	17	319			2009-10	17	320
2	Dhragadhra	2004-05	26	491	7	Chotila	2004-05	36	632
		2005-06	30	839			2005-06	30	1113
		2006-07	32	763			2006-07	34	643
		2007-08	37	716			2007-08	38	982
		2008.09	23	910			2008.09	25	1149
		2009-10	20	314			2009-10	18	440
3	Dasada	2004-05	25	717	8	Sayla	2004-05	28	706
		2005-06	32	996			2005-06	31	1100
		2006-07	29	721			2006-07	34	621
		2007-08	32	798			2007-08	37	877
		2008-09	16	303			2008-09	25	907
		2009-10	25	763			2009-10	17	377
4	Lakhter	2004-05	28	561	9	Chuda	2004-05	23	560
		2005-06	35	757			2005-06	24	1230
		2006-07	24	501			2006-07	26	516
		2007-08	43	837			2007-08	27	777
		2008.09	22	1263			2008.09	23	851

		2009-10	14	235			2009-10	13	188
5	Wadhwan	2004-05	28	493	10	Limadi	2004-05	31	648
		2005-06	32	919			2005-06	31	1245
		2006-07	41	733			2006-07	33	777
		2007-08	48	985			2007-08	35	1087
		2008.09	29	1006			2008.09	28	1071
		2009-10	19	243			2009-10	19	286

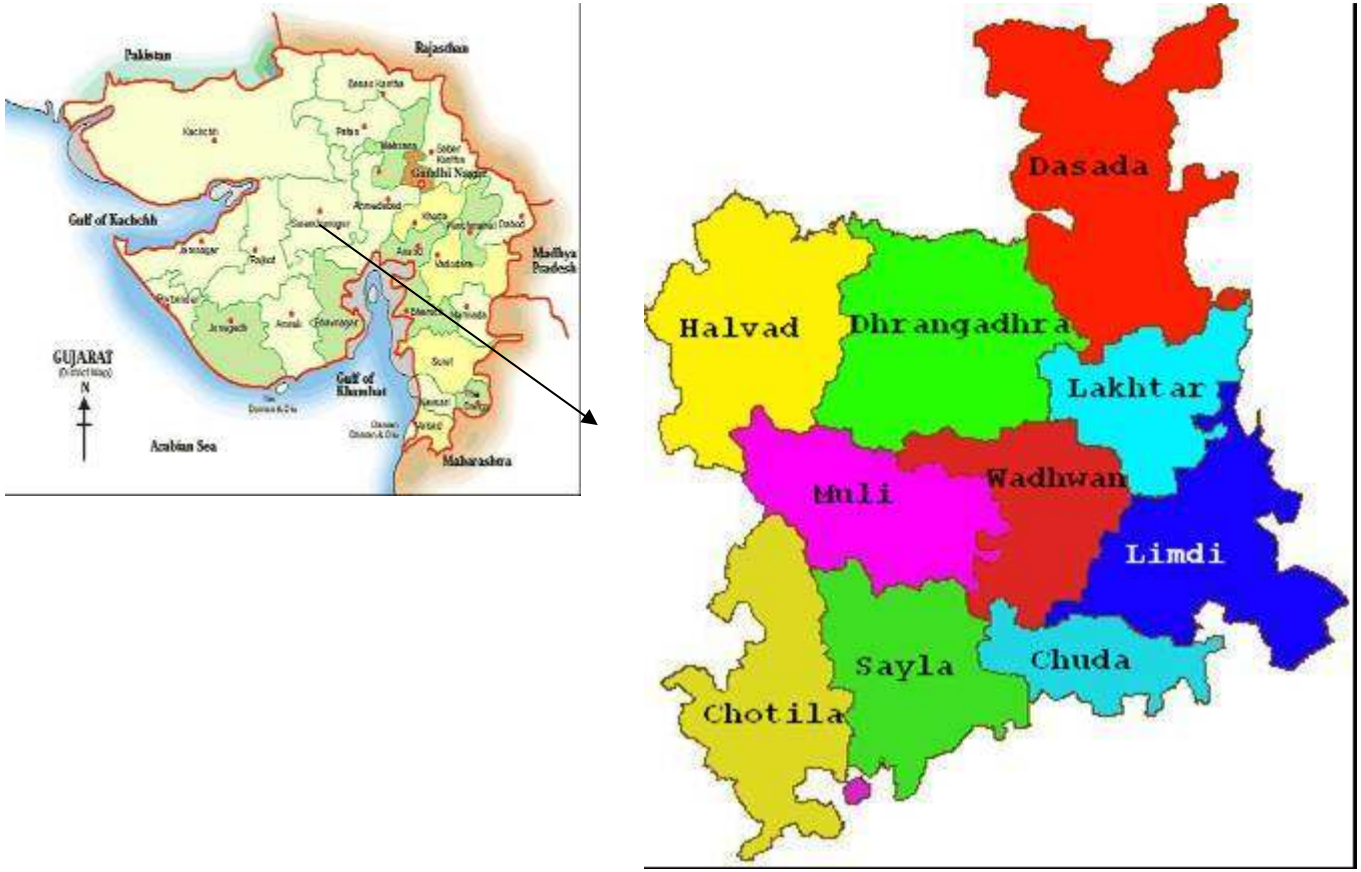

Fig.1: Location map of Surendranagar district