

State: GUJARAT
Agriculture Contingency Plan for District: SURAT

1.0 District Agriculture profile					
1.1	Agro-Climatic/Ecological Zone				
	Agro Ecological Sub Region (ICAR)	Central Highlands(Malwa),Gujarat plain(5.2)			
	Agro-Climatic Zone (Planning Commission)	Gujarat Plain and Hills Region(XIII)			
	Agro Climatic Zone (NARP)	South Gujarat Zone (GJ 2)			
	List all the districts or part thereof falling under the NARP Zone	Surat, Bharuch, Narmada			
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude	
		21 ^o 11'42.00" N	72 ^o 49'10.00" E	39 ft above MSL	
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Main Cotton Research Station, Navsari Agricultural University, Surat396 001 Main Sorghum Research Station, Navsari Agricultural University, Surat.			
	Mention the KVK located in the district	Krishi Vigyan Kendra, Athwa Farm, Surat			
1.2	Rainfall	Normal RF (mm)	Normal Rainy days	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	1078	45	3 rd week of June	4 th week of September
	NE Monsoon(Oct-Dec):	-	-	-	-
	Winter (Jan- March)	-	-	-	-
	Summer (Apr-May)	-	-	-	-
	Annual	1078	45	-	-

(Source :District Panchayat reports, reports of Agriculture department)

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)	431	327	37	39	17	-	-	11	-	-

(Source :District Panchayat reports, reports of Agriculture department)

1.4	Major Soils (common names like red sandy loam deep soils (etc.,))	Area ('000 ha)
	Hilly and highly undulating fine texture	67
	Mid plains, fine texture, high rainfall	111
	Mid plains, fine texture, medium rainfall	107
	Coastal plain, deep fine texture, salt affected	42

1.5	Agricultural land use	Area ('000 ha)	Cropping intensity %
	Net sown area	327	134
	Area sown more than once	110.5	
	Gross cropped area	437.5	

(Source :District Panchayat reports, reports of Agriculture department)

1.6	Irrigation	Area ('000 ha)		
	Net irrigated area	195		
	Gross irrigated area	224		
	Rain fed area	103		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals	1024 km	148.0	66.07
	Tanks			
	Open wells	13164	76.0	33.93
	Bore wells	939		
	Lift irrigation schemes	5456		
	Micro-irrigation	22		
	Other sources (please specify)	204		
	Total Irrigated Area	-	224.0	100.0
	Pump sets	7003		
	No. of Tractors	5341		
	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	3	25	saline
	Safe	4	65	-
	Wastewater availability and use	-	-	-
	Ground water quality	Medium to good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

1.7 Area under major field crops & horticulture (as per latest figures) (2016-17)

1.7	Major field crops cultivated	Area ('000 ha)							
		Kharif			Rabi			Summer	Grand total
		Irrigated	Rain fed	Total	Irrigated	Rain fed	Total		
Rice	28	7	35	0	0	0	0.1	35.1	
Sorghum	0	9	9	2	0	2	0	11	
Wheat	0	0	0	7	0	7	0	7	
Sugarcane	0	0	0	88	0	88	0	88	
Cotton	0	2	2	0	0	0	0	2	

(Source :District Panchayat reports, reports of Agriculture department)

Horticulture crops - Fruits	Area ('000 ha)		
	Total	Irrigated	Rain fed
Banana	7.0	7.0	-
Mango	9.0	9.0	-
Sapota	2.1	2.1	-
Papaya	7.2	7.2	-
Coconut	0.2	0.2	-
Horticulture crops - Vegetables	Total	Irrigated	Rainfed
Brinjal	5.2	5.2	-
Okra	11.6	11.6	-
Tomato	1.6	1.6	-
Cowpea	1.5	1.5	-
Cabbage-flower	2.1	2.1	-

Fodder crops	Total	Irrigated	Rainfed
Total fodder crop area	9.2	1.8	7.4

Source :District Panchayat reports, reports of Agriculture department)

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)			
	Non descriptive Cattle (local low yielding)	-	-	289.4			
	Crossbred cattle	-	-	-			
	Non descriptive Buffaloes (local low yielding)	-	-	300.3			
	Graded Buffaloes	-	-	-			
	Goat	-	-	150.5			
	Sheep	-	-	1.7			
	Others (Camel, Pig, Yak etc.)	-	-	-			
	Commercial dairy farms (Number)						
1.9	Poultry	No. of farms	Total No. of birds ('000)				
	Commercial	903	460.1				
	Backyard	2000	330.6				
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)	
		4309	155	870	-	95942	ICF plant-44 Cold storage-3
	ii) Inland (Data Source: Fisheries Department)	No. Farmer owned ponds		No. of Reservoirs		No. of village tanks	
		45		7		567	
	B. Culture						
		Water Spread Area (ha)		Yield (t/ha)		Production ('000 tons)	
	i) Brackish water (Data Source: MPEDA/ Fisheries Department)	19200		15.21		1262	
	ii) Fresh water (Data Source: Fisheries Department)					1684	
	Others					8161	

(Source :District Panchayat reports, reports of Agriculture department)

1.11 Production and Productivity of major crops (Average of last 5 years: 2012, 13, 14, 15, 16)

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)										
	Rice	1150	2682	-	-	341	3460	1491	3071	1850
	Sorghum	196	1180	41	1480	-	-	237	1330	690
	Wheat	-	-	120	2498	-	-	120	2498	175
	Sugarcane	-	-	8212	69150	-	-	8212	69150	-
	Cotton	84	1920	-	-	-	-	84	1920	165
Major Horticultural crops (Crops to be identified based on total acreage)										
	Banana	-	-	-	-	672	62100	672	62100	-
	Mango	-	-	-	-	580	8155	59	8185	-
	Sapota	-	-	212	10335	-	-	212	10335	-
	Papaya	-	-	85	5955	-	-	79	5955	-
	Coconut	-	-	-	-	1.3	7765	1.3	7765	-

1.12	Sowing window for 5 major field crops	Paddy	Sorghum	Wheat	Sugarcane	Cotton
	Kharif- Rainfed	2 nd week of June to 2 nd week July	2 nd week of June to 2 nd week July	-	-	2 nd week of June to 2 nd week July
	Kharif-Irrigated	2 nd week of June to 2 nd week July	2 nd week of June to 2 nd week July	-	-	4 th week of May to 2 nd week of June
	Rabi- Rainfed	-	2 nd week of October to 4 th week of October	2 nd week of November to 4 th week of November	-	-
	Rabi-Irrigated	-	-	2 nd week of November to 4 th week of November	1 st week of October to 4 th week of January.	-

(Source :District Panchayat reports, reports of Agriculture department)

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)	-	√	
	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	

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition	Major Farming situation	Normal Crop/ Cropping system	Suggested Contingency measures		
			Change in crop/cropping system including variety	Agronomic measures	Remarks on Implementation
Delay by 2 weeks (July 1 st week)	Hilly and highly undulating fine texture	Rice	No Change	Nursery sown if irrigation available. Early maturing variety select. In rice SRI or sprouted seed technology follow.	Supply of seeds through GSSC and NAU
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, high rainfall	Rice	No Change	Nursery sown if irrigation available. Early maturing variety select. In rice SRI or sprouted seed technology follow.. Protective Irrigation should be given in sugarcane, vegetables if available	Supply of seeds through GSSC and NAU
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, medium rainfall	Rice	No Change	Nursery sown if irrigation available. Early maturing variety select. In rice SRI or sprouted seed technology follow.	Supply of seeds through NFSM Supply of seeds through GSSC
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Coastal plain, deep fine texture, salt affected	Rice	No Change	Nursery sown if irrigation available. Early maturing variety select. In rice SRI or sprouted seed technology follow.	Supply of seeds through GSSC
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 4 weeks 3 rd week of July	Hilly and highly undulating fine texture	Rice	No Change	<ul style="list-style-type: none"> Narrow spacing Mulching Micro irrigation Early maturing Variety SRI or sprouted seed technology follow. Protective Irrigation should be given in sugarcane, vegetables if available 	<ul style="list-style-type: none"> GSSC NSC RKVY NHM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, high rainfall	Rice	No Change	<ul style="list-style-type: none"> Wider spacing Narrow spacing Mulching Micro irrigation Early maturing Variety SRI or sprouted seed technology follow. Protective Irrigation should be given in sugarcane, vegetables if available 	<ul style="list-style-type: none"> GSSC NSC RKVY NHM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, medium rainfall	Rice	No Change	<ul style="list-style-type: none"> Narrow spacing Mulching Micro irrigation Early maturing Variety 	<ul style="list-style-type: none"> GSSC NSC RKVY NHM
		Sorghum			
Wheat					
Sugarcane					

		Cotton		<ul style="list-style-type: none"> • SRI or sprouted seed technology follow. • Protective Irrigation should be given in sugarcane, vegetables if available 	
	Coastal plain, deep fine texture, salt affected	Rice	No Change	<ul style="list-style-type: none"> • Narrow spacing • Mulching • Micro irrigation • Early maturing Variety • SRI or sprouted seed technology follow. • Protective Irrigation should be given in sugarcane, vegetables if available 	<ul style="list-style-type: none"> • GSSC • NSC • RKVY • NHM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Early season drought (Normal onset)					
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Hilly and highly undulating fine texture	Rice	Gap filling Thinning Give protective irrigation	Adopt foliar sprays of nutrients intercultivation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, high rainfall	Rice	Gap filling Thinning Give protective irrigation	Adopt foliar sprays of nutrients intercultivation	Seeds through GSSC
		Sorghum			
		Wheat			
Sugarcane					

		Cotton			
	Mid plains, fine texture, medium rainfall	Rice	Gap filling Thinning Give protective irrigation	Adopt foliar sprays of nutrients intercultivation	Interculturing implements through RKVY Seeds from NSC
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Coastal plain, deep fine texture, salt affected	Rice	Gap filling Thinning Give protective irrigation	Adopt foliar sprays of nutrients intercultivation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
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	Hilly and highly undulating fine texture	Rice	Use antitranspirant chemical	Give protective irrigation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum	Repeated Intercultivation	Application of foliar nutrients	
		Wheat		Give protective irrigation	
		Sugarcane	Alternate furrow irrigation	Use plastic or grass mulch.	
		Cotton	Alternate furrow irrigation Follow proper weeding management practice	Application of foliar nutrients . Use plastic or grass mulch.	
	Mid plains, fine texture, high rainfall	Rice	Use antitranspirant chemical	Give protective irrigation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum	Repeated Intercultivation	Application of foliar nutrients	
		Wheat		Give protective irrigation	
		Sugarcane	Alternate furrow irrigation	Use plastic or grass	

				mulch.	
		Cotton	Alternate furrow irrigation	Application of foliar nutrients. Use plastic or grass mulch.	
	Mid plains, fine texture, medium rainfall	Rice	Use antitranspirant chemical	Give protective irrigation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum	Repeated Intercultivation	Application of foliar nutrients	
		Wheat		Give protective irrigation	
		Sugarcane	Alternate furrow irrigation	Use plastic or grass mulch.	
		Cotton	Alternate furrow irrigation	Application of foliar nutrients. Use plastic or grass mulch.	
	Coastal plain, deep fine texture, salt affected	Rice	Use antitranspirant chemical	Give protective irrigation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum	Repeated Intercultivation	Application of foliar nutrients	
		Wheat		Give protective irrigation	
		Sugarcane	Alternate furrow irrigation	Use plastic or grass mulch.	
		Cotton	Alternate furrow irrigation	Application of foliar nutrients. Use plastic or grass mulch.	
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	Hilly and highly undulating fine texture	Rice	Harvest at physiological harvest stage Give protective irrigation	Adopt foliar application of nutrients Give protective irrigation Use plastic or grass mulch. Repeated Intercultivation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, high rainfall	Rice	Harvest at physiological harvest stage Give protective irrigation	Adopt foliar application of nutrients Give protective irrigation	Supply of inter cultural implements through RKVY
		Sorghum			
		Wheat			

		Sugarcane		Use plastic or grass mulch .Repeated Intercultivation	Seeds supply through NFSM
		Cotton			
	Mid plains, fine texture, medium rainfall	Rice	Harvest at physiological harvest stage Give protective irrigation	Adopt foliar application of nutrients Give protective irrigation Use plastic or grass mulch. Repeated Intercultivation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Coastal plain, deep fine texture, salt affected	Rice	Harvest at physiological harvest stage Give protective irrigation	Adopt foliar application of nutrients Give protective irrigation Use plastic or grass mulch. Repeated Intercultivation	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			

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)	Hilly and highly undulating fine texture	Rice	Harvest at physiological harvest stage Give protective irrigation	wider spacing Mulching Life saving irrigation Irrigate at critical stage water saving technique	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, high rainfall	Rice	Harvest at physiological harvest stage Give protective irrigation	wider spacing Mulching Life saving irrigation Irrigate at critical stage water saving technique	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Mid plains, fine texture, medium rainfall	Rice	Harvest at physiological harvest stage Give protective irrigation	wider spacing Mulching Life saving irrigation Irrigate at critical stage water saving technique	Supply of inter cultural implements through RKVY Seeds supply through NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			
	Coastal plain, deep fine texture, salt affected	Rice	Harvest at physiological harvest stage Give protective irrigation	wider spacing Mulching Life saving irrigation Irrigate at critical stage water saving technique	Supply of inter cultural implements through RKVY Seeds supply through NFSM
Sorghum					
Wheat					
Sugarcane					
Cotton					

2.1.2 Drought - Irrigated situation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed release of water in canals due to low rainfall	Canal command area high to medium rainfall area, heavy to	Rice	Use rain fed paddy varieties Use rainfed cotton varieties G cot 23	Use mulching Use FYM & compost	Seeds through GSSC and NFSM
		Sorghum			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
	medium textured soil	Wheat			
		Sugarcane			
		Cotton			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Limited release of water in canals due to low rainfall	Canal command area high to medium rain fall area, heavy to medium textured soil	Rice	Use rain fed paddy varieties Use rainfed cotton varieties	Use mulching Use FYM & compost	Seeds through GSSC and NFSM
		Sorghum			
		Wheat			
		Sugarcane			
		Cotton			

Condition	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation

Condition					
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	This is not expected in this district				

Condition					
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall	This is not expected in this district				

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				
Rice	Resowing Provide drainage	Provide drainage	Provide drainage , Select suitable rabi crop	Shift to safer place
Sorghum	Resowing Provide drainage	Provide drainage	Provide drainage ,Select suitable rabi crop	Shift to safe place dry in shade and turn frequently
Wheat	-	-	-	Safe storage against storage pest and disease
Sugarcane	Provide drainage	Provide drainage	Provide drainage	----
Cotton	Resowing Provide drainage	Provide drainage	Provide drainage . Select suitable rabi crop	Shift to safe place dry in shade and turn frequently
Horticulture				

Banana	Provide drainage	Provide drainage	Provide drainage	Shift to safe place dry in shade and turn frequently
Mango	Provide drainage	Provide drainage	Provide drainage	Shift to safe place dry in shade and turn frequently
Sapota	Provide drainage	Provide drainage	Provide drainage	Shift to safe place dry in shade and turn frequently
Papaya	Provide drainage	Provide drainage	Provide drainage	Shift to safe place dry in shade and turn frequently
coconut	Provide drainage	Provide drainage	Provide drainage	Shift to safe place dry in shade and turn frequently
Heavy rainfall with high speed winds in a short span				
Rice	Resowing, Gap filling Provide drainage	Provide drainage	Provide drainage . Select suitable rabi crop Indian bean	Shift to safe place dry in shade and turn frequently
Sorghum	Resowing Provide drainage	Provide drainage	Provide drainage . Select suitable rabi crop	Shift to safe place dry in shade and turn frequently
Wheat	-		-	Shift to safe place dry in shade and turn frequently
Sugarcane	Provide drainage Propping &twisting	Provide drainage Propping & twisting	Provide drainage Propping &twisting	Shift to safe place dry in shade and turn frequently
Cotton	Resowing, Gap filling Provide drainage	Provide drainage Provide support	Select suitable rabi crop Indian bean	Shift to safe place dry in shade and turn frequently
Horticulture				
Banana	Protect with wind break crop (Shevari, Castor)	Provide drainage . Provide support	Provide drainage . Provide support	Shift to safe place dry in shade and turn frequently
Mango	Protect with wind	Provide drainage . Provide	Provide drainage . Provide	Shift to safe place dry in shade and turn

	break crop (Shevari,Castor)	support	support	frequently
Sapota	Protect with wind break crop (Shevari,Castor)	Provide drainage . Provide support	Provide drainage . Provide support	Shift to safe place dry in shade and turn frequently
Papaya	Protect with wind break crop (Shevari,Castor)	Provide drainage . Provide support	Provide drainage . Provide support	Shift to safe place dry in shade and turn frequently
coconut	-			
Outbreak of pests and diseases due to unseasonal rains				
Rice	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Sorghum	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Wheat	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Sugarcane	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Cotton	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Horticulture				
Banana	Need based Plant protection	Need based Plant protection	Need based Plant protection	Safe storage against storage pest and

	IPDM	IPDM	IPDM	diseases
Mango	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Sapota	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
Papaya	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases
coconut	Need based Plant protection IPDM	Need based Plant protection IPDM	Need based Plant protection IPDM	Safe storage against storage pest and diseases

2.3 Floods

Condition	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation¹				
Rice	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Sorghum	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Wheat	-	-	-	-
Sugarcane	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Cotton	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Horticulture				
Banana	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Mango	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Sapota	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage

Continuous submergence for more than 2 days				
Rice	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Sorghum	Provide proper drainage	Provide proper drainage	Provide proper drainage	
Wheat	-	-	-	-
Sugarcane	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Cotton	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Horticulture				
Banana	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Mango	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Sapota	Provide proper drainage	Provide proper drainage	Provide proper drainage	Provide proper drainage
Sea water intrusion³	Not expected			

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				
Rice	Application of irrigation Protection with wind break crop Use mulching	Application of irrigation Protection with wind break crop Use mulching	Application of irrigation Protection with wind break crop Use mulching	Application of irrigation Protection with wind break crop Use mulching
Sorghum				
Wheat				
Sugarcane				
Cotton				
Horticulture				
Banana	Application of irrigation Protection with wind break crop	Application of irrigation Protection with wind break crop	Application of irrigation Protection with wind break crop	Application of irrigation Protection with wind break
Mango				
Sapota				

	Use mulching	Use mulching	Use mulching	crop Use mulching
Cold wave	Not Observed			
Horticulture				
Frost	Not Observed			
Horticulture				
Hailstorm	Not Observed			
Horticulture				
Cyclone	Not Observed			
Horticulture				

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingent measures		
Drought	Before the event	During the event	After the event
Feed and fodder availability	<ul style="list-style-type: none"> • Insurance • Encourage perennial fodder on bunds and waste land on community basis • Establishing fodder banks, • Encouraging fodder crop in irrigated area • Silage-using excess fodder for silage 	<ul style="list-style-type: none"> • Utilization of perennial tree and fodder bank reserves • Utilizing stored silos • Transporting excess fodder from adjoining districts • Use of feed mixture 	<ul style="list-style-type: none"> • Availing insurance • Culling unproductive livestock
Drinking waters	<ul style="list-style-type: none"> • Preserving water in the tank for drinking purpose • Excavation of bore wells 	<ul style="list-style-type: none"> • Using preserved water in the tanks for drinking wherever ground water resources are available priority for drinking purpose 	
Health and disease	Veterinary preparedness with medicines	<ul style="list-style-type: none"> • Mass animal health camp and treatment of affected animals once in campaign 	<ul style="list-style-type: none"> • Culling of sick animals

management	and vaccine		
Floods			
Feed fodder availability	<ul style="list-style-type: none"> • Feeds and fodder should be transported to adjoining well protected areas. • Village or Taluka level feed and fodder bank with facilities like TMR machine/ feed block machine should be developed. • Prepare balanced feed formulations using available feed resources. 	<ul style="list-style-type: none"> • Transportation of fodder especially dry fodder should be done to affected area. • Use of Total Mixed Ration (TMR)/ feed block should be encouraged. • Use of unconventional feed like tree leaves etc. in ration may be incorporated. 	<ul style="list-style-type: none"> • Culling of unproductive animals
Drinking Water	<ul style="list-style-type: none"> • Preserving water in water tank for drinking purpose. 	<ul style="list-style-type: none"> • Using preserved water for drinking • Avoid wastage of water 	<ul style="list-style-type: none"> • Repair damaged water sources like tank, pond, wells etc.
Health and disease management	<ul style="list-style-type: none"> • Veterinary preparedness with medicines and vaccine • Availing Insurance of animals and farm equipments 	<ul style="list-style-type: none"> • Mass animal health camp and treatment of animals • Ring vaccinations like FMD, HS should be conducted. 	<ul style="list-style-type: none"> • Culling of sick animals • Proper burial of carcass using disinfection
Cyclone			
Heat wave and cold wave			

2.5.2 Poultry

	Suggested contingency measures		
	Before the event	During the event	After the event
Drought			
Shortage of feed ingredients	<ul style="list-style-type: none"> • Purchase sufficient quantity of ready feed /raw feed ingredients as per storage facilities and requirement. • Identify and test available alternative low cost feed resources in feed testing laboratories for 	<ul style="list-style-type: none"> • Feed formulations using low cost feed ingredients in case of non-availability of high priced conventional ingredients. • Keep check on 	<ul style="list-style-type: none"> • Shift over to good quality feed for optimum production performance.

	<p>their exact composition for formulating balanced feed.</p> <ul style="list-style-type: none"> • Prepare balanced feed formulation using available feed resources. • Create alternative power generating facilities i.e. Generator set. <p>Take insurance of poultry sheds, equipments and feed factory well in advance may be in the starting phase of opening the farm.</p>	<p>production performance and modify ration consulting poultry specialist.</p> <ul style="list-style-type: none"> • Nutrient density should be increased in proportion to feed consumption. • Avoid feed wastage 	
Drinking water	-	-	-
Health and disease management	<ul style="list-style-type: none"> • Use of anti-stress vitamins (AD₃ECB₁₂-Vimeral / Famitone / Stressvell etc.) in feed and drinking water. • Use of adaptogenetic herbal medicines (Zetress / Zist etc). • Use probiotics (Protexin / Biovet-YC) in feed. • Vaccinate birds against important diseases like R.D., IBD, I.B., Fowl pox according to age as per scheduled programme. 	<ul style="list-style-type: none"> • Use anti-stress, vitamins and adaptogenetic herbal drugs. • Perform vaccination for Ranikhet Disease & Infectious Bronchitis . • Prophylactic medication for important diseases like E.coli & CRD. • Use of electrolytes in feed and drinking water. 	<ul style="list-style-type: none"> • Vaccinate birds as per vaccination schedule. • Perform deworming with Levamisole / Albendazole / Piperazine etc) and use antibiotics, vitamins as per monthly health calendar programme
Floods			
Shortage of feed ingredients	<ul style="list-style-type: none"> • Purchase sufficient quantities of ready feed / raw feed ingredients. • Store feeding material in suitable houses which should be leak proof and without dampness. • Store feed on iron stands away from the wall to avoid increase in moisture & mould growth. • Road repairing for transporting feed and farm products. • Take insurance of poultry sheds, equipments, feed factory and mortality of birds due to drowning in flood water well in advance may be in the starting phase of opening the farm. 	<ul style="list-style-type: none"> • Use of toxin binders (Chek-O-Tox/ UTPP etc.) in the feed. • All electric connections should be in good condition to avoid shock and accident. 	<ul style="list-style-type: none"> • Use of Toxin binder should be continued to avoid development of mycotoxins in the feed
Drinking water	-	-	-
Health and disease management	<ul style="list-style-type: none"> • Complete vaccination as per the programme for various categories of the birds i.e. Layers & Broilers. 	<ul style="list-style-type: none"> • Use of probiotics / or antibiotics in feed to protect birds from 	<ul style="list-style-type: none"> • Use of probiotics should be continued in feed for 10-15 days.

	<ul style="list-style-type: none"> Poultry sheds should be constructed at high raised land/or go for raised platform poultry sheds especially in flood affected areas. (conceptual biosecurity) 	bacterial infections like E.coli, CRD, Enteritis etc.	
Cyclone	Not Observed		
Shortage of feed ingredients			
Drinking water			
Health and disease management			
Heat wave and cold wave	Not Observed		
Shelter/environment management			
Health and disease management			

2.5.3 Fisheries / Aquaculture

	Suggested contingency measures		
	Before the event	During the event	After the event
1) Drought	When the drought condition arise at that time available irrigation canals can be connected to the affected reservoir and village ponds to defend from drought condition of particular zone.		
A. Capture	Marine sector couldn't effected directly but estuarine biodiversity will effected (some fresh water fish migrate to marine or vice versa for breeding, feeding etc. & it will be effective)		
Marine	Prepare fish database of particular zone	Catadromus fish stock affected due to scarcity of river water (fresh water).	Developed the stock by stocking of fishes during favorable condition, it will auto stock fish in natural condition
Inland	Inland sector will be affected most during the drought condition. Indian Major Carp (Catla, Rou, Mrigal etc.), Exotic Carp (Silver		

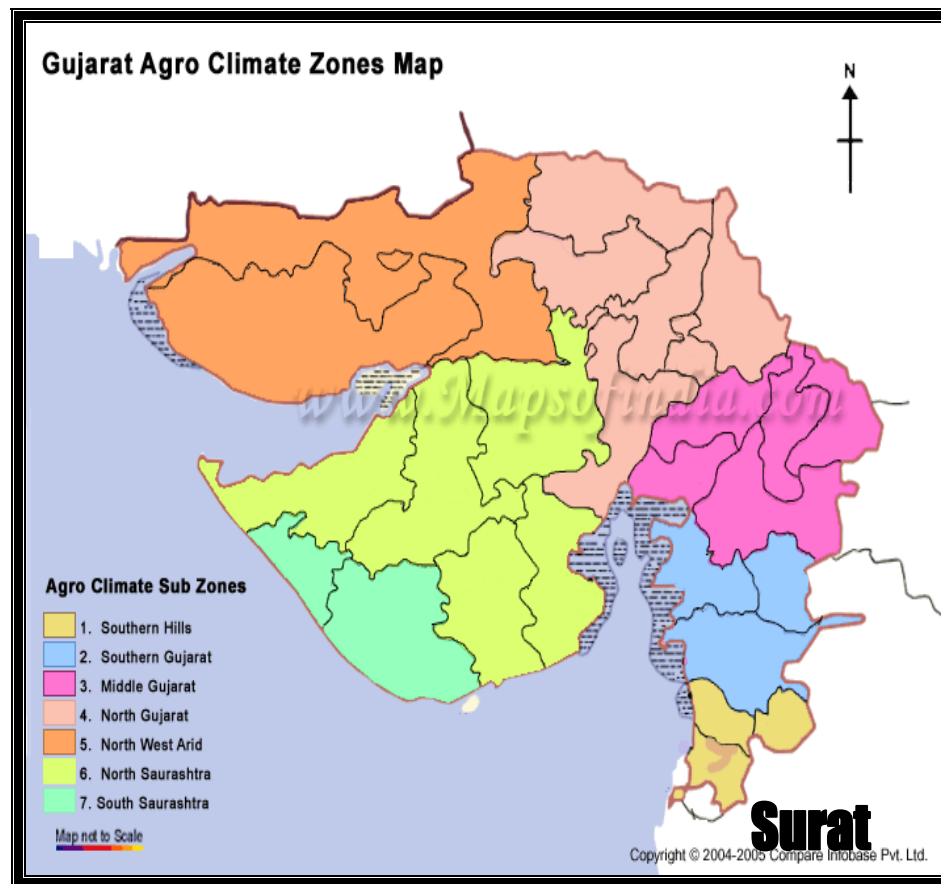
	Suggested contingency measures		
	Before the event	During the event	After the event
	carp, Grass carp, Common carp etc.), Cat fish and other biodiversity will either migrate or not survive.		
(i) Shallow water depth due to insufficient rains/ inflow	1. Provide water through cannel and pipeline from major reservoirs to maintain sufficient water depth 2. Taxonomic fish data collection & Preserved fish stock (gene)	1. Migration of fish stock 2. Conservation of breeders/ fish stock at unaffected area	Transplant the fish stock and breed the fish in hatchery to stock the fish seed in affected area
(ii) Changes in water quality	Migration of fish due to change of water quality	-	-
(iii) Any other	-	-	-
B. Aquaculture	“Culture of aquatic organisms in confined water body”, so this sector will affected most incase of either non availability of water or mismanagement.		
(i) Shallow water in ponds due to insufficient rains/ inflow	1. Lower the stocking density by harvest the big size (500 gm) fish and place in market. 2. Transfer of under culture fishes to abundance water zone	Pre- harvest all the materials (fish and prawns) & preserved by freezing	Sanitize the dead fish biomass.
(ii) Impact of salt load build up in ponds / change in water quality	Protect the water and use of lime and other probiotics	Cover the pond with plants (duckweed etc) to protect from evaporation.	Flush the pond with fresh water and manure before the next stocking of fish to maintain the food chain
(iii) Any other	-	-	-

	Suggested contingency measures		
	Before the event	During the event	After the event
2) Floods	Flood are generally predicted and early warning will protect the lives and livelihood		
A. Capture	Change of breeding grounds, migration of fish against and with the water and increase of fish stock etc, so positive effect on capture fisheries.		
Marine	All the fishermen must call back from fishing	No fishing	
Inland	All the fishermen must call back from fishing	No fishing	
(i) Average compensation paid due to loss of human life	1. Recognizing the risk of flood & making the people aware of it 2. Migrate the people at safe place 3. Collect the details information of swimmers & life savers appliances.	Send the rescue teams to protect the lives of the most vulnerable peoples.	1. Measure social impact of losses risks of diseases, loss of employment. 2. The most vulnerable fishermen be taken care of first and fast
(ii) No. of boats/ nets/ damaged	Transfer boats/nets at safe places	If possible protect boats during rescue operation	Identify the damages according to assessment & compensate
(iii) No. of houses damaged			
(iv) Loss of stock			
(v) Changes in water quality			
(v) health and diseases	Prepared the medical rescue team	-	1. Proper hygiene & sanitation 2. Send the medical rescue team with drugs.
B. Aquaculture	Flood affects the culture ponds which are situated near the river. It demolished the pond dyke, overflows the pond and		

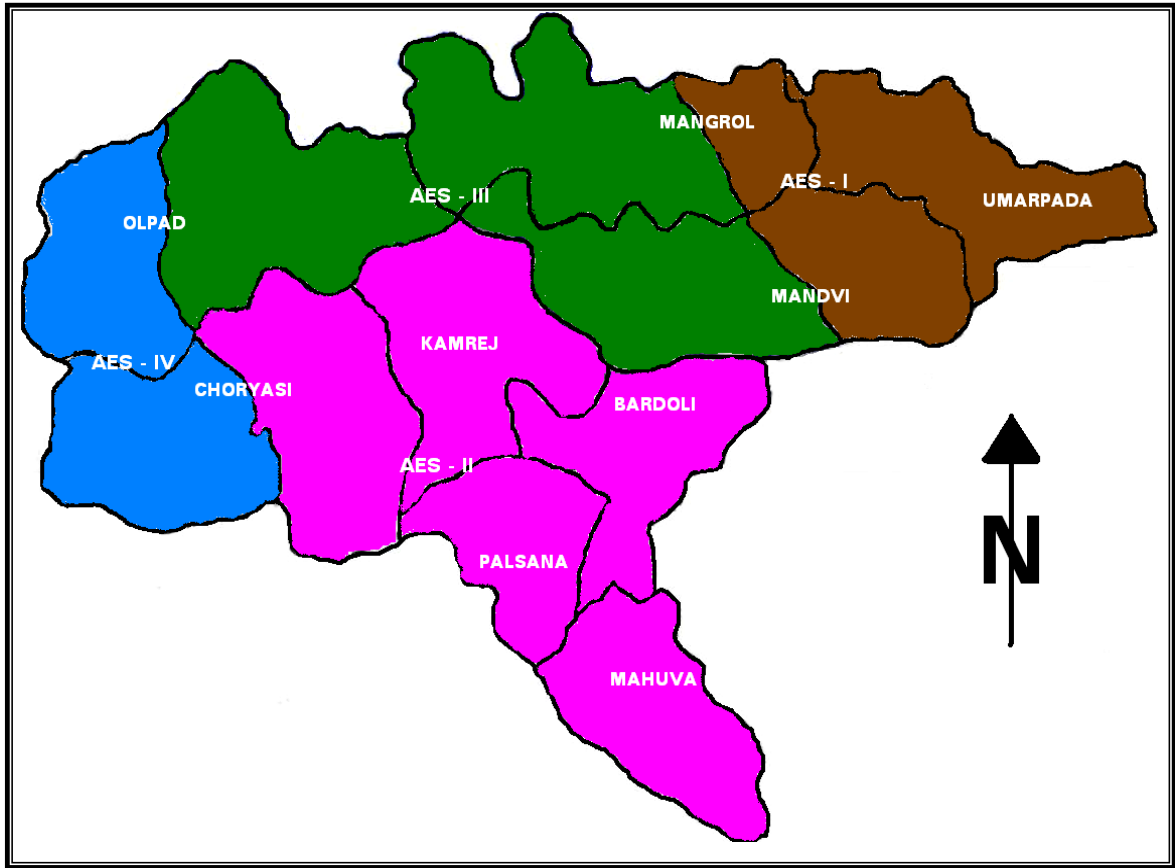
	Suggested contingency measures		
	Before the event	During the event	After the event
	contaminated the culture.		
(i) Inundation with flood water	1. Transfer of aquaculture farmers to protected places 2. Harvest fish from culture ponds and preserved or sale at market 3. Protect the pond dykes with sand bags.		1. Harvest the culture fish as well as wild fish which came with flood water. 2. Disinfect the ponds with chemicals
(ii) Water continuation and changes in water quality	Reduced water level of culture pond.	Flood water fills the pond if empty or reduced before the flood.	Exchange water with fresh water to maintain the water quality.
(iii) health and diseases	Take preventive measures		Destroy the dead fish with disinfectant
(v) Loss of stock and inputs(feed etc)	Transfer the stock and inputs at safe places	-	Demolish the wet & spoiled feed
Infrastructure damage(pumps, aerators, huts etc)	Transfer the detachable infrastructure at safe places	-	Measure impact of losses of infrastructure and provide assistance for rehabilitation
(vi) Any other			
3. Cyclone / Tsunami	Not Observed		



Annexure I
Location map of district within state



Annexure III
Soil map of Surat district



Annexure II
Mean annual rainfall

Sr. No.	Year	Rainfall in mm
1	2006	3653
2	2007	1766
3	2008	1550
4	2009	1352
5	2010	1278
6	2011	1165
7	2012	1350
8	2013	986
9	2014	1013
10	2015	989
11	2016	1078