State: GUJARAT

Agriculture Contingency Plan for District: KHEDA

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	Central Highlands (Malwa), Gujarat Plain And Kathiawar Peninsula, Semi-Arid Eco-Region (5.2)		
	Agro-Climatic Region (Planning Commission)	Gujarat plains and hill region (XIII)		
	Agro Climatic Zone (NARP)	Middle Gujarat Agro Climatic zone(GJ-3), North Gujarat Zone GJ-4		
	List all the districts or part thereof falling under the NARP Zone	Kheda, Anand		
	Geographic coordinates of district	Latitude	Longitude	Altitude
		22^0 -45^0 N	72^0-41^0 East	21m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Main Rice Research Station, Anand Agricultural University, NAWAGAM. Agricultural Research Station, Anand Agricultural University, NENPUR, Agricultural Resesearch Station (Irrigated crops), THASRA and Agricultural Research Station, SANSOLI		
	Mention the KVK located in the district	KrishiVignan Kendra, Gujarat Vidyapith, Dethli, District:- Kheda Phone No.02694-291252, e-mail:kvkkheda@gmail.com		

1.2	**Rainfall**	**Normal RF(mm)**	**Normal Rainy days (number)**	**Normal Onset**	**Normal Cessation**
	SW monsoon (June-Sep):	900	40	June 3rd week	September 4th week
	NE Monsoon(Oct-Dec):	--	--	-	-
	Winter (Jan-February)	--	--	-	-
	Summer (March-May)	--	--	-	-
	Annual	900	40	-	-

1.3	**Land use pattern of the district** (latest statistics)	**Geographical area**	**Cultivable land**	**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)	394.3	298.54	7.9	1.5	7.9	15.8	--	9.8	6.3	1.0

Source :Director of Agriculture, Gandhinagar.

1. 4	**Major Soils (common names like shallow red soils etc.,)**	**Area ('000 ha)**	**Percent (%) of total**
	1: Goradu soil (Loamy sand)	1,26,77	7
	2 Sandy soil	13,253	7
	3. Black (kyari) soil	65,332	34
	4. Medium Black soil	93,300	49
	5. Saline alkali soil	5,712	3
	Others (specify):	-	
	Total	190274	
1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	297.24	126%
	Area sown more than once	78.41	
	Gross cropped area	375.65	

1.6	**Irrigation**	**Area ('000 ha)**		
	Net irrigated area	195.27		
	Gross irrigated area	224.85		
	Rainfed area	129.11		
	Sources of Irrigation	**Number**	**Area ('000 ha)**	**Percentage of total irrigated area**
	Canals	373	117.16	36.0 %
	Tanks	28	58.58	-
	Open wells			36.0 %
	Bore wells	1168		17.0 %
	Lift irrigation	-	-	4.0 %
	Micro-irrigation			
	Small ponds and water streams		19.52	2.0 %
	Farm pond			
	Check dam			
	Total Irrigated Area		195.27	
	Pump sets			

	Groundwater availability and use*	**No. of blocks/ Tehsils**	**(%) area**
	Over exploited	Nil	
	Critical	Nil	
	Semi- critical	NIL	
	Safe	9	100%
	Wastewater availability and use	Nil	
	Ground water quality	67% (Safe)	

*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%
Source : Director of Agriculture, Gandhinagar

1.7 Area under major field crops & horticulture etc.

	Major Field Crops cultivated	Area ('000 ha)					Total area ('000 ha)
		Kharif		Rabi		Summer	
		Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
	Rice	87.64	-	-	-	15.00	102.64
	Cotton	29.30		-	-	-	29.30
	Tobacco	22.50		-	-	-	22.50
	Maize	20.20	-	-	-	-	20.20
	Pearl millet	7.63	-	-	-	1.95	9.58

Source: Directorate of Agriculture, Gandhinagar

	Major Horticulture crops - Fruits	Total area ('000 ha)	Irrigated	Rainfed
	Aonla	3.04	-	3.04
	Citrus (Lemon)	2.10	2.10	-
	Papaya	1.16	1.16	-
	Mango	0.79	-	7.90
	Guava	0.63	-	0.63

Source : Directorate of Horticulture, Gandhinagar

	Major Horticultural crops – Vegetables			
	Potato	6.58	6.58	-
	Brinjal	3.14	3.14	-
	Tomato	2.05	2.05	-
	Okra	2.25	2.25	-
	Cabbage	1.89	1.89	-

Source : Directorate of Horticulture, Gandhinagar

	Medicinal and Aromatic crops	Total area ('000 ha.)	Irrigated	Rainfed
	Funnel	1.80	1.80	-
	Cumin	0.47	0.47	-
	Isabgol	0.25	0.25	-
	Dillseed	0.11	0.11	-

Source : Directorate of Horticulture, Gandhinagar

Plantation crops	Total area ('000 ha)	Irrigated	Rainfed
Grazing land	19. 68	-	-
Forest area	9. 81	-	-
Sericulture etc	-	-	-
Others (Specify) Non Agriculture	42.42	-	-

Source : Directorate of Agriculture, Gandhinagar

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Cattle(cows)	90.94	136.09	227.03
	Buffaloes	--	566.14	566.14
	Goat	--	--	109.77
	Sheep	--	--	38.01
	Others (Camel, Pig, Yak etc.)	--		106.86
	Commercial dairy farms (Number)	---		
1.9	Poultry	**No. of farms**	**Total No. of birds ('000)**	
	Commercial	1139	468.33	
	Backyard	--	--	

Source: Directorate of Animal Husbandry, Gandhinagar

1.10	**Fisheries**						
	A. Capture						
	i) Marine	**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)**	
		3055	-	16	-	1873	
	ii) Inland	**No. Farmer owned ponds**		**No. of Reservoirs**		**No. of village tanks**	
	B. Culture						
		Water Spread Area (ha)		**Yield (t/ha)**		**Production ('000 tons)**	
	i) Brackish water	--		--		--	
	ii) Fresh water	--		--		4041	
	Others	--		--		--	

Source : Commissioner of Fisheries, Gandhinagar

1.11 Production and Productivity of major crops (Average of last 5 years: 2004, 05, 06, 07, 08)

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)									
Paddy	206	2101	-	-	15	2934	221	2518	272
Cotton	15	541	-	-	-	-	15	541	211
Tobacco	37	1740	-	-	-	-	37	1740	7
Maize	22	1094	-	-	-	-	22	1094	98
Pearl millet	10	910	-	-	46	2464	56	1687	353
Source: Directorate of Agriculture, Gandhinagar									
Potato	-	-	19780	3000	-	-	19780	3000	--
Bringal	-	-	50240	16000	-	-	50240	16000	--
Tomato	-	-	41100	20000	-	-	41100	20000	--
Okra	-	-	18000	8000	-	-	18000	8000	--
Cabbage	-	-	35910	19000	-	-	35910	19000	--
Source : Directorate of Horticulture, Gandhinagar									
Aonla	-	-	30440	10000	-	-	-	-	-
Lemon	29596	14000	-	-	-	-	-	-	-
Papaya	-	-	-	-	27760	40000	-	-	-
Mango	-	-	-	-	800	1000	800	1000	-

Source : Directorate of Horticulture, Gandhinagar

1.12	Sowing window for 5 major field crops	Rice	Cotton	Tobacco	Maize	Pearlmillet
	Kharif- Rainfed	-	3rd week of June - 4th week of July	2nd week of Aug - 2nd week of September	3rd week of June - 4th week of July	3rd week of June - 4th week of July
	Kharif-Irrigated	3rd week of June - 4th week of July	3rd week of June - 4th week of July	2nd week of Aug - 2nd week of September	-	-
	Summer	2nd week of February – 2nd week of March	-	-	-	2nd week of February – 2nd week of March

1.13 What is the major contingency the district is prone to?

(Tick mark and mention years if known during the last 10 year period)	Regular	Ocational	None
Drought	-	√	-
Flood	-	√	-
Cyclone	-	√	-
Hail storm	-	-	√
Heat wave	-	√	-
Cold wave	-	√	-
Frost	-	-	√
Sea water intrusion	-	-	√
Pests and diseases (specify)	√ BLB, WBPH, Aphid, White fly, Jassid, Spodoptara	√ Blast, Sheath rot,False smut	-

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		
1. Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/ cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
1.**Delay by 2 weeks** **(1st Week of July)**	Medium rain fall, Low lying area, Clay loam soil	**Paddy :** GR-4, GR-7, GR-12, GR-13, GR-101, GR-103, GR-104, Masuri, Gurjari, Narmada	No any change	No need of contingency plan	• Seed drills under RKVY • Supply of seeds through GSSC, NFSM
	Medium rain fall, Loamy sand deep soil	**Paddy : :** GR- 4, GR- 7, GR- 12, Gurjari	No any change	No need of contingency plan	• Seed drills under RKVY • Supply of seeds through GSSC, NFSM
		Cotton : BT cotton var.	No any change	No need of contingency plan	
		Tobacco : GTH- 1, A -119, GT-5, GT -7 (rainfed),GT-9	No any change	No need of contingency plan	
		Maize: GM- 4, GM- 6, Narmda moti, HQPM-1	No any change	No need of contingency plan	
		Pearl millet :GHB-558**,** GHB-538 Inter cropping : Pearl millet + Pigeon Pea (2:1)	No any change	No need of contingency plan	
	Medium rain fall, Shallow sandy loam soil	**Cotton :** BT cotton	No any change	No need of contingency plan	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM
		Tobacco : GTH-1, A- 119, GT- 5, GT-7 (rainfed), GR- 9	No any change	No need of contingency plan	
		Maize: GM -4, GM- 6, Narmda Moti	No any change	No need of contingency plan	
		Pearl millet : GHB - 558**,** GHB - 538 Inter cropping : Pearl millet + Pigeon Pea (2:1)	No any change	No need of contingency plan	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system[b]**	**Change in crop/cropping system[c]**	**Agronomic measures[d]**	**Remarks on Implementation**
2.Delay by 4 weeks **(3rd Week of July)**	Medium rain fall, Low lying area, Clay loam soil	**Paddy :** GR-4, GR-7, GR-12, GR-13, GR-101, GR-103, GR-104, Masuri, Gurjari, Narmada	No change	• Use sprouted seed for sowing (Aerobic method of sowing) • Use SRI technology	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM
	Medium rain fall, Loamy Sand deep soil	**Paddy :** GR- 4, GR- 7, GR- 12, Gurjari	No change	• Use sprouted seed for sowing (Aerobic method of sowing) • Use SRI technology	
		Cotton : BT cotton	No change	Dry sowing of Cotton seeds	
		Tobacco : GTH- 1, A -119, GT-5, GT -7,GT- 9	No change	No need of contingency plan	
		Maize: GM- 4, GM- 6,Narmda Moti	No change	No need of contingency plan	
		Pearl millet :GHB-558**,** GHB-538	No change	No need of contingency plan	
	Medium rain fall, Shallow sandy loam soil	**Cotton :** BT cotton G. Cot. Hy-4, G. Cot. Hy- 6, G. Cot. Hy- 8, G. Cot. Hy-10, G. Cot. Hy-12.	No change	Dry sowing of Cotton seeds	
		Tobacco : GTH 1, A 119, GT 1, 5, 7, 9	No change	No need of contingency plan	
		Maize: GM- 4, GM- 6,Narmda Moti	No change	No need of contingency plan	
		Pearl millet : GHB-558**,** GHB-538 , GHB-732 Inter cropping : Pearl millet + Pigeon Pea (2:1)	No change	No need of contingency plan	

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**
3. Delay by 6 weeks **(1st Week of Aug.)**	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	**Paddy :** SK 20, GR-3, GR-4,GR-6, GR-11, GAR1,Ashoka 200F, Gurjari	• Aerobic method of sowing • Use SRI technique • If irrigation facility is available apply irrigation for TP	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM
	2 Medium rain fall, Loamy sand deep soil	Paddy	**Paddy :** SK 20, GR-3, GR-4,GR-6, GR-11, GAR1,Ashoka 200F, Gurjari	• Aerobic method of sowing • Use SRI technique • If irrigation facility is available apply irrigation for TP	
		Cotton	**Shift on Castor**: GCH- 6, GCH-7	• Replace the crop as suggested for castor • If irrigation facility is available apply irrigation for sowing • Use organic manure • Apply nutrients as per SHC • Keep narrow spacing for rainfed castor cultivation (90x30cm) • Keep wider spacing for irrigated castor(120x30cm)	
		Tobacco	**Tobacco:** GTH-1, A-119, GT-5, GT-7 (rainfed), GT-9	• Transplant the tobacco seedling when rain is occur	
		Maize	**Maize**: Fodder , Ganga safed-2, Farm Saummery **Jowar fodder** : S-1049 , GFS-1	• Use higher seed rate(20%) for sowing	
		Pearl millet	**Vegetable cowpea**:AVC-1 **Green gram:** GM -4,CO-4, **Cluster bean**	• In shortage of water, use cowpea for fodder	
	3. Medium rain fall, Shallow sandy loam soil	Cotton	**Shift on Castor**: GCH-6, GCH-7	• Replace the crop as suggested for castor • Dry sowing • If irrigation facility is available, apply irrigation for sowing • Keep narrow spacing for rainfed castor cultivation (90x30cm) • Keep wider spacing for irrigated castor(120x30cm)	

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**
		2.Tobacco	**Tobacco:** GTH-1, A-119, GT-5, GT-7 (rainfed), GT-9-	• Transplant the tobacco seedling when rain is occur	
		3.Maize	**Maize**: Fodder (Ganga Safed-2) **Jowar fodder** : S 1049, GFS-1	• Use 20% higher seed rate for sowing	
		4.Pearl millet	Shift on Vegetable cow pea AVCP1 **Green gram:**GM 2,4,CO 4 **Cluster bean :** HG-75, Guj Guar-1,2	• Replace the crop as suggested	

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 **(3rd Week of Aug.)**	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	**Paddy :** SK 20, GR-3, GR-4, GR-6, GR-11, ADR-1,Ashoka 200F, Gurjari	• Staggering of nursery, • Aerobic method of sowing • Use SRI technique • If irrigation facility is available apply irrigation for TP	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM
	2 Medium rain fall, Loamy sand deep soil	Paddy	**Paddy :** SK 20, GR-3, GR-4, GR-6, GR-11, ADR-1,Ashoka 200F, Gurjari	• Staggering of nursery, • Aerobic method of sowing • Use SRI technique • If irrigation facility is available apply irrigation for TP	
		Cotton	**Shift on Castor**: GCH- 5, GCH-7	• Replace the crop as suggested for castor • Keep narrow spacing for rainfed castor cultivation (90x30cm) • Keep wider spacing for irrigated castor(120x30cm)	
		Tobacco	**Tobacco:** GTH-1, A-119, GT-5, GT-7 (rainfed), GT-	• If irrigation facility is available apply irrigation for TP	

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**
			9-		
		Maize	**Maize**: Fodder (Ganga Safed-2) **Jowar fodder** : S-1049 , GFS-1	• Replace the crop as suggested • Use 20% higher seed rate for sowing	
		Pearl millet	**Vegetable cowpea**:AVC-1 **Green gram:** GM -4, Meha **Cluster bean :** HG-75, Guj Guar-1,2	• In shortage of water use cowpea for fodder	
	Medium rain fall, Shallow sandy loam soil	Cotton	**Shift on Castor**: GCH-5, GCH-7 (Deshi cotton hybrids) **Green gram:** GM -4, Meha **Black gram**: T-9,TPU-4	• Replace the crop as suggested for castor • Keep narrow spacing for rainfed castor cultivation (90x30cm) • Keep wider spacing for irrigated castor(120x30cm)	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM
		Tobacco	**Tobacco:** GTH-1, A-119, GT-5, GT-7 (rainfed), GT-9-	• If irrigation facility is available apply irrigation for TP	
		Maize	**Maize**: Fodder (Ganga Safed-2) **Jowar fodder** : S-1049, GFS-1	• Replace the crop as suggested • Use 20% higher seed rate for sowing	
		Pearl millet	**Vegetable cowpea**:AVC-1 **Green gram:** GM -4,Meha **Cluster bean**	• In shortage of water, use cowpea for fodder	

Condition			Suggested Contingency measures		
Early season drought (Normal onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
Normal on set followed by 15-20 days dry spell after sowing leading to poor germination/ crop stand etc.	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM • Timely establishment of plant stand is inevitable for taking benefit of short water availability period
	Medium rain fall, Loamy sand deep soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	
		Cotton	Gap filling	• Interculturing and • Weeding • Spray 2% urea	
		Tobacco	Gap filling	• Interculturing and • Weeding • Delay top dressing of N till occurrence of next rain	
		Maize	Thinning& Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Interculturing and • Weeding	
		Pearl millet	Thinning and Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Interculturing and • Weeding	
	Medium rain fall, Shallow sandy loam soil	Cotton	Gap filling	• Interculturing and • Weeding • Spray 2% urea	
		Tobacco	Gap filling	• Interculturing and • Weeding • Delay top dressing of N till occurrence of next rain	
		Maize	Thinning& Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Interculturing and • Weeding	
		Pearl millet	Thinning& Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Interculturing and • Weeding	

Condition			Suggested Contingency measures		
2. Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period.) Vegetative stage	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Crop management[c]**	**Soil nutrient & moisture conservation measues[d]**	**Remarks on Implementation[e]**
	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM • Timely establishment of plant stand is inevitable for taking benefit of short water availability period
	2 Medium rain fall, Loamy sand deep soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	
		Cotton	-	• Interculturing and Weeding • Delay top dressing of N till occurrence of next rain • Spray 2% urea • Spray 2% KNO_3, 2 times when crop shows reddening symptoms	
		Tobacco	Topping and remove suckers	• Weeding • Inter culturing	
		Maize	Thinning & Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Weeding and earthing up by harrowing • Delay top dressing of N till occurrence of next rain	
		Pearl millet	Thinning & Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Weeding Inter culturing • Delay top dressing of N till occurrence of next rain	
	3. Medium rain fall, Shallow sandy loam soil	Cotton	-	• Interculturing and Weeding • Delay top dressing of N till occurrence of next rain • Spray 2% urea • Spray 2% KNO_3, 2 times when crop shows reddening symptoms	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM
		Tobacco	Topping and removing of suckers	• Weeding • Inter culturing	

Condition			Suggested Contingency measures		
2. Mid season drought (long dry spell, consecutive 2	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Crop management[c]**	**Soil nutrient & moisture conservation measues[d]**	**Remarks on Implementation[e]**
		Maize	Thinning & Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Weeding, Inter culturing and Ear thing up, • Delay top dressing of N till occurrence of next rain	
		Pearl millet	Thinning & Gap filling by uprooting the extra plants from the raw at occurrence of next rain	• Weeding, Inter culturing, Delay top dressing of N till occurrence of next rain	

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
At flowering/ fruting stage	Medium rain fall, Low lying area, Clay loam soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM • Ensure power supply for efficient use of ground water
	Medium rain fall, Loamy sand deep soil	Paddy	-	• Apply irrigation if available • Weeding • Delay top dressing of N till occurrence of next rain	
		Cotton	Topping	• Apply irrigationin alternate furrow • Weeding • Delay top dressing of N till occurrence of next rain • Inter culturing • Use organic mulch • Spray 2% urea • Spray 2% KNO_3, 2 times when crop shows reddening symptoms	
		Tobacco	Topping before flowering and remove suckers	• Apply irrigationin alternate furrow if it is require • Weeding • Interculturing	
		Maize	Use as fodder if severe drought is occur	• Weeding and apply irrigation if available	

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
		Pearl millet	Use as fodder if severe drought is occur	• Weeding and apply irrigation if available	
	Medium rain fall, Shallow sandy loam soil	Cotton	Topping	• Apply irrigationin alternate furrow • Weeding • Delay top dressing of N till occurrence of next rain • Spray 2% urea • Spray 2% KNO_3 2 times when crop shows reddening symptoms	
		Tobacco	Topping before flowering and remove suckers	• Apply irrigationin alternate furrow if it is require • Weeding • Interculturing	
		Maize	Use as fodder if severe drought is occur	• Apply irrigation if available • Interculturing	
		Pearl millet	Use as fodder if severe drought is occur	• Apply life saving irrigation if available • Inter culturing • Weeding	

Condition			Suggested Contingency measures		
	Major Farming situation[a]	**Normal Crop/cropping system[b]**	**Crop management[c]**	**Rabi crop planning**	**Remarks on Implementation[e]**
4. Terminal drought	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	Harvest at physiological maturity stage	• Sowing of Gram (GG-1) • Wheat (GW-496, GW-366) and • Cress crops	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM • Ensure power supply for efficient use of ground water
	2 Medium rain fall, Loamy sand deep soil	Paddy	Harvesting at physiological maturity stage	• Sowing of Gram (GG-2) • Wheat(GW-496, GW-366) , • Safflower (Tara) and • Cress crops (Guj.Asario-1)	
		Cotton	Picking of seed cotton	• Sowing of Wheat (GW-496, GW-366)	
		Tobacco	Harvest matured leaves	• Sowing of Wheat (GW-496, GW-366)	
		Maize	Harvest green cob for sale	• Sowing of Gram (GG-1) and Wheat (GW-496, GW-366)	
		Pearl millet	Use as fodder crop	• Sowing of Mustard (GM-2 & 4)	
	3. Medium rain fall, Shallow sandy loam soil	Cotton	Picking of seed cotton	• Sowing of Wheat (GW-496, GW-366) and Mustard (GM-2 & 4)	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Farm ponds through IWSM • Ensure power supply for efficient use of ground water
		Tobacco	Harvest matured leaves	• Sowing of Wheat (GW-496, GW-366)	
		Maize	Harvest green cob for sale	• Sowing of Gram (GG-2 unirrigated)/ Wheat (GW-496, GW-366)	
		Pearl millet	Use as fodder crop if severe drought is occur	• Sowing of Gram (GG-2 unirrigated) / Wheat (GW-496, GW-366)	

2.1.2 Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed release of water in canals due to low rainfall	Medium rain fall, Low lying area, Clay loam soil	Paddy	Grow early and mediumduration varieties Sukhvel 20, GR3, GR4, GR6, GR11, GAR1, Ashoka 200F, Gurjari, GR12	• Use SRI technique for rice cultivation • Sowing of aerobic rice • Conjuctive use of water for TP	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Ensure power supply for efficient use of ground water • Provide drip set through GGRC for cotton
	Medium rain fall, Loamy sand deep soil	Paddy	Grow early and medium durationvarieties Sukhvel 20, GR3, GR4, GR6, GR11, GAR1, Ashoka 200F, Gurjari, GR12	• Use SRI technique for rice cultivation • Sowing of aerobic rice • Conjuctive use of water for TP	
		Cotton	**Cotton :** Bt cotton	• Conjunctive use of water for sowing • Irrigation through drip or furrow for sowing	
		Tobacco	**Tobacco :** GTH1, A119, GT5, GT7 (Rainfed), GT9	• Apply light irrigation for TP	
		Maize	Grow early maturing varieties GM4,GM6, NarmdaMoti , HQPM-1	• Conjunctive use of water for sowing • Apply irrigation in alternate furrow for subsequent irrigation • Open tide ridge for water conservation	
		Pearl millet	GHB538, GHB732	• Conjunctive use of water for TP (seedling) • Apply irrigation in furrow for subsequent irrigation • Open conservation furrow after every 4 to 6 rows	
	Medium rain fall, Shallow sandy loam soil	Cotton	**Cotton :** Bt cotton	• Conjunctive use of water for sowing • Apply Irrigation through drip furrow for sowing	
		Tobacco	**Tobacco :** GTH1, A119, GT5, GT7 (Rainfed), GT9	• Apply light irrigation in furrow for TP	

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
				• Conjunctive use of water for TP • Weeding	
		Maize	Grow early maturing varieties (GM6, Narmdamoti, HQPM-1)	• Conjunctive use of water for sowing • Apply irrigation through alternate furrow for subsequent irrigation • Open tide ridge for water conservation seedling TP	
		Pearl millet	**Pearl millet :** GHB538, GHB732	• Conjunctive use of water for seedling TP • Apply irrigation in furrow for subsequent irrigation	

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Limited release of water in canals due to low rainfall	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	• Grow early and mediumdurationvarieties Sukhvel 20, GR3, GR4, GR6, • GR11, GAR1, Ashoka 200F, Gurjari, GR12	• Conjunctive use of water (Tubewell) • Use SRI technique for rice cultivation • Aerobic sowing of rice	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Ensure power supply for efficient use of ground water
	2 Medium rain fall, Loamy sand deep soil	Paddy	Grow early and mediumdurationvarieties sukhvel 20, GR3, GR4, GR6, GR11, GAR1, Ashoka 200F, Gurjari, GR12	• Conjunctive use of water (Tubewell) • Use SRI technique • Aerobic sowing of rice	
		Cotton	**Cotton :** Bt cotton	• Conjunctive use of water (Tubewell) • Apply irrigation through drip/ alternate furrow • Use organic mulch (paddy straw, 5 t/ha) • Spray 2% urea • Spray 2% KNO_3, 2 times	

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
				when crop shows reddening symptoms	
		Tobacco	**Tobacco :** GTH1, A 119, GT5, GT 7(Rainfed), GT 9	• Conjunctive use of water (Tubewell) • Apply irrigation in alternate furrow if it is require	
		Maize	Grow early maturing varieties (GM 6, NarmdaMoti, HQPM-1)	• Conjunctive use of water (Tubewell) • Apply irrigation in alternate furrow if it is require • Opening of tide ridge for water conservation	
		Pearl millet	Pearl millet :GHB538	• Conjunctive use of water (Tubewell) if it is require	
	3. Medium rain fall, Shallow sandy loam soil	Cotton	**Cotton :** Bt cotton	• Conjunctive use of water (Tubewell) • Apply irrigation through drip/ alternate furrow • Use organic mulch (paddy straw, 5 t/ha) • Spray 2% urea • Spray 2% KNO_3 2 times when crop shows reddening symptoms	
		Tobacco	**Tobacco :** GTH 1, A119, GT 5, GT 7 (Rainfed), GT 9	• Apply irrigation in alternate furrow	
		Maize	Grow early maturing varieties (GM 6, Narmdamoti, HQPM-1)	• Conjunctive use of water (Tubewell) • Apply irrigation in alternate furrow if it is require • Opentide ridge across the rows for water conservation	
		Pearl millet	**Pearl millet** : GHB538, GHB 732	• Conjunctive use of water (Tubewell) conservation	

Condition			Suggested Contingency measures		
	Major Farming situation[f]	**Normal Crop/cropping system[g]**	**Change in crop/cropping system[h]**	**Agronomic measures[i]**	**Remarks on Implementation[j]**
Non release of water in canals under delayed onset ofmonsoon in catchments	1.Medium rain fall, Low lying area, Clay loam soil	Paddy	**Paddy :** GR- 12, GR-101, GR-104, Masuri, Gurjari	• Use of other sources of irrigation (Tubewell& pond) for growing the crop with SRI technique or aerobic rice	• Seed drills under RKVY • Supply of seeds through GSSC • Supply of seeds through NFSM • Ensure power supply for efficient use of ground water
	2 Medium rain fall, Loamy sand deep soil	Paddy	**Paddy :** GR- 12, GR-101, GR-104, Masuri, Gurjari	• Use of other sources of irrigation (Tubewell& pond) for growing the crop with SRI technique or aerobic rice	
		Cotton	**Cotton :** Bt cotton	• Conjunctive use of water with drip irrigation or furrow irrigation for growing the crop	
		Tobacco	Anand-119, GT-7(Rainfed)	• Apply irrigation for transplanting the seedling	
		Maize	Grow early maturing varieties GM 6, NarmdaMoti, HQPM-1	• Maize can grow in any season (wait for sowing upto the end of July) • Use other sources of water for sowing (Tubewell)	
		Pearl millet		• Wait for sowing up to 15th July • Use other sources of water for sowing (Tubewell)	
	3. Medium rain fall, Shallow sandy loam soil	Cotton	**Cotton :** Bt cotton	• Use other source of water through drip or furrow for sowing	
		Tobacco	**Tobacco :** GTH -1, A-119, GT-5, GT-7 (Rainfed), GT-9	• Conjunctive use of water (Tubewell) • Apply irrigation for transplanting the seedling	
		Maize	Grow early maturing varieties(GM 6, NarmdaMoti, HQPM-1)	• Apply irrigation through drip system • Opentide ridge	
		Pearl millet	Fodder Pearlmillet : GFB-1 Sorghum S-1049	-	

Condition			Suggested Contingency measures		
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
4. Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Not Applicable				

Condition			Suggested Contingency measures		
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
5. Insufficient ground water recharge due to low rain fall	**No such situation is prevailed in Kheda District (sufficient ground water is available)**				

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

Condition	Suggested contingency measure			
1.Continuous high rainfall in a short span leading to water logging	**Vegetative stage[k]**	**Flowering stage[l]**	**Crop maturity stage[m]**	**Post harvest[n]**
Major field crops				• Shift the produce at safer place • Turn frequently to dry the produce • Dry in sunshine • Cover the plastic sheets o produce if available
Paddy	-	• Drain out excess water	• Drain out excess water • Harvest the crop at physiological maturity stage • Spray 5% common salt to avoid the germination of the seeds and spoilage of straw from the moulds • Allow the paddy crop dry completely before harvest	
Cotton	• Drain out excess water • Spraying of monocrotophos 0.04%	• Drain out excess water • Spraying of monocrotophos 0.04% to control the sucking pest • Spray 2-4% urea to prevent the flowering dropping	• Drain out excess water • Delay the picking of seed cotton	
Tobacco	• Drain out excess water • Follow the interculturing to remove the excess moisture from the soil	• Drain out excess water	• Drain out excess water • Harvest the mature leaves	
Maize	• Drain out excess water	• Drain out excess water	• Drain out excess water • Cob should be harvested in standing crop	
Peal millet	• Drain out excess water	• Drain out excess water	• Drain out excess water • Nipping of earhead in standing crop	
Major Horticultural crops				
Brinjal	• Drain out excess water	• Drain out excess water	• Drain out excess water • Picking of brinjal fruits	• Shift the produce at safer place • Harvest the vegetables for market
Tomato	• Drain out excess water	• Drain out excess water	• Drain out excess water • Harvest the fruits for selling	
Okra	• Drain out excess water	• Drain out excess water	• Drain out excess water • Picking the fruits for selling	
Cabbage	• Drain out excess water	• Drain out excess water	• Drain out excess water	

Condition	Suggested contingency measure			
2.Heavy rain fall with high speed winds in a short span[2]	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Major field crops				• Shift the produce at safer place • Turn frequently to dry the produce
Paddy	• Drain out excess water	• Drain out excess water	• Drain out excess water • Harvest the crop at physiological maturity stage • Spray 5% common salt to avoid the germination of the seeds and spoilage of straw from the moulds • Allow the paddy crop dry completely before harvest	
Cotton	• Drain out excess water • Spraying of monocrotophos 0.04%	• Drain out excess water • Spraying of monocrotophos 0.04%	• Drain out excess water • Delay the picking of seed cotton	
Tobacco	• Drain out excess water	• Drain out excess water	• Drain out excess water • Harvest the mature leaves	
Maize	• Drain out excess water	• Drain out excess water	• Drain out excess water • Cob should be harvested in standing crop	
Peal millet	• Drain out excess water	• Drain out excess water	• Drain out excess water • Nipping of earhead in standing crop	

Major Horticultural crops				
Brinjal	• Drain out excess water	• Drain out excess water	• Drain out excess water • Picking of brinjal fruits	• Shift the produce at safer place • Harvest the produce for market
Tomato	• Drain out excess water	• Drain out excess water	• Drain out excess water • Harvest the fruits for selling	
Okra	• Drain out excess water	• Drain out excess water	• Drain out excess water • Picking the fruits for selling	
Cabbage	• Drain out excess water	• Drain out excess water	• Drain out excess water	

Condition	Suggested contingency measure			
Outbreak of pests and diseases Due To unseasonal rains	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Major field crops	Take Preventive measure and control measure for Insect pests and Diseasesas per annexure IV			
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet				
Major Horticultural crops	Take Preventive measure and control measure for Insect pests and Diseases as per annexure IV			
Brinjal				
Tomato				
Okra				
Cabbage				

APPENDIX – IV

Important insect pest/disease on each crop and their control measure in details

A. Pest of major crops of the State and their control measures

Crop	Name of the Pest	Control measures
Paddy	Rice stem borer	• Apply carbofuran 3 G 1.0 kg a.i./ha or Carptape 4 G @ 1.0 kg/100 sq. meter at 5 days after sowing and five days before transplanting in paddy nursery. • Application of carbofuran 3 G 1.0 kg a.i./ha or Carptape 4 G @ 1.0 kg/ha or carbosulfan 5 G @ 1.0 kg a.i//ha at 30 and 50 days after transplanting • Spray any one of these Phosphomedon 0.03 % or Endosulfan 0.07 % or Quinalfos 0.05 % or Phosalone 0.05 %
	Paddy leaf hopper/Jassid	• Avoid the top dressing of nitrogen application and Drain the water from the field • Later stage of the crop, spray Imidacloprid 0.05 % or Fenobucarb 0.07 %
	Rice leaf folders/roller and leaf eating caterpillars	• Collect the pupae & rolled up leaves with larvae and destroy • Spray any one of these phosphomedon 0.03 % or Endosulfan 0.07 % or Quinalfos 0.05 % or Phosalone 0.05 % or Acephate 0.07 %
	Rice hispa and rice blue bittle	• Collect the adults and destroy • Summer ploughing • Spray any one of these Endosulfan 0.07 % or Carbaryl 0.02 % or Methyl Parathion 0.05 % or Fenitrothion 0.05 %
	Rice grass hopper	• Deep ploughing before rain • Dust any one of these, Carbaryl 10 % or Methyl Parathion 2 % or Quinalphos 1.5 % @ 20-25 kg/ha
	Rice root Weevil	• Methyl Parathion 2 % dust @ 20 kg/ha • Apply 100 kg P2O5/ha which may help to decrease the incidence of this pest

Crop	Name of the Pest	Control measures
Pearlmillet	Shoot Fly	• Early sowing • Higher seed rate i.e. 5 kg/ha • Phorate 10 G or Carbofuran 3 G @ 2 gram/meter row length • Spray Endosulfan 0.07 %
	Blister beetle	• Carbaryl 10 % dust @ 20 kg/ha
	Stem borer	• Spray Endosulfan 0.07 %
	Gujarat Hairy cater Pillar	• Methyl parathion 2 % dust should be dusted on the boundaries,farm bunds and west land near the field after one week of the first rain • In standing crop, Carbaryl 5 % or Methyl Parathion 2 % or Quinalphos 1.5 % @ 20 kg/ha should be dusted
Cotton	Spotted boll worm / pink boll worm /Spodoptera/ Heliothis	• Avoid summer cotton / ratoon crop • Timely removal of cotton stocks and deep ploughing • Use delinted seeds • Treat the seed with Imidoclopride 70 WS or Thiamethoxam 70 WS • Grow trap crop like Okra, Marigold, Maize etc. • Installed the sticky trap or light trap or Pheromone trap in the field • Spray any one of these, Monocrotophos 0.04 % or Endosulfan 0.07 % or Phosalone 0.07 % or Prophenofos 0.05 %
	White fly	• Spray any one of Acephate 0.1 % or Triazophos 0.1 % or Quinalphos 0.05 %
	Mites/Aphid/Jassid/Thrips	• Spray any one of Dicofol 0.05 % or Carbofenithion 0.03 % or Methyl –O-Dematone 0.025 % or Phosphomedon 0.03 % or Dimethoate 0.03 % or Monocrotophos 0.04 %
Tobacco	White fly	• Spray any one of these, Dimethoate 0.03 % or Methyl-O-Dematone 0.025 %
	Cut worm	• Dusting of any one of these Methyl Parathion 2 % or Endosulfan 4 % or Quinalphos 1.5 % should be dusted @ 25 kg/ha at evening time
	Stem borer	• Destruction of crop residues after harvestSelect and use healthy pest free seedlings • Spray any one of these, Quinalphos 0.05 % or Endosulphan 0.07 % or Carbaryl 0.2 % at an interval of 10 days in Nursery and transplanted crop • Inject DDVP 0.05 % in to the gall

B. Diseases and Nematodes of major crops of the State and their control measures

Sr.No	Crop Name	Major disease	Control Measures
4	Pearlmillet	Downy mildew/Green ear head	• Crop rotation with non host crop • Destroy diseased plants • Early sowing of bajra on onset of monsoon • Seed treatment with Apron 35SD @6g/kg seed or fosetyle @5g/kg seed • 2-3 sprays of Metalaxyl Compound @ 4 g/10 lit water • Spray of Mancozeb @1 kg /ha 30 DAS • Use resistant varieties GHB-15, PHB-10, 14, MH-169, 179, HB-1, 5 CO-7
		Ergot or Sugary	• Removal of Collateral hosts • Use disease free seed • Sowing crop just after on onset of monsoon • Seed treatment with 20 % NaCl solution • Spraying of carbendazine 300 g or mancozeb 1.25 kg /ha • Long crop rotation
		Smut	• Remove smutted ear heads and destroy them • Use clean healthy disease free seeds • Follow crop rotation with one host crop • Growing bajra in summer season

2.3 Floods

Condition	Suggested contingency measure			
1. Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Major field crops				• Shift the produce at safer place • Turn frequently to dry the produce • Spray 5% common salt to avoid the germination of the seeds and spoilage of straw from the moulds for paddy • Allow the paddy crop dry completely before harvest
Paddy	Remove excess water	Remove excess water	• Remove excess water • Harvest at physiology maturity Stage	
Cotton	Remove excess water	Remove excess water	• Remove excess water • Picking up the seed cotton	
Tobacco	Remove excess water	Remove excess water	• Remove excess water • Harvest the mature leaf	
Maize	Remove excess water	Remove excess water	• Remove excess water • Harvest the cob in standing crop	
Peal millet	Remove excess water	Remove excess water	• Remove excess water • Nipping of ear head in standing crop	
Major Horticultural crops				• Shift the produce at safer place • Harvest the vegetable for market
Brinjal	Remove excess water	Remove excess water	• Remove excess water	
Tomato	Remove excess water	Remove excess water	• Remove excess water	
Okra	Remove excess water	Remove excess water	• Remove excess water	
Cabbage	Remove excess water	Remove excess water	• Remove excess water	

Condition	Suggested contingency measure[o]			
2.Heavy rain fall with high speed winds in a short span	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Major field crops				• Shift the produce at safer place • Control the store grain pests • Turn frequently to dry the produce
Paddy	Remove excess water	Remove excess water	• Remove excess water • Harvest at physiology maturity Stage • Spray 5% common salt to avoid the germination of the seeds and spoilage of straw from the moulds • Allow the paddy crop dry completely before harvest	
Cotton	Remove excess water	Remove excess water	• Remove excess water • Picking of the seed cotton	
Tobacco	Remove excess water	Remove excess water	• Remove excess water • Harvest the mature leaf	
Maize	Remove excess water	Remove excess water	• Remove excess water • Harvest the cob in standing crop	
Peal millet	Remove excess water	Remove excess water	• Remove excess water • Nipping of ear head in standing crop	
Major Horticultural crops				• Shift the produce at safer place • Harvest vegetable for market
Brinjal	Remove excess water	Remove excess water	• Remove excess water	
Tomato	Remove excess water	Remove excess water	• Remove excess water	
Okra	Remove excess water	Remove excess water	• Remove excess water	
Cabbage	Remove excess water	Remove excess water	• Remove excess water	

Condition	Suggested contingency measure[o]			
3.Sea water intrusion[3]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Major field crops	**Such type of situation is not arising in Kheda district.**			
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet				
Major Horticultural crops				
Brinjal				
Tomato				
Okra				
Cabbage				

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

Extreme event type	Suggested contingency measure[r]			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
1.**Heat wave**	Frequent irrigation with low depth at morning and evening			Harvest the crop at physiological maturity Stage
Major field crops				
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet	Frequent irrigation with low depth at morning and evening			
Major Horticultural crops				
Brinjal				
Tomato				
Okra				
Cabbage				

Extreme event type	Suggested contingency measure[r]			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
2. Cold wave[q]	**Apply irrigation and make the smoke in the field by burning of organic waste**			
Major field crops				
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet				
Major Horticultural crops				
Brinjal				
Tomato				
Okra				
Cabbage				

Extreme event type	Suggested contingency measure[r]			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
3. Hailstorm	**Such type of situation is not arising in Kheda district.**			
Major field crops				
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet	**Such type of situation is not arising in Kheda district.**			
Major Horticultural crops				
Brinjal				
Tomato				
Okra				
Cabbage				

Extreme event type	Suggested contingency measure[r]			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
4. Cyclone	**Such type of situation is not arising in Kheda district.**			
Major field crops				
Paddy				
Cotton				
Tobacco				
Maize				
Peal millet	**Such type of situation is not arising in Kheda district.**			
Major Horticultural crops				
Brinjal				
Tomato				
Okra				
Cabbage				

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event[s]	**During the event**	**After the event**
Drought			
Feed fodder availability	• Development of fodder bank – urea molesis treatment.	• Distribution of feed resources for the minimum maintenance requirement	• Ample feeding to compensate nutritional loses
Drinking water	• Deepings of water body, Water storage.	• Supply of minimum requirement and control of wastage and evaporative loses	• Local area ponds and recharging ground water
Health and diseases management	• Vaccination for HS & FMD • Deficiency diseases are likely and hence min. Mix.,Vit A and phosphorus inj.	• Poor plane of nutrition due to draught can likely to result in stress as well as manifestations of deficiencies which may make animals susceptible to various ailments. Therefore, supplementation with minerals and vitamins besides fodder is essential • (1) FMD is common in summer. Treatment of affected animals.(2) Special care of pregnant buffaloes population will be advanced pregnant. (3)Breeding season for goats and hence special care.	• The measures mentioned in the previous column will have to be continued • Treatment of affected animals. • Precaution against GIT infection. • Dininfection of areas where dead animal carcass were lying.
Floods			
Feed fodder availability	• Make dry hay for future requirement	• Protect the fodder from soaking and wastage / drained in flood.	• Grow fodder Varity
Drinking water			
Health and diseases management	• Vaccination against FMD & HS, untieing of animals, taking them to higher places. • Routine vaccination for HoemorragicSepticemia (HS) • untie animals – move to higher places – avoid tieing to electric poles.	• Evacuation of animals from flooded areas, drainage of water from and around animal sheds, pasture areas. Deworming of animals. Provision of animals. Provision of clean drinking water as well as feed/fodder	• Treatment of animals showing signs of clinical disease, parasitic disease, avoid stagnation of water , parasitic diseases control. Disposition of dead animal carcass. • Control of mosquitoes. • (1) Treatment of animals for entritis etc. (2) Special care and treatment of young animals for enteric diseases like calf scour, neumonia
Cyclone			
Feed fodder availability			
Drinking water			
Health and diseases management	• Evacuation of animals to safer place particularly from the kuchche dwellings	• Take animals to safe places - free animals	• Rehabilitation of animals from affected areas and therapeutic management of injured/diseased.

	• untie animals		• Treatment of injured animals and rehabilitation of affected animals.
Heat wave and Cold wave			
Shelter/environment management	• Shed/ Tree plantation provision of drinking water	• Ample water available	
Health and diseases management	• Provision of shed and drinking water • In cold season blood protozoan diseases are common and hence control of vectors like ticks etc should be a routine	• Animals should be kept under sheds during peak hours with sufficient supply of drinking water. Episodes of heat/sun stroke are common. Feeding during night hours, working during cool hours. Working animals working may show dehydration. Control dehydration and restore electrolyte balances. Provision of ample drinking water for all animals and intravenous fluid infusions should be made. • (1)Special intensive care of young growing animals by giving proper parenteral nutrition etc. (2) In cold wave highly specific treatment of all the animals particularly the young ones and efforts to prevent the freezing injury to the extremities of the animal body.	

[$]Based on flowering wherever available

2.5.2. Poultry

	Suggested contingency measures		
	Before the event*	**During the event**	**After the event**
Drought			
Shortage of feed ingredients	• Purchase sufficient quantity of ready feed / raw feed ingredients as per storage facilities and requirement. • Indentify and test available alternative low cost feed resources in feed testing laboratories for their exact composition for formulating balanced feed. • Prepare balanced feed formulation using available feed resources. • Create alternative power generating facilities i.e. Generator set. • Take insurance of poultry sheds, equipments and feed factory well in advance may be in the starting phase of opening the farm.	• Feed formulations using low cost feed ingredients in case of non-availability of high priced conventional ingredients. • Keep check on production performance and modify ration consulting poultry specialist. • Nutrient density should be increased in proportion to feed consumption. • Avoid feed wastage.	• Shift over to good quality feed for optimum production performance.
Drinking water	• Tube well and water storage facilities should be	• Judicious use of water by avoiding spillage/	• Use water sanitizers

	adequately created.	leaking through waterers. • Use of cooling facilities like sprinklers, foggers, fans etc. for comfort zone and optimum production performance.	(chlorination/Sokrena / Vigrox etc.) and softeners (pH. 6).
Health and disease management	• Use of anti-stress vitamins (AD_3ECB_{12}-Vimeral / Famitone / Stressvell etc.) in feed and drinking water. • Use of adaptogenetic herbal medicines (Zetress / Zistetc). • 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.	• 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.	• Vaccinate birds as per vaccination schedule. • Perform deworming with Levamisole / Albendazole / Piperazineetc) and use antibiotics, vitamins as per monthly health calendar programme

Floods			
Shortage of feed ingredients	• 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.	• 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.	• Use of Toxin binder should be continued to avoid development of mycotoxins in the feed
Drinking water	• Drinking water should be stored in over head tanks. • Underground water tanks should be repaired and closed properly to avoid contamination.	• Use of water sanitizers and softeners.	• Check water quality and accordingly use water sanitizers and water softeners for optimum pH.
Health and disease management/construction of poultry shed	• Complete vaccination as per the programme for various categories of the birds i.e. Layers & Broilers.	• Use of probiotics / or antibiotics in feed to protect birds from bacterial infections like E.coli, CRD, Enteritis etc.	• Use of probiotics should be continued in feed for 10-15 days.

	• Poultry sheds should be constructed at high raised land/or go for raised platform poultry sheds especially in flood affected areas. (conceptional biosecurity)		

Cyclones			
Shortage of feed ingredients	• Store feed ingredients / ready feed as per need. • Use curtains to avoid splashing of water in feed stores and poultry houses.	• Avoid direct splashing of water and wind draft on the birds by using proper curtains.	• Use good quality and balanced feed for optimum production performance.
Drinking water	• Keep ready stock of water sanitizers and softeners.	• Use of water sanitizers and softeners in drinking water. • Use Toxin binders in feed. • Mixing of lime in the litter to avoid wet litter problems and ammonia production.	• Repair damages to watering systems, if any.
Health and disease management	• Keep stock of probiotics / antibiotics and anti-stress vitamins.	• Use probiotics and anti stress vitamins in feed and water.	• Use antibiotics / coccidiostate and anti-mycoplasma drugs in feed / drinking water.
Heat and cold wave			
Shelter/environment management	• Install foggers inside the house. • Install sprinklers on the roof. • Tree plantation surrounding the shed. • Purchase of electrolyte and anti-stress vitamins and antibiotics	• Try to Keep the house temperature in comfort zone i.e. 70-75° F through use of foggers, sprinklers and air velocity fans. • Reduce protein by 2% in feed. • Use of fat / Vegetable oil (2-5%) in feed as partial replacement to carbohydrates sources i.e. Maize, Wheat, Rice Kani etc.	• Use of cooling mechanisms to maintain house temperature in comfort zone for best production performance.
Health and disease management	• Birds should be free from bacterial and mycoplasma infections by using antibiotics/ antimycoplasma drugs (Tiamutin/ Tylosin etc.) as mortality in affected birds is high due to heat stress. • Vaccinate birds for respiratory diseases like Ranikhet disease /Infectious Bronchitis.	• Use anti stress vitamins and electrolytes in drinking water / feed.	• Check titres for respiratory disease and accordingly repeat vaccination against Ranikhet disease / Infectious Bronchitis .

* based on forewarning wherever available.

2.5.3 Fisheries

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought	• Connect the all major rivers of state and make network to connect all 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		

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
	breeding will effected)		
Marine			
Inland	• Inland sector will affected most during the drought condition. Indian Major Carp, Exotic Carp, Cat fish and other biodiversity will either migrate or not survive.		
(i) Shallow water depth due to insufficient rains/ inflow	• Provide water through cannel and pipeline from major reservoirs to maintain sufficient water depth • 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	• Lower the stocking density by harvest the big size (500 gm) fish and place in market. • 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			

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 affect on capture fisheries.		
Marine			
Inland	• All the fishermen must call back from fishing	• No fishing	•
(i) Average compensation paid due to loss of human life	• Recognizing the risk of flood & making the people aware of it • Migrate the people at safe place • 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

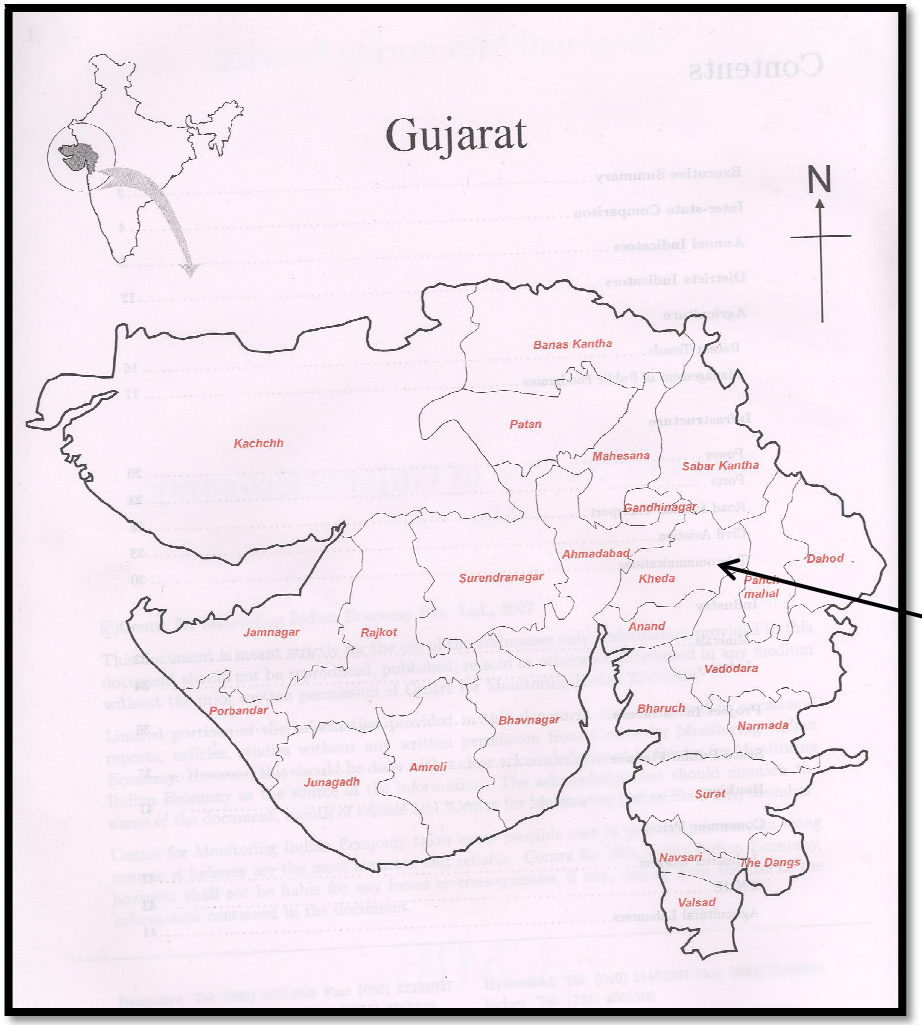
(ii) No. of boats/ nets/ damaged	• Transfer boats/nets at safe places	• If possible protect boats during rescue operation	• Identify the damages according to assessment & compensate
(iii) No. of houses damaged			
(iv) Loss of stock			
(v) Changes in water quality			
(v) health and diseases	• Prepared the medical rescue team	-	• Proper hygiene & sanitation • Send the medical rescue team with drugs.
B. Aquaculture	• Flood affects the culture ponds which situated near the river. It demolished the pond dyke, overflows the pond and contaminated the culture.		
(i) Inundation with flood water	• Transfer of aquaculture farmers to protected places • Harvest fish from culture ponds and preserved or sale at market • Protect the pond dykes with sand bags.		• Harvest the culture fish & wild fish which came with flood water. • 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		• Destroyed the dead fish with disinfectant
(v) Loss of stock and inputs(feed etc)	• Transfer the stock and inputs at safe places	-	• Demolish the decayed feed
Infrastructure damage(pumps, aerators, huts etc)	• Transfer the detachable infrastructure at safe places	-	• Measures impact of losses of infrastructure and provide assist for rehabilitation
(vi) Any other			
3. Cyclone / Tsunami	• Cyclone, heavy rain and flooding are generally predicted and early warning are issued by the concern agencies, while Tsunami, Oil spill etc. cannot be forewarned		
A. Capture	• Capture fishery affected due to cyclone, as current pattern change & upwelling cause the migration of some fish species, so it will either affect to stock or species variation.		
Marine			
(i) Average compensation paid due to loss of fishermen lives			
(ii) Avg. no. of boats/nets/ damaged			
(iii) Avg. no. of houses damaged			
Inland	• Recognizing the risk of cyclone and making the people aware of risk • migrate the fishermen at safe	• Protecting the lives and livelihood of the most vulnerable fishermen	• Measure social impact of losses risks of diseases, loss of employment. • The most vulnerable fishermen be taken care of first and fast

	place		
B. Aquaculture	• Most of coastal aquaculture farms (shrimp culture) will affect most due to cyclone & tsunami, as sea water intrusion, high current & tide & high wind velocity will affect the dyke and infrastructure of aquaculture units.		
(i) Overflow/ flooding of ponds	• Pre- harvest the materials (fish and prawns) • Protect the dykes by putting soil bags. • Place the iron screen on inlet and outlet	• In case of over flooding open outlet of the pond	• Measure impact of losses and risks of diseases • Provide better hygienic sanitation, disinfected the ponds.
(ii) Changes in water quality (fresh water/ brackish water ratio)			
(iii) Health and diseases			
(iv) Loss of stock and inputs (feed, chemicals etc)	• Transfer the stock and inputs at safe places	-	• Destroy the decomposed feed
(v) Infrastructure damage(pumps, aerators, shelters/ huts etc)	• Transfer the detachable infrastructure at safe places	-	• Measures impact of losses of infrastructure and provide assist for rehabilitation
(vi) Any other			

4. Heat wave and cold wave	• This factor will affect indirectly to the fish stock.		
A. Capture	• Due to heat and cold wave some fishes migrate to offshore as well as non affected area so, it will affect the fish catch.		
Marine			
Inland	• Assessment of capture fish catch	• Study the impact of heat and cold wave on fish capture and biodiversity.	• Established the fishery
B. Aquaculture	• Due to these factor, fish growth will affect, change in feeding, breeding and rearing of fish larvae.		
(i) Changes in pond environment (water quality)	• Exchange of water to maintain the water temperature and water parameter	• Use equipment to protect the fish from drastic change in temperature as well as depletion of oxygen, i.e. use of thermostat heater to maintain constant pond temperature & use of aerator to maintain dissolve oxygen in pond.	• Acclimatize the fish stock in natural condition and reduced the used equipments from the ponds. Maintain the feed ration accordingly.
(ii) Health and Disease management	• Take some preventive measures to protect from disease	• Use of probiotics as well as fresh and live feed	
(iii) Any other			

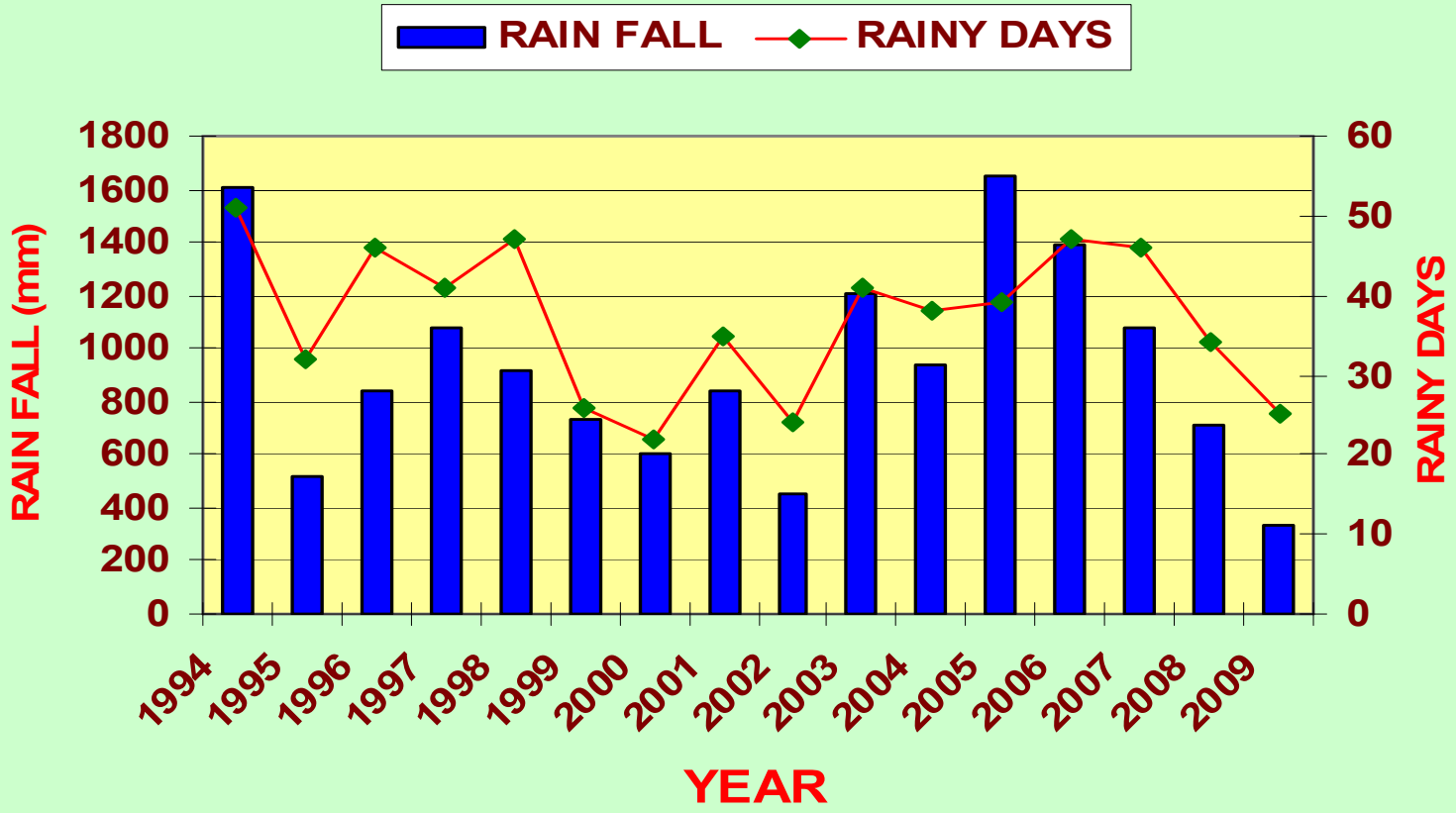
KHEDA DISTRICT

Map of Kheda district



KHEDA DISTRICT

TOTAL RAINFALL & RAINY DAYS OF NAWAGAM (KHEDA) DURING 1994 to 2009



Annexure_III

Soils of Kheda district