State: TAMIL NADU

Agriculture Contingency Plan for District: MADURAI

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Region / Sub Region (ICAR)	Tamil Nadu uplands and leeward flanks of south Sahyadris, hot, dry semi-arid eco-subregion (8.1)		
	Agro-Climatic Region (Planning Commission)	East Coast Plains and Hill Region (XI)		
	Agro Climatic Zone (NARP)	Southern Zone (TN-5)		
	List all the districts or part thereof falling under the NARP Zone	Madurai, Ramanathnpuram, Tirunelveli, Dindugal. Pudukkottai district excluding Aranthangi taluk		
	Geographic coordinates of district	Latitude	Longitude	Altitude
		13°10'03.90"N	77° 37'36.97" E	976 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Agricultural College and Research Institute ,TNAU, Madurai-625001		
	Mention the KVK located in the district	Krishi Vigyan Kendra , Agricultural College and Research Institute,TNAU, Madurai -625001		
1.2	**Rainfall**	Average (mm)	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	288.8	1st week of June	1st week of October
	NE Monsoon (Oct-Dec):	408.9	2nd week of October	3rd week of December
	Winter (Jan- Feb)	35.4		
	Summer (Mar-May)	140.4		
	Annual	873.5		

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Forest area	Land under non-agricultural use	Permanent pastures	Culti-vable waste land	Land under Misc. tree crops and groves	Barren and Uncultivable land	Current fallows	Other fallows
	Area (`000ha)	374.2	48.5	75.2	0.2	6.5	3.0	13.2	20.6	65.2

1. 4	**Major Soils**	Area (000 ha)	Percent (%) of total
	1 Red alluvial soils	137.2	52
	2 black soil	76.1	28
	3 brown soils	51.7	19
1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	144.4	106.4
	Area sown more than once	9.2	
	Gross cropped area	153.5	

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	86.0		
	Gross irrigated area	95.0		
	Rainfed area	58.4		
	Sources of Irrigation	Number	Area (‘000 ha)	% of total irrigated area
	Canals	30876	26.9	32.1
	Tanks	29400	25.2	30.1
	Open wells	35208	39.2	40
	Bore wells	643	0.6	0.7
	Total	96127	95.3	100.0

	Pumpsets	35361		
	Micro-irrigation			
	Groundwater availability and use	No. of blocks	% area	Quality of water
	Over exploited	3	23.0	84% Good 13% medium saline 3% saline
	Critical	1	7.7	
	Semi- critical	4	30.8	
	Safe	5	38.5	
	Wastewater availability and use	Data not available		
	*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%			

Area under major field crops & horticulture etc.

*If break-up data (irrigated, rainfed) is not available, give total area

1.7	**Major Field Crops cultivated**	**Area ('000 ha)**					
		Kharif		***Rabi***		**Summer**	**Total**
		Irrigated	***Rainfed***	***Irrigated***	***Rainfed***		
	Paddy	62.4	-	8.5	-	-	71.0
	Sorghum	-	0.5	-	11.6	-	12.0
	Cotton						6.6
	Pearl millet	-	1.0	-	4.7	-	5.7
	Sugarcane	4.9					4.9
	Maize	1.0			3.4		4.5
	Groundnut						4.0
	Green gram						1.5
	Horticulture crops - Fruits	**Total area**					
	Mango	5.8					
	Banana	2.7					
	Guava	0.8					
	Amla	0.2					
	Tamarind	1.4					
	Horticultural crops - Vegetables	**Total area**					
	Chillies	1.2					
	Tomato	0.4					

	Onion	0.5
	Brinjal	0.3
	Drumstick	0.2
	Cluster bean	0.2

CO4, TCSH1, Morden

Horticultural crops - Flowers		
	Jasmine	1.1
	Rose	0.1
	Tube rose	0.1
	Medicinal and Aromatic crops	**Total area**
	Acorus	-
	Katrazhai	-
	Plantation and spice crops	**Total area**
	Coconut	10.6
	Coriander	0.3

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non Descriptive Cattle(local low yielding)	27.3	51.9	79.2
	Cross bred cattle	19.7	250.1	269.8
	Non descriptive Buffaloes (local low yielding)	1.0	5.1	6.2
	Graded buffaloes			
	Goat	203.6	308.7	512.4
	Sheep	179.7	258.6	438.3
	Others(Camel, Pig, Yak etc.,)			2.6
	Commercial dairy farms (Number)	--	---	142
1.9	Poultry	No. of farms	Total No. of birds	
	Commercial	58	4,48,000	
	Backyard	1,103	5,40,412	

1.10 Fisheries: Capture							
Distr ict	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)	
		No. Farmer Owned Ponds		No. of Reservoirs		No. of Village tanks	
		-		3		680	
A. Culture							
		Water Spread Area ('000ha)		Yield (t/ha)		Production ('000 tons)	
	Brackish Water (Data Source: MPEDA / Fisheries Department)	--		--		--	
	Fresh Water (Data Source : Fisheries Department)	40.6		-		1151.8	
	Others	--		--		--	

1.11	**Production and Productivity of major crops** (Average of last 3 years: 2006, 07, 08)	**Kharif**		**Rabi**		**Summer**		**Total**	
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivit y (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)
1	Paddy	19.81	3561	207.13	3317	7545	2534	234.4	3137
2	Sorghum	0.70	1422	12.31	1063			13.01	1242
3	Bajra	1.34	1331	5.44	1160			6.78	1245

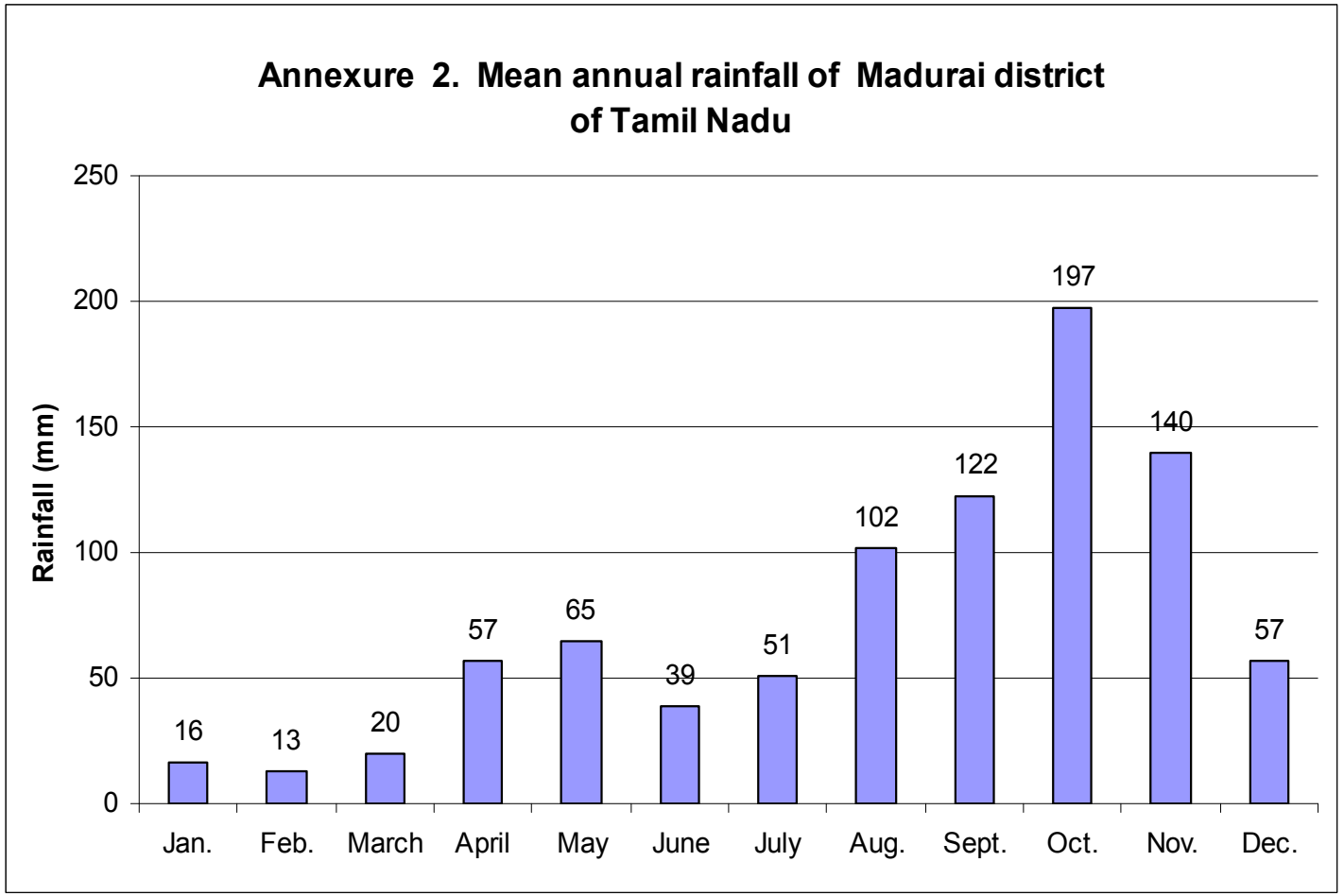
4	Maize			1.68	1143			1.68	1143
5	Green gram			2.81	713			2.81	713
6	Cotton (lint)	4.98	355	8.75	185			13.73	270
7	Sugarcane	67.93	93 t					67.93	93
8	Groundnut	4.45	1721	7.44	1534			11.89	1627
Horticultural crops – fruits									
1	Mango							3313	20493
2	Banana							47741	133292
3	Guava							13603	10828
4	Tamarind							3018	4228
Horticultural crops - Vegetables									
1	Chillies							506	584
2	Tomato							35954	16035
3	Onion							12550	8402
4	Brinjal							10011	

1.12	**Sowing window for 5 major crops (start and end of sowing period)**	Paddy	Sorghum	Bajra	Sugarcane	Cotton
	Kharif- Rainfed	-	1st week of June to 3rd week of June	1st week of June to 3rd week of June	--	--
	Kharif-Irrigated	1st week of June to 1st week of July	1st week of June to 1st week of July	1st week of June to 1st week of July	--	--
	Rabi- Rainfed	-	2nd to 4 th week of October	2nd to 4th week of October	--	2nd to 4th week of October
	Rabi-Irrigated	1st to 4th week of October	--	--	December - January	1st to 3rd week of August

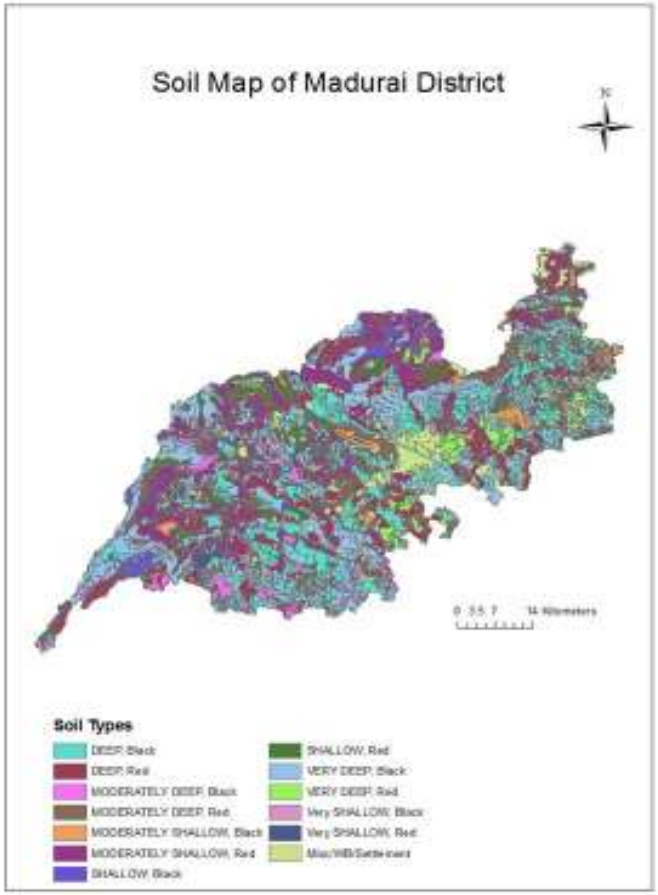
1.13	**What is the major contingency the district is prone to? (Tick mark and mention years if known during the last 10 year period)**	Regular	Occasional	None
	Drought		✔	
	Flood		✔	
	Cyclone		✔	
	Hail storm			✔
	Heat wave			✔
	Cold wave			✔
	Frost			✔
	Sea water intrusion			✔
	Pests and diseases i) Blast in Paddy ii) YMV in Pulses iii) Leaf folder in Paddy	✔		

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

Annexure 1. Location map of Madurai district and the blocks


Annexure 2. Mean annual rainfall of Madurai district of Tamil Nadu
Rainfall (mm)
250
200
150
100
50
0
16
13
20
57
65
39
51
102
122
197
140
57
Jan.
Feb.
March
April
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.

Annexure 3. Soil map of Madurai district of Tamil Nadu



2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks (June 3rd week)	Shallow / Deep black soils	Cotton + Black gram Sorghum + cowpea Maize Pulses – Green gram Black gram Redgram	No Change	• Seed hardening (2% KCl 5 hr) • Sowing with tractor drawn seed drill • Sowing in BBF system • Seed treatment (mix with wood ash) • Nursery Cotton var. KC 2, SVPR 2 / red gram APK1, VBN 2,3 • Run-off harvesting • Contour sowing	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks (July1st week)	Shallow / deep black soils	Cotton + Blackgram	Pearl Millet CO7, Co Cu 9,	Seed hardening (2% KCl 5 hr) Seed treatment	State Department of Agriculture
		Sorghum + Cowpea	Sunflower CO4, TCSH1, Morden		
		Maize	CO MH5		

		Pulses – Greengram Blackgram Redgram	VBN 1, VBN 2, VBN 3	Sowing with seed drill Moisture conservation measures (BBF) Cotton / Red gram portray nursery Run-off harvesting Seed treatment (mix with wood ash)	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks (July 3rd week)	Shallow / deep black soils	Cotton + Blackgram	Pearl millet CO-7, Co Cu- 9,	• Seed hardening • (2% KCl 12 hr) • Seed treatment • (biofert. & bioagents) • Seed drill sowing • Moisture conservation • (contour sowing)	State Department of Agriculture
		Sorghum + Cowpea	Sunflower CO4, TCSH1		
		Maize	Coriander CO6		
		Pulses – Greengram Blackgram Redgram	Minor millets		

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks (August 1st week)	Shallow / Deep Black soils	Cotton + Blackgram	Bajra CO-7, Co Cu 9,	• Seed hardening • (2% KCl 12 hr) • Seed treatment • Biofert. & bio agents • Seed drill sowing • Moisture conservation • Contour sowing	State Department of Agriculture
		Sorghum + Cowpea	Sun flower CO-4, TCSH1, Modern		
		Maize	Bengal Gram/ Horse gram CO-2,CO-3, CO-4		
		Pulses – Green gram Black gram Redgram	Senna KLI- 1		

Condition			**Suggested Contingency measures**		
Early season drought (Normal onset, followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.)	Major Farming situation	Crop/cropping system	Crop management	Soil management	Remarks on Implementation
	Shallow / deep black soils	Cotton + Blackgram	Gap filling	Sowing in BBF method Mulch application Vertical mulching	State Department of Agriculture
		Sorghum + Cowpea	Thinning		
		Maize + Greengram	Severe condition re-sowing		
		Pulses	Raising Cotton/Redgram in nursery Contour sowing		

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
At vegetative stage	Shallow / deep black soils	Cotton + Black gram	Alternate rows can be removed	Soil mulching Vertical mulching Contour sowing	State Department of Agriculture
		Sorghum + Cowpea	Mulch application		
		Maize + Greengram	Cotton / Redgram raising portray nursery for gap filling		
		Pulses	Foliar nutrition spray 1% urea, 1% DAP, 1% KCl Spray All 19:19:19		

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
At reproductive stage	Shallow / deep black soils	Cotton + Black gram Sorghum + Cowpea Maize + Greengram Pulses	Harvest at physiological maturity Spray 1% KCl water 1% Kaolin spray	Dust mulching Waste mulching	State Department of Agriculture

Condition			Suggested Contingency measures		
Terminal drought	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
	Shallow / deep black soils	Cotton + Blackgram	Harvest at physiological maturity Spraying growth regulator / 1% NaCl to hasten maturity	--	State Department of Agriculture
		Sorghum + Cowpea			
		Maize + Green gram			
		Pulses			

2.1.2 Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed/ limited release of water in canals due to low rainfall	Clayey loam soils	Rice – Rice – Pulse	Green manure – Rice (short duration)	SRI methods of rice cultivation	State Department of Agriculture
		Sugarcane	Sugarcane (Subsurface drip fertigation)	Drip fertigation	
		Vegetables	Vegetables (drip fertigation)		

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Non release of water in canals under delayed onset of monsoon in catchment	Clayey loam soils	Rice – Rice – Pulse	Green manure – Rice	Daincha, Sunhemp	State Department of Agriculture
		Sugarcane	Maize (drip) Pulses	Drip fertigation	
		Vegetables	Vegetable (drip)		

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Clayey loam soils	Rice-Rice-Pulse	Green gram Black gram	Short duration pulses Cotton – pro tray nursery Vegetables – precision farming	State Department of Agriculture
		Sugarcane	Maize Sun flower / cotton		
		Vegetables	Vegetables (drip irrigation)		

Condition			Suggested Contingency measures		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient groundwater recharge due to low rainfall	Garden land	Vegetables	Vegetables in precision farming	Micro-irrigation Drip fertigation Run-off harvesting & recycling	State Department of Agriculture
		Cotton			
	Red loam soils	Jasmine			

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

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Paddy / Vegetables	Provide drainage	Provide drainage	--	Spray NaCl
Heavy rainfall with high speed winds in a short span				
Outbreak of pests and diseases due to unseasonal rains				

2.3 Floods -

Condition	Transient water logging/ partial inundation and Continuous submergence for more than 2 days			
	Suggested contingency measure			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Cotton	To drain out the excess water at the earliest by farming drainage channels if there is a gradient and if not by using motors Take up the gap filling at the earliest Inter cultivate at optimum field moisture condition Apply 20 kg N + 10 kg K /ha after draining excess water To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition Take up plant protection measures against possible pests and disease incidence Select short duration hybrids Adopt closer spacing of 90X45 or 90X30 cm	To drain out the excess water at the earliest by farming drainage channels if there is a gradient and if not by using motors Inter cultivate at optimum field moisture condition Apply 20 kg N + 10 kg K /ha after draining excess water To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition Spray of micronutrients two times at 7-10 days interval Take up plant protection measures against possible pests and disease incidence	To drain out the excess water at the earliest by farming drainage channels if there is a gradient and if not by using motors 5 To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition Take up plant protection measures against possible pests and disease incidence	Kapas picking should be done carefully to prevent admixtures with waste plant material
Blackgram	To drain out the excess water at the earliest Take up the gap filling at the earliest	To drain out the excess water at the earliest Takeup weed control either mechanically or through	To drain out the excess water at the earliest Apply 4-5 kg N/acre after draining excess water	Drain out the excess water at the earliest Harvest the crop after the fields are dried up

	Takeup weed control either mechanically or through weedicides Apply 4-5 kg N/acre after draining excess water Take up plant protection measures against possible pests and disease incidence	weedicides Apply 4-5 kg N/acre after draining excess water To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition Take up plant protection measures against possible pests and disease incidence	To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition Take up plant protection measures against possible pests and disease incidence	
Maize	To drain out the excess water at the earliest Takeup weed control either mechanically or through weedicides Intercultivation and earthing up to be done Apply 20 kg N + 10 kg K /acre after draining excess water Take up plant protection measures against possible pests and disease incidence	To drain out the excess water at the earliest Takeup weed control either mechanically or through weedicides Intercultivation and earthing up to be done Apply 20 kg N + 10 kg K /acre after draining excess water Take up plant protection measures against possible pests and disease incidence	To drain out the excess water at the earliest Take up plant protection measures against possible pests and disease incidence	To drain out the excess water at the earliest Cob picking to be done after they are dried fully
Horticulture				
Horticulture crops – Fruits				
Banana	.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant in two to three splits	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Stake the plants with bamboos to prevent further lodging.	• Drain the excess water as soon as possible. • Harvest the mature bunches as soon as possible. • use ripening chambers for quick and uniform ripening

		at monthly intervals. • If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months.		• Store the harvested bunches in well ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.
Mango	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	•
Horticulture crops vegetables				
Chillies	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Dry the pods on concrete floor/ tarpaulins. • Spray any drying oil after the pods are free from surface moisture for quick drying. • Use poly house solar driers for quick drying • Remove the pest and disease infected pods. • Market the produce as soon as possible
Brinjal	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as

		times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Spray COC 30 g in 10 liters of water, 2-3 times against leaf spots		soon as possible. • Store the produce in well ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.

2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone - Not Applicable

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingent measures		
	Before the event	**During the event**	**After the event**
Drought			
Feed and fodder availability	1.Establishment of Fodder banks 2.Development of Drought resistant grass varieties 3.Technology adoption of Fodder Preservation methods like Silage making, Urea enrichment of Paddy straw etc.,	Provision of green fodder for the productive animals.	Storage of chaffed fodder materials as feed blocks .
Drinking water	1.Construction of Check dams 2.Construction of Rain harvesting structures etc.,	Usage of water judiciously for drinking and storage.	The message of importance of water usage and its application has to be delivered to the farmers and livestock owners through training classes and awareness camps.
Health and disease management	1.Special training programmes for Village Level Workers etc., 2.Awareness camps on Disease outbreaks, prevention and vaccination details etc.,	Participating in the Cattle Protection Camps and other camps in coordination with the Animal Husbandry	1. Segregation of flock according to instructions of the veterinarian in terms of Convalascent,ailing etc as per age and sex of the animals. 2. Feeding for pregnant and lactating animals

	3. Special vaccination camps to be conducted in endemic areas. 4.Conducting Mass Conduct Programmes, Infertility camps etc.,	Department and offering expert opinion to cases referred in the camps.	judiciously.
Floods			
Feed and Fodder availability	1. Storage facilities to be created. 2. Camps organized to safeguard fodder advocation esp. tree fodders. 3.Propagation of Tree Fodder cultivation	1.Economic feeding of leguminous fodder to livestock 2. Safeguarding the feeds and fodder	Tree fodder to be advocated in exigency conditions.
Drinking water	1.Chlorination of drinking water 2. Water treatment protocols to be followed strictly. 3. Usage of fresh water advocated. 4. Housing in an elevated area. 5. Pamplets on important diseases and health aspect to be distributed. 6. Precautionary measures to be adopted to avoid seepage of sewage water and dirty water.	1. Sanitary measures to be adopted. 2.Water logging areas to be sanitized and maintained properly	1. Awareness camps on infection through water spread to be conducted. 2. Diseases and its management should be emphasized through audio video lessons and other aids through extension oriented training programmes.
Health and disease management	1. Rearing of separate groups of Livestock to prevent carrier status in animals. 2. Construction of quarantine sheds advocated.	1. Healthy flock to be segregated and vaccinated against contagious diseases. 2. Stocking and feeding of animals in quarantine sheds.	Disease prevention training programmes and economy of maintaining livestock should be taught to the livestock rearing community.
Cyclone			
Feed and fodder availability	1.Storage of feeds, preservation of feed materials etc 2. Field demonstration on Paddy straw enrichment, Silage making and Cultivation of Fodder grass.	1.Feed blocks and mineral licks can be used for productive animals 2. Young animals and pregnant animals to be judiciously fed.	Series of workshops, Seminars on Urea enriched paddy straw preparation, Feed block preparation and its usage and Mineral supplements and its application and impact has to be conducted.
Drinking water	1.Proper storage of water through construction of Water tanks 2. Water treatment through chemical sanitization has to be advocated.	1. Providing Water to animals with utmost care especially in sanitized condition. 2.Livestock should be kept in partitions to prevent the cold weather	1. Polluted water being an important focal point in spread of disease and hence its aftereffects has to be advocated. 2. Special training programmes at village level periodically on sanitation and its benefit to livestock have to be conducted.
Health and Disease	Deworming and Vaccination schedule has to be propagated to create awareness	Newborn animals to be safeguarded against the rough	Pamplets on the various diseases and its management and general scientific management of livestock during

management	among the village people and cattle rearing population.	weather by keeping in enclosures	the period has to be distributed among the livestock rearing community.
Heat wave and cold wave			
Shelter/environment management	1. Construction of Temporary shed with pen and run system to be adopted. 2.Provision of Foggers 3.Awareness camps on Heat stroke emphasized Fodder cultivation practices i.e. Trees around the shelter 4.Provision of antistress medication in water 5.Increase or decrease the drinkers according to the atmosphere 7. Increase or decrease the floor space availability according to the ambience prevailing in the shed.	1. Medication to be continued to prevent heat shock during the period. 2. Green fodder adlibitum to be provided for the livestock. 3. Cross ventilation to be provided by means of exposing the livestock during early morning and late evenings. 4. During the cold wave, side ventilation to be arrested during night hours.	Conducting various training programmes on how to prevent cold shock in animals and its management to Women in the villages.
Health and Disease management	1.Provision of Green Fodder 2.Feed and fodder preservation techniques to be advocated 3. Training on disease management during the heat wave and increase in temperature should be widely taught to livestock owners.	1. Feeding of animals in the early hours of the day during heat wave condition. 2. Bathing of animals to be increased daily.	1. Pamphlets on scientific management of animals during heat wave or cold wave have to be distributed. 2. Off campus training programmes at the livestock rearing villages along with field demonstration have to be conducted.

2.5.2 Poultry

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Feed and fodder availability	1. Development of poultry strains which are drought resistant. 2. Manufacturing poultry feed at subsidized rate by using damaged grains and oil cake. 3. Educate the public about, how drought affects plants, grazing animals, and livestock management, and what options exist. 4. Monitoring of Rainfall and likely drought scenario from the beginning by Natural Disaster Management Division 5. Timely declaration of drought and initiation of drought relief measures	1. Provide feed to poultry,as needed. 2. Consider feeding alternative feeds.	1. At community level, collect and distribute feed, as needed. 2. At community level, help negotiate soft-term credits for the poor families to restore economic activities (e.g., Animal Husbandry activities).
Drinking water	1. Construction of check dams and water reservoirs. 2. Construction of rain harvesting structures. 3. Practice proper water conserving management systems.	1. Birds water requirements may double during hot weather. If birds do not meet their water needs, they may refuse to eat, experience lowered production, and become sick.	1. Educate the farmers about the judicious usage of water for animals and how to save the water. 2. Tree planting to be implemented to a major extent. 3. Repair work in the water channels and water resources to be carried out.
Health and disease management	1. State should organize a disaster management group in the Department dealing with Animal Husbandry and veterinary service with specially trained staff, epidemiological data & communication facilities. 2. The required field staff should be kept in constant readiness throughout the vulnerable months of the year. During lean period, the team should undertake preparedness and relief exercise to test their efficacy and preparedness	1. Bring the Birds to the protection camps organized by the Animal Husbandry department and get suitable ideas about the draught management practices.	1. Segregate the ailing birds and fed them with suitable ration to overcome the post draught effect.

Floods			
Feed and fodder availability	1. Collect and store enough feed for birds during flood. 2. The stored feed should have the longer self life.	1. Feed the birds with uncontaminated feed. 2. Feed storage building or tent should be rodent proof	1. Shells of snails and other mollusks , rice husks, oil-cake and extra household food may be used as supplementary feed for poultry.
Drinking water	1. Collect and store enough potable water for birds during flood	1. Water from contaminated sources can be treated by using commercially available halogen-releasing tablets; freshly released halogen is supposed to kill unwanted bacteria and other microbiological elements present in water. These water purifying tablets are available on the market at affordable costs 2. Provide drinking water to livestock and poultry, as needed. 3. Install a hand pump and obtain enough large containers to water your poultry for at least a week	1. During flood and post flood times, poultry should not be provide with the drink water of ditches and of polluted cultivable water bodies. After ebbing of flood water, newly grown grass should not be fed, but some rainfall would decrease the toxicity of the grass. 2. Awareness' camps on infection through water spread to be conducted.
Health and disease management	1. Ensure that poultry have access to high areas in which to perch, if they are in a flood-prone area, as well as to food and clean water. 2. Maintain the block with proper vaccination 3. Essential drugs should be keeping in hand using during the disaster.	1. Disease affected birds and ailing birds should be separated and treated or culled and dispose it properly.	1. Provide the birds with adequate feed and water which is free from contamination. 2. Feed the birds with supplemental minerals in order to the bring the birds to its normal productive life.
Cyclone			
Feed and fodder availability	1. If the potential risk for the livestock/poultry is deemed very high, minimize loss by selling before the cyclone, keep the money in a bank and start afresh after the cyclone. 2. Be ready at any time to overcome the natural disaster.	1. Transfer the birds from the low lying area to the elevated grounds or a common shelter. 2. Dead birds should be disposed in proper way to in order to prevent the disease transmission.	1. Before housing the birds to the original shed, shed should be sanitized. 2. The feed fed to the birds should be check for ant contamination.
Drinking water	1. Collect and store enough potable water for birds during flood	1. Water from contaminated sources can be treated by using commercially available halogen-releasing tablets; freshly released halogen is supposed to kill unwanted bacteria and other microbiological elements present in water. These water purifying tablets are available on the market at affordable costs	1. During flood and post flood times, poultry should not be provide with the drink water of ditches and of polluted cultivable water bodies. After ebbing of flood water, newly grown grass should not be fed, but some rainfall would decrease the toxicity of the grass.

		2. Provide drinking water to livestock and poultry, as needed. 3. Install a hand pump and obtain enough large containers to water your poultry for at least a week	2. Awareness' camps on infection through water spread to be conducted.
Health and disease management	1. Maintain the block with proper vaccination 2. Essential drugs should be keeping in hand using during the disaster.	1. Disease affected birds and ailing birds should be separated and treated or culled and dispose it properly. 2. Tent or temporary shed should free from rodents and predators.	1. Provide the birds with adequate feed and water which is free from contamination. 2. Feed the birds with supplemental minerals in order to the bring the birds to its normal productive life.
Heat wave and cold wave			
Shelter/environment management	1. Construct the Poultry shed depending upon the geographical location of the particular place, type of Birds (Layer/Broiler), number of birds etc... 2. Grow trees around the shelter which will prevent or reduce the direct heat wave in to the shed.	1. During the heat and cold wave temporary structure should be provided to save the poultry and keep the bird with normal productivity. 2. Take necessary alteration in the feed provided to the birds depending upon the adverse climatic factor. 3. Providing the animals with ad libitum of water during the heat wave and provide them with anti stress drugs.	1. Providing the poultry with standard veterinary check up after the adverse climatic condition. 2. Ailing birds should be segregated and provide them with necessary care.
Health and disease management	1. Routine health check up should be done. 2. Keep an eye on the productive performance of the birds. 3. Vaccinate the birds periodically. 4. Educate the farmers on disease management during the heat wave and cold wave situation.	1. Care must be take to reduce the environmental stress. 2. Get advice from the technical persons about the management of stressful environment.	1. Provide the birds with supplemental feeding to regain the body condition and return to the normal production which lost during the stressful time.

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	Negligible changes	Negligible changes	Negligible changes
Inland			
(i) Shallow water depth due to insufficient rains/inflow	• Harvesting large individuals • Move and enclose Stacked into pens or in smaller/confined areas	• Harvesting large individuals • Disposable of unwanted excess stock • Stocking of desirable/special individuals in brood stock ponds	• Proper nutrition and management of water bodies to improve remaining stock
(ii) Changes in water quality	Negligible changes in water quality	Negligible changes in water quality	Negligible changes in water quality
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	• Harvesting of the stock	• Harvesting of the stock • Transferring of smaller fishes to artificial ponds (if available) for tiding over the drought	• Steps to improve the quality of stocked fishes, via supplementary feed/fertilizer water quality management
(ii) Impact of salt load build up in ponds / change in water quality	• Harvesting of the stock	• Harvesting of the stock • Transferring of smaller fishes to artificial ponds (if available) for tiding over the drought with water from other source (less hardness)	• Steps to improve the quality of stocked fishes, via feed/fertilizer water quality management
2) Floods			
A. Capture			
Marine	Proper bunds and strengthening of existing structures to prevent flooding Ensure proper draining works to divert flood water	Netting and strengthening of weaker beach structures to prevent escaping of fishes	Improve the shore structures and beaches
Inland	• Proper fencing to prevent escaping of fishes • Increasing bund height and improve bund strength • Improve land drainage to allow easy and quick flow of flood waters	• In extreme conditions, controlled draining of flooded ponds • Thinning of stock by harvesting of larger individuals	• Repair damaged bunds • Collect and preserve existing stock
(i) Average compensation paid due to loss of human life	--	--	--
(ii) No. of boats /	--	--	--

nets/damaged			
(iii) No. of houses damaged	--	--	--
(iv) Loss of stock	--	--	--
(v) Changes in water quality	• Negligible changes	• Flood water can bring parasites, and increased turbidity – repair/correct drainage to improve quick drainage of flood waters	• Turbid waters may be flushed off with fresh bore well/well water
(vi) Health and diseases	--	--	--
B. Aquaculture			
(i) Inundation with flood water	• Proper fencing to prevent escaping of fishes • Increasing bund height and improve bund strength • Improve land drainage to allow easy and quick flow of flood waters	• In extreme conditions, controlled draining of flooded ponds • Thinning of stock by harvesting of larger individuals	• Repair damaged bunds • Collect and preserve existing stock
(ii) Water continuation and changes in water quality	• Negligible changes	• Water can become turbid due to flood waters, reduce stock to prevent mortality	• Flushing of pond water with bore- well water to improve water quality
(iii) Health and diseases	--	--	--
(iv) Loss of stock and inputs (feed, chemicals etc)	• Negligible changes	• Harvesting of stock • Shift reserve of brood stock to ponds at elevated levels	• Selling remaining stock and inundated equipment immediately to minimize losses
(v) Infrastructure damage (pumps, aerators, huts etc)	• Dismantling of pumps, aerators and other equipment and shifting to safer zones	• Salvaging of inundated pumps, aerators and other equipment and shifting to safer zones	• Selling remaining stock and inundated equipment immediately to minimize losses
3. Cyclone / Tsunami			
A. Capture			
Marine	Move fisher folk to higher/safer zone	Keep vigil of any trapped person and keep rescue operations on red alert	Assess damage and take up measures to build structures to check beach erosion
(i) Average compensation paid due to loss of fishermen lives	--	--	--
(ii) Avg. no. of boats / nets/damaged	--	--	--
(iii) Avg. no. of houses damaged	--	--	--
Inland	--	--	--

B. Aquaculture	--	--	--
(i) Overflow / flooding of ponds	--	--	--
(ii) Changes in water quality (fresh water / brackish water ratio)	--	--	--
(iii) Health and diseases	--	--	--
(iv) Loss of stock and inputs (feed, chemicals etc)	--	--	--
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	--	--	--
4. Heat wave and cold wave	--	--	--
A. Capture	--	--	--
Marine	Improve land drainage to control salinity fluctuations	Can release water from reservoirs to maintain salinity	Damage control measure like proper rainwater drainage, removal of municipal waste etc., can be taken
Inland			
B. Aquaculture			
(i) Changes in pond environment (water quality)	• Strengthening of pond bund to prevent seepage • Shifting of stock to a more sheltered pond	• Shifting of stock to a more sheltered pond • Improve aeration and water recycling	• Shifting of stock to normal ponds to ensure proper growth
(ii) Health and Disease management	-	-	-