State: TAMIL NADU

Agriculture Contingency Plan for District: SIVAGANGAI

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Region / Sub Region (ICAR)	Eastern Ghat (TN uplands and SE Sahyadris), hot semi-arid ecosystem (8.1)		
	Agro-Climatic Region (Planning Commission)	East Coast Plains and Hills Regioin (XI)		
	Agro Climatic Zone (NARP)	Southern Zone (TN-5)		
	List all the districts or part thereof falling under the NARP Zone	Ramanathapuram, Tirunelveli , Tuticorin , Virudhunagar , Dindigul, Madurai, Pudukkottai		
	Geographic coordinates of district	Latitude	Longitude	Altitude
		9^0 50'43.45" N	78^0 29' 01.93" E	111 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Dryland Agricultural Research Station, Chettinad-630102		
	Mention the KVK located in the district	ICAR-KVK, Kundragudi-608102		
1.2	**Rainfall**	Average (mm)	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	238	1st Week of June	2nd Week of September
	NE Monsoon(Oct-Dec):	415	1st Week of October	1st Week of December
	Winter (Jan- Feb)	35		
	Summer (Mar-May)	135		
	Annual	823		

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area (`000 ha)	418.9	16.4	122.0	1.4	21.0	5.5	4.7	12.9	122.8

1. 4	**Major Soils**	Area (000 ha)	Percent (%) of total geographical area
	Very deep red	104.0	24.8
	Deep red	106.6	25.4
	Deep black	18.4	4.4
	Very deep black	42.3	10.1
	Moderately deep black	45.1	10.8
1.5	**Agricultural land use**	Area (000 ha)	Cropping intensity %
	Net sown area	113.6	100.0
	Area sown more than once	-	
	Gross cropped area	113.7	

1.6	**Irrigation**	Area (000 ha)		
	Net irrigated area	79.7		
	Gross irrigated area	79.7		
	Rainfed area	34.0		
	Sources of Irrigation	Number	Area ('000 ha)	% area
	Canals	Nil	-	
	Tanks	4966	65.4	84.9
	Open wells	16558	9.8	0.23
	Bore wells	1377	1.9	2.5
	Lift irrigation			
	Other sources	Nil	-	
	Total		77.1	100.0
	Pumpsets	18016	11.7	0.2
	Micro-irrigation	-	2.1	0.05
	Groundwater availability and use	No. of blocks	% area	Quality of water
	Over exploited	-		
	Critical	-		
	Semi- critical	3	27.7	
	Safe	9	72.3	
	Wastewater availability and use	Data not available		
	*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%			

1.7 Area under major field crops & horticulture etc.

1.7	**Major Field Crops cultivated**	**Area ('000 ha)**					
		Kharif		***Rabi***		**Summer**	**Total**
		Irrigated	***Rainfed***	***Irrigated***	***Rainfed***		
	Paddy	-	-	58.6	18.1	0.1	76.7
	Sugarcane	-	-	6.0	-	-	6.0
	Groundnut	0.5	3.7	0.3	0.6	-	5.2
	Pulses	0.018	0.6	0.06	0.2	-	1.0
	Sesame	0.04	0.1	0.3	1.0	-	1.5
	Horticulture crops - Fruits	7.8					
	Mango	1.6					
	Banana	0.6					
	Cashew	4.6					
	Horticultural crops - Vegetables	3.22					
	Chillies	3.0					

	Medicinal and Aromatic crops	-
	Plantation crops	6.7
	Coconut	6.1
	Fodder crops	0.075
	Total fodder crop area	-
	Grazing land	1.3
	Sericulture etc	-
	Others (Specify)	-

1.8	**Livestock**	**Male('000)**	**Female('000)**	**Total('000)**
	Non descriptive cattle (local low yielding)	52.6	109.1	161.7
	Cross bred cattle	11.6	54.5	66.1
	Non descriptive Buffaloes (local low yielding)	1.8	5.9	7.8
	Graded Buffaloes			
	Goat			227.0
	Sheep			243.7
	Others (Camel, Pig, Yak etc.,)			5.1
	Commercial dairy farms (Numbers)			
1.9	**Poultry**			**Total (number)**
	Commercial			7,20,831
	Backyard			7,15,907

1.10 A. Capture

i. Marine (Data Source : Fisheries Department)	**No. of Fishermen**	**Boats**		**Nets**		**Storage facilites (Ice plants etc.)**
		Mechanized	Non-Mechanized	Mechanized (Trawl nets, Gill nets)	Non-Mechanized (Shore Seines stake & trap nets)	

ii. Inland (Data Source : Fisheries Department)	**No. Farmer Owned Ponds**	**No. of Reservoirs**	**No. of Village tanks**
	640	--	603

B. Culture

	Water Spread Area (ha)	Yield (t/ha)	Production ('000 tons)
i. Brackish Water (Data Source: MPEDA / Fisheries Department)	--	--	--
ii. Fresh Water (Data Source : Fisheries Department)	77695		4950

1.11 Production and Productivity of major crops (Average of last 3 years: 2006, 07, 08)

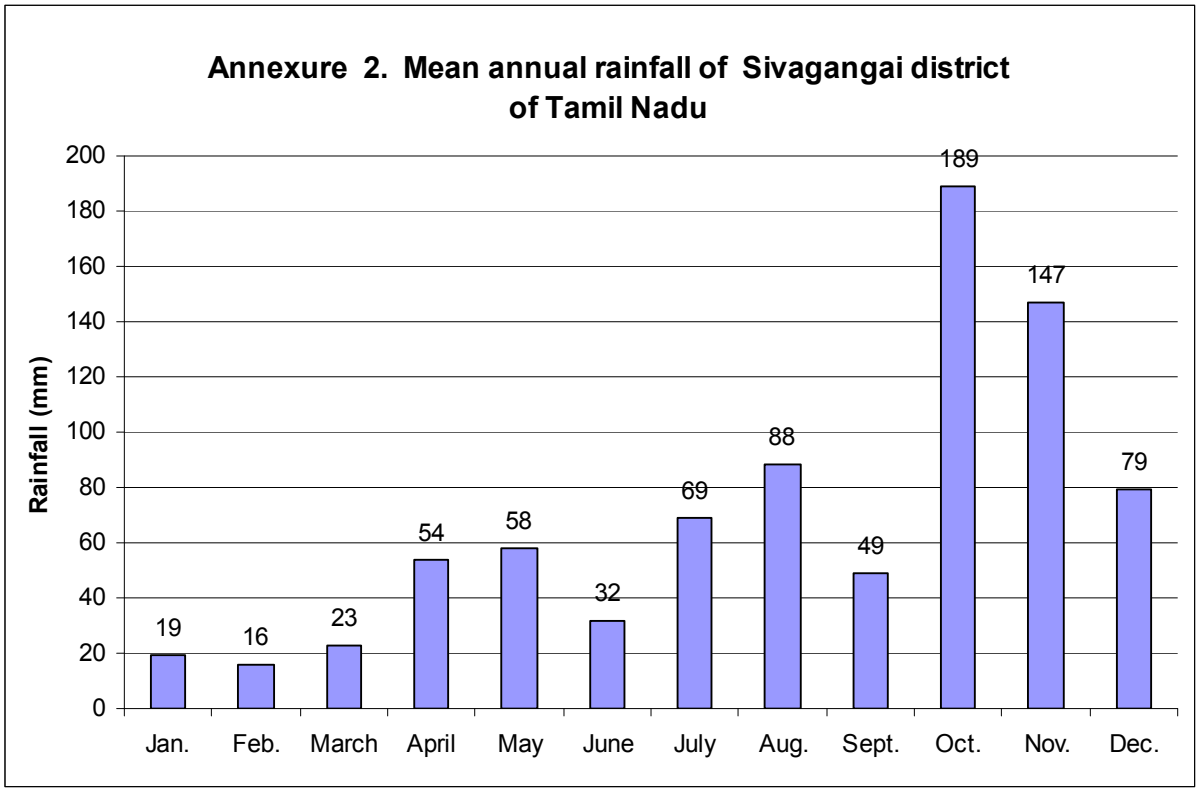
1.11	Name of crop	Kharif		Rabi		Summer		Total	
		Production (' 000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)
	Paddy	-	-	121.9	1025	0.4	3389	123.7	1029
	Sugarcane	-	-	-	-	-	-	602.2	101(t)
	Ground nut	3.0	685	1.4	1603	-	-	4.3	839
	Pulses (Black gram)	-	-	-	-	-	-	3.7	401
	Sesame	0.3	334	0.2	676	-	-	0.6	414
	Major Horticultural crops	-	-	-	-	-	-		
	Chillies	-	-	-	-	-	-	3.0	444
	Mango	-	-	-	-	-	-	6.1	1771
	Banana	-	-	-	-	-	-	35.4	47741

1.12	**Sowing window for 5 major crops**	Paddy	Sugarcane	Groundnut	Pulses	Gingelly
	Kharif- Rainfed	July 2nd week to August 1st week (late Kharif)	-	July 2nd week to August 1st week	-	July 2nd week to August 1st week
	Kharif-Irrigated	-		-		-
	Rabi- Rainfed	September 2nd week to October 2nd week	-	September 2nd week to October 2nd week	December 1st week	
	Rabi-Irrigated	-	November 3rd week to December 4th week	-	-	-

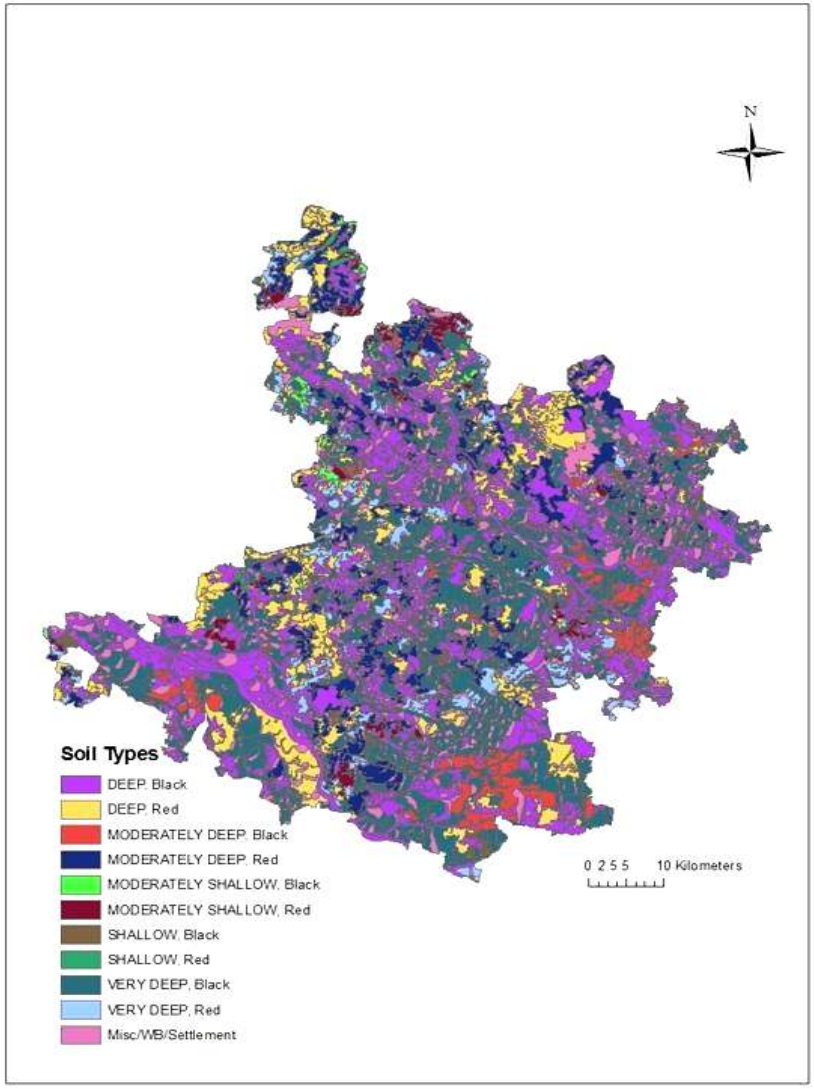
1.13	**What is the major contingency the district is prone to? (Tick mark and mention years if known during the last 10 year period)**	**Regular**	**Occasional**	**None**
	Drought	✓	-	-
	Flood	-	-	√
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Sea water intrusion	-	-	√
	Pests and diseases (Leaf folder and stem borer, Blast in rice, Groundnut leaf miner, Pulse pod borer)	✓		

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 Sivagangai district and the blocks



Annexure 3. Soil Map of Sivagangai district


N
Soil Types
DEEP, Black
DEEP, Red
MODERATELY DEEP, Black
MODERATELY DEEP, Red
MODERATELY SHALLOW, Black
MODERATELY SHALLOW, Red
SHALLOW, Black
SHALLOW, Red
VERY DEEP, Black
VERY DEEP, Red
Misc/WB/Settlement
0 2.5 5 10 Kilometers

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation (Kharif)

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 2 weeks (June 3rd week)	Deep and very deep red soils	Groundnut	Groundnut + Pigeon pea intercropping (6:1) Groundnut: TMV-7, VRI-2,JL-24, VRI3 Pigeon pea : VBN3 Groundnut based cropping system Continued up to July 15th	In Groundnut: • Mechanical sowing with tractor drawn seed drill as the sowing window is narrow • FYM enriched recommended phosphorous application • Seed hardening of soaking seeds with • 0.5 % MnSO4 and ZnSO4 for 6 hours • Inter-cultivation • Basal application of Rhizobium 2kg/ha • Seed treatment using Rhizobium 500g • Conservation furrow	Linkage with State Dept of Agriculture and engineering for supply of seeds and Seed drills Groundnut: Linkage with breeder seeds supply- ARS Virudhachalam and Thindivanam F1 seeds supply – Dept of a\agriculture
	Deep and very deep black soils	Sesame	No change	Seed hardening	
		Paddy	No change		

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks (July 1st week)	Deep and very deep red soils	Groundnut	Groundnut + Pigeon pea intercropping (6:1) Groundnut: TMV-7, JL-24, VRI-2,VRI3 Pigeon pea : VBN3 Groundnut based cropping system Continued up to July 30th	• Seed hardening of rice with 0.2 % KNO3 • Basal application of Rhizobium and Azospirillum 2kg/h a • Thinning to retain one seedling at 30 cm and crop residue mulching	Groundnut: Breeder seeds supply- ARS Virudhachalam and Thindivanam F1 seeds supply – Dept of agriculture Linkage with State Dept of agriculture and engineering for supply of seeds and Seed drills
	Deep and very deep black soils	Sesame	No change		
		Rice	No Change Prefer varieties like ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16		

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 6 (weeks July 3rd week)	Deep and very deep red soils	Groundnut	No change Prefer Groundnut varieties: TMV-7 JL-24, VRI-2, VRI3 Alternative crops: Black gram : VBN3, VBN 5 Green gram : VBN3 Jowar : CO26, CO28, Co 30, K Tall, APK1 Cowpea: CO7, CO6	• Seed drill sowing for pulses • Dry sowing 8-10 days before rains with 15-20% higher seed rate for jowar • Seed hardening of Groundnut, Sesame and pulses by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Thinning to retain one seedling at 30 cm • Basal application of Rhizobium 2kg/ha • Seed treatment using Rhizobium 500g	Supply of seeds through Dept of agriculture Supply of Seed drills through Dept of agriculture engineering
	Deep and very deep black soils	Sesame	No change. Prefer cultivars TMV5, TMV-7, SVPR1,2	• Seed hardening of Sesame by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Seed treatment using Rhizobium 500g • Basal application of Rhizobium 2kg/ha	
			Alternatively Sunflower: Sunbred, K2, Morden/ Coriander : CO2, CO3	• Seed hardening of Sunflower by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Seed treatment using Rhizobium 500g	

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 (August 1st week)	Deep and very deep red soils	Groundnut	No change. Prefer varieties TMV-7 JL-24, VRI-2, VRI3 Alternatively Black gram : VBN3, VBN 5 Green gram : VBN3 Cowpea: CO7, CO6	• Seed drill sowing for pulses • Crop residue mulching • Seed hardening of Groundnut, Sesame and pulses by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Thinning to retain one seedling at 30 cm • 2 % DAP spray for pulses • Basal application of Rhizobium 2kg/h and • Seed treatment using Rhizobium 500g	Supply of seeds through Dept of agriculture Supply of Seed drills through Dept of agriculture engineering
	Deep and very deep black soils	Sesame	No change. Go for varieties like TMV-7, TMV5, SVPR1,2 or Sunflower: Sunbred, CO4,K2, Morden / Coriander : CO2, CO3	• Crop residue mulching • Seed hardening by soaking seeds with 2 % KH_2PO_4 for 6 hours • Seed treatment using Rhizobium 500g	

2.1.2 Rainfed situation (Rabi Season)

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 2 weeks (October 3rd week)	Deep and very deep red soils	Groundnut	Groundnut + Pigeonpea intercropping (6:1) Groundnut: TMV-7 JL-24, VRI-2, VRI3 Pigeonpea : VBN3 , APK1 Groundnut based cropping system Continued up to July 15th	• Mechanical sowing with tractor drawn seed drill as the sowing window is narrow • FYM enriched recommended phosphorous application • Seed hardening by soaking seeds with 2 % KH_2PO_4 for 6 hours • Seed hardening of rice with 0.2 % KNO3 • Conservation furrow • Basal application of Rhizobium and Azospirillum 2kg/h and • Seed treatment using Rhizobium 500g • Thinning and crop residue mulching	Linkage with State dept of Agriculture for Seed drills and seeds supply
	Deep and very deep black soils	Sesame	Prefer varieties like TMV5, TMV-7, SVPR1,2		
		Rice	Prefer varieties like ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16		

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks (November 1st week)	Deep and very deep red soils	Groundnut	Groundnut + Pigeon pea intercropping (6:1) Groundnut: TMV-7 , VRI-2, JL 24, VRI3 Pigeon pea : VBN3 Groundnut based cropping system Continued up to July 30th	-Same as above-	Groundnut: Breeder seeds supply- ARS Virudhachalam and Thindivanam F1 seeds supply – Dept of agriculture
	Deep and very deep black soils	Sesame	No Change Prefer varieties like TMV5, TMV-7, SVPR1,2		
		Rice	No Change Prefer varieties like ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16		

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 6 weeks (November 3rd week)	Deep and very deep red soils	Groundnut	TMV-7 JL-24, VRI-2, VRI3 Black gram : VBN3, VBN 5 Green gram : VBN3 Cowpea: CO7, CO6 Jowar : CO26, CO28, K Tall, APK1	• Seed drill sowing for pulses • Dry sowing 8-10 days before rains with 15-20% higher seed rate for jowar • Seed hardening of Groundnut, Sesame and pulses by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Thinning to retain one seedling at 30 cm • FYM enriched recommended phosphate application • Basal application of Rhizobium 2kg/ha • 2% DAP spray	Linkage with State dept of Agriculture for Seed drills and seeds supply
	Deep and very deep black soils	Sesame	Prefer varieties like TMV 5, TMV-7, SVPR1,2 Sunflower: Sunbred, CO4,K2, Morden Coriander : CO2, CO3		
		Rice	ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16		

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	Deep and very deep red soils	Groundnut, Sesame, Groundnut: TMV-	Black gram : VBN3, VBN 5	• Seed drill sowing for pulses • Crop residue mulching • Seed hardening of Groundnut, Sesame	Linkage with State dept of Agriculture for Seed drills and seeds supply

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**
(December 1st week)		7 JL-24, VRI-7 Sesame: TMV-7, SVPR1,2	Green gram : VBN3 Cowpea: CO7, CO6 Sunflower: Sunbred, CO4,K2, Morden Coriander : CO2, CO3	and pulses by soaking seeds with 0.5 % MnSO4 and ZnSO4 for 6 hours • Thinning to retain one seedling at 30 cm • 2 % DAP spray for pulses • Rhizobium 2 kg/ha basal application • 2% DAP spray	
	Deep and very deep black soils	Rice	ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16		

Normal, mid season and terminal drought situations

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**	**Normal Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
	Deep and very deep red soils	Groundnut, Sesame	• Re sowing • Supplemental irrigation using micro irrigation system • Seed hardening of Groundnut, Sesame and pulses by soaking seeds with	Intercultivation (soil mulching) Opening of conservation furrows at an interval of 15-20 m	Linkage with State dept of Agriculture for Seed drills and seeds supply

Condition			Suggested Contingency measures		
Early season drought (Normal onset, followed by	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
	Deep and very deep black soils	Sesame	0.5 % MnSO4 and ZnSO4 for 6 hours • Thinning to retain one seedling at 30 cm • Crop residue mulching • Seed hardening of rice with 0.2 % KNO3 • Basal application of Azosprillum/ Rhizobium • 2 kg/ha		
		Rice			

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	Deep and very deep red soils	Groundnut, Sesame, Groundnut:TMV-7,JL-24,VRI-2, VRI3	• Supplemental irrigation if possible from harvested water • 2% DAP spray • 1% KCl spray • Kaolin spray • Water spray	• Intercultivation (soil mulching) • Opening of conservation furrows at an interval of 15-20 m • Earthing up, apply Gypsum after receipt of rains	Linkage with State Agriculture engineering dept for Seed drills and seeds supply Farm ponds through DRDA programme
	Deep and very deep black soils	Sesame: TMV5, TMV-7, SVPR1,2			

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Soil management**	**Remarks on Implementation**
		Rice : ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16			

Condition			Suggested Contingency measures		
Terminal drought	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Rabi Crop planning**	**Remarks on Implementation**
	Deep and very deep red soils	Groundnut, Sesame, Groundnut: TMV-7 JL-24, VRI-2, VRI3	• Supplemental irrigation if possible from harvested water • Harvest at physiological maturity stage	Transplanted rice (October 2nd week)	Groundnut digger and Stripper can be supplied through Dept of Agriculture Threshing implements through Dept of Agriculture
	Deep and very deep black soils	Sesame: TMV5, TMV-7, SVPR1,2			
		Rice : ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16			

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 tanks due to low rainfall	Low land tube well tank irrigated Deep and very deep red soils	Transplanted rice	SRI method of rice cultivation Rice: ADT36, ADT39, ADT 45 Sesame: TMV5,TMV7, SVPR1,2	• 25kg/ha ZnSO4 basal application • FYM enriched recommended phosphate application • Limited irrigation with mulching • Alternate Furrow irrigation • Zero tillage • Residue mulching • Sprinkler irrigation with mulching	Seeds and micro irrigation systems can be supplied through State Seed farm or seed corporation / Agri. Dept. /Agrl.Eng
	Upland land tube well tank irrigated Deep and very deep red soils	Groundnut	Groundnut + Pigeonpea (6:1) intercropping Groundnut:, TMV7, VRI2, VRI3 Pigeonpea: VBN 3, APK1	Sprinkler irrigation with Residue mulching	

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		- Not applicable -			

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		- Not applicable -			

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	Tube well Deep and very deep red soils and Deep and very deep black soils	Transplanted rice : ADT36, ADT37, PMK3 ,ADT43, ADT45, MDU5, ASD16 Groundnut	Groundnut :VRI2, TMV7, VRI3, JL 24 Sesame: TMV5, TMV7, SVPR1,2 No change	1. Sprinkler irrigation with mulching 2. crop residue mulching	1.Seeds can be supplied through Dept of Agriculture /Horticulture

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**
Groundnut	Provide drainage	Drain out excess water	Drain out excess water Harvesting at physiological maturity	Mechanical drying
Paddy	-	-	-	Mechanical drying
Sesame	Provide drainage	Drain out excess water	Drain out excess water	Mechanical drying

Pulses	Provide drainage	Drain out excess water	Drain out excess water	Mechanical drying
Sugarcane	-	-	-	-
Horticulture				
Chillies	Provide drainage	Drain out excess water	Drain out excess water	Mechanical drying
Heavy rainfall with high speed winds in a short span				
Horticulture				
Outbreak of pests and diseases due to unseasonal rains				
Groundnut	Need based plant protection Integrated Pest and Disease Management for paddy,	Need based plant protection Integrated Pest and Disease Management for paddy,		Safe storage against storage pest and diseases
Paddy				
Sesame				
Pulses				
Sugarcane				

2.3 Floods - Not applicable

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 contingency measures		
	Before the event	**During the event**	**After the event**
DROUGHT			
Feed and fodder availability	Storage management like silage making, haymaking and other traditional methods of fodder Preservation. Cultivation of drought resistant fodder crops and trees	Make use of adlibitum dry fodder with all essential nutrients. Leaves from fodder trees may be collected and can be fed to the animals. Fodder from drought resistant tree/crops may utilize.	Cultivation of available fodder crops and trees considering the future need. Plantation of as many as verities of fodders essential for animal rearing.

Drinking water	Storage of rain water and other available water sources in the form of Tank, Sump, Dam, Ponds, Lake etc., with all the precautionary measures. Advise render to test the water periodically with the help of water testing laboratory	Make use of storage water hygienically. Periodic utilization of available water with due consideration for future use.Make all measures for increasing the ground water level during the drought. Rain water and other waste water harvesting systems may be implemented	Storage of sufficient water for future need as specified
Health and diseases management	Animals should be protected by means of proper immunization for respective diseases and also follow proper deworming strategies. Ailing animals should be properly culled and eliminated from the area before drought or the animal should be treated properly	Tune our attention towards feeding and watering which inturn improves the health status of animals. Ailing animals should be treated properly.	Slowly introduce different types of new feeding regimes. Also take health measures deworming, immunization and also follow routine procedures as adopted routinely.
FLOOD			
Feed and fodder availability	Storage of feed and fodders at an elevated levels. Animal should be grazed only on the elevated places and not allow them near water logging areas	Use of stored feed and fodder stuffs. Animals should be eliminated to a safe custody.	Cultivation and preservation of feed stuffs for future use. First aid measures for all animals to be taken.
Drinking water	Hygienically safe water may be stored for future use considering the prevailing situation. Advise render to test the water periodically with the help of water testing laboratory	Avoid animals for consuming flood water. Dislocate all animals from near by water logged areas.	Harvest clean and hygienic water sources and store them effectively.
Health and diseases management	Rearing of animals to the elevated areas. Close confinement and proper monitoring of animals. Preparation of strong and effective housing with all levels of protection. Proper immunization, deworming and other prevention measures.	Proper treatment of unhealthy and ailing animals. Secure animals for treating wounds and other minor and major ailments. Immunomodulator should be used. Other strict hygienic measures to be adopted.	Sick animals due to flooding to be treated properly Immunization and deworming to be adopted effectively. Hygienic feeding and watering to be supplied continuously

		Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	
CYCLONE			
Feed and fodder availability	Cyclone resistant trees and fodder crops should be cultivated Proper cyclone free fencing should be provided	Animals should be housed in a safe custody. Feed and fodders should be placed in a close confinement.	As specified earlier all possible ways to be followed.
Drinking water	Storage of hygienic water from all available sources Advise render to test the water periodically with the help of water testing laboratory	Animal should be rescued and placed in well protected areas. Shelter should be provided with thunder absorbents.	Hygienic and clean water should be provided.
Health and diseases management	Animals should be protected by means of proper immunization for respective diseases and also follow proper deworming strategies. Ailing animals should be properly culled and eliminated from the area before drought or the animal should be treated properly	Tune our attention towards feeding and watering which inturn improves the health status of animals. Ailing animals should be treated properly. Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	Slowly introduce different types of new feeding regimes. Also take health measures deworming, immunization and also follow routine procedures as adopted routinely.
HEAT WAVE AND COLD WAVE			
Shelter/ environment management	Shed / shelter should be placed as per scientific direction. Air flow to the shelter should be properly monitored. Roofing should be placed with fire heat or cold resistant materials.	Remove all animals to the safe custody.	Renovation works to be carried out.

Health and diseases management	Roofing should be monitored for not passing of heat and cold waves.	Ailing animals should be primarily treated for burns or scalds. Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	Treat animals accordingly.

2.5.2 POULTRY

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
DROUGHT			
Shortage of feed ingredient	Educate and motivate the farmers to cultivate feed ingredient for future use. Tripartite agreement for banker, farmer and poultry corporate procurer for sustainable production and supply of feed ingredient.	Procured feed ingredients from available sources may be utilized.	Cultivate the feed ingredient as specified
Drinking water	Store rain water and other available water sources in the form of Tank, Sump, Dam, Ponds, Lake etc., with all precautionary measures Advise render to test the water periodically with the help of water testing laboratory	Make use of storage water hygienically. Periodic utilization of available water with due consideration for future use. Make all measures for increasing the ground water level during the drought. Rain water and other waste water harvesting systems may be implemented	Storage of sufficient water for future need as specified
Health and diseases management	Birds should be protected by means of proper immunization for respective diseases and also follow proper deworming strategies. Ailing birds should be properly culled and eliminated from the flock before drought or the birds should be treated properly for a particular disease.	Unconventional feed stuffs should be used. Restricted feeding regime to be adopted. Skip feeding (once in two days). Artificial moulting of birds. Concentrate more on feeding and watering which inturn improves the health status of birds. Ailing birds should be treated properly. Any mortality due to the natural calamities should be Immediately report to the higher authority of the	Slowly introduce different types of new feeding regimes. Also take health measures deworming immunization and also follow routine procedures as adopted in the farm.

		district.	
FLOOD			
Shortage of feed ingredient	Cultivation and production of feed ingredients sufficiently for future use.	Make use of unconventional feed ingredients.	Cultivation and preservation of feed stuff for future use First aid measures for all birds to be taken.
Drinking water	Hygienically safe water might be stored for future use. Advise render to test the water periodically with the help of water testing laboratory	Avoid birds for consuming flood water Dislocate all birds from near by water logging areas.	Harvest clean and hygienic water sources and store them effectively.
Health and diseases management	Stress reducing substances may be used. Birds brought to the elevated areas Close confinement and proper monitoring. Preparation of strong and effective housing with all level of protection. Proper immunization and deworming	Alternate to deep litter, Cage system of rearing may adopted Elevated shed may be used for housing of birds. Proper treatment of unhealthy and ailing birds. Immunomodulator should be used. Other strict hygienic measures to be adopted Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	Sick birds due to flooding to be treated properly Immunitization and deworming to be adopted effectively. Hygienic feeding and watering to be supplied continuously.
CYCLONE			
Shortage of feed ingredient	Procure all available feed ingredients and store them without fungal contamination. Rat proof storage area may be built for the use.	Utilize the stored feed ingredients.	Plan in such a way to make and procure feed ingredients for use in the poultry farm.
Drinking water	Storage of hygienic water from all available sources Advise render to test the water periodically with the help of water testing laboratory	Birds should be rescued and placed in well protected areas. Shelter should be provided with thunder absorbent.	Hygienic and clean water should be provided.
Health and diseases management	Proper cyclone free fencing should be provided. Birds should be protected by means of proper immunization for respective diseases and also follow proper deworming strategies. Ailing birds should be properly culled and eliminated from the area before disaster or the birds should be treated properly	Tune our attention towards feeding and watering which inturn improves the health status of animals. Ailing animals should be treated properly. Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	Slowly introduce different types of new feeding regimes. Also take health measures deworming, immunization and also follow routine procedures as adopted routinely.

HEAT WAVE AND COLD WAVE			
Shelter/ environment management	Highly inflammable materials like petrol, kerosine to be prohibited at farm premises. Electrical line should be kept in a secured way. Roofing should be monitored for not passing of heat and cold waves. All precautionary measures to inform authority to be taken.	Fan, fogger in heat wave and heater in cold wave to be fixed at shed.	Treat animals accordingly.
Health and diseases management	Restricted feeding and energy less feed to be given to the birds interims of reduce the fattiness of the birds Immunization for respective diseases and also follow proper deworming strategies. Ailing birds should be properly culled and eliminated from the area before disaster or the birds should be treated properly	Heat stress protected supplement to be added in the feed ingredients. Also increase energy level at cold climatic condition. Any mortality due to the natural calamities should be Immediately report to the higher authority of the district.	Slowly introduce different types of new feeding regimes. Also take health measures deworming, immunization and also follow routine procedures as adopted routinely

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
(iii) Any other			
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	• Steps to improve the quality of stocked fishes, via supplementary feed/fertilizer water quality

		artificial ponds (if available) for tiding over the drought	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
(iii) Any other	--	--	--
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	• In extreme conditions, controlled draining of flooded	• Repair damaged bunds • Collect and preserve existing stock

	• Increasing bund height and improve bund strength • Improve land drainage to allow easy and quick flow of flood waters	ponds • Thinning of stock by harvesting of larger individuals	
(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
(vi) Any other			
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)	--	--	--
(vi) Any other	--	--	--

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	-	-	-