

**State: KERALA**

**Agriculture Contingency Plan for District: MALAPPURAM**

1.0 District Agriculture profile					
<b>1.1</b>	<b>Agro-Climatic/Ecological Zone</b>	Central Zone			
	Agro Ecological Sub Region (ICAR)	High lands: Central and south Sahyadris, hot moist, subhumid to humid eco-subregion (19.2) Coastal belt: Konkan, Karnataka and Kerala Coastal Plain, hot humid to perhumid eco-subregion (19.3)			
	Agro-Climatic Region (Planning Commission)	West coast plains and ghat region (XII)			
	Agro Climatic Zone (NARP)	Central Zone (KE-3)			
	List all the districts or part thereof falling under the NARP Zone	Malappuram, Thrissur, Ernakulam, Palakkad, Wayanad			
	Geographic coordinates of district	Latitude	Longitude	Altitude	
		10 <sup>0</sup> 40 - 11 <sup>0</sup> 32 N	75 <sup>0</sup> 48 - 76 <sup>0</sup> 33 E	40 MSL	
	Name and address of the concerned ZRS/ ZARS/	RARS Pattambi, Mele Pattambi P.O., Palakkad Pin-679306			
Mention the KVK located in the district	Krishi Vigyan Kendra, Tavanur P.O., Malappuram Pin- 679573				
<b>1.2</b>	<b>Rainfall</b>	Normal RF(mm)	Normal Rainy days (number)	Normal Onset ( specify week and month)	Normal Cessation (specify week and month)
	SW monsoon (June-Sep):	2053.0	81	First week of June	First week of September
	NE Monsoon(Oct-Dec):	458.1	13	Second week of October	Second week of November
	Winter (Jan- March)	5.5	1	-	-
	Summer (Apr-May)	276.5	11	-	-
	Annual	2793.3	106	-	-

<b>1.3</b>	<b>Land use pattern of the district</b> (latest statistics)Source: <b>(Farm Guide 2011)</b>	Geographical area ('000 HA)	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
	<b>Area ('000 ha)</b>	355.4	103.4	39.5	0.017	5.0	Not available	1.8	9.9	4.6

<b>1.4</b>	<b>Major Soils (common names like shallow red soils etc.,)</b>	<b>Area ('000 ha)</b>	<b>Percent (%) of total</b>
	1. Loamy sand soils	20.4	5.7
	2. Laterite soils	248.7	70.5
	3. Silty clay loam soils	49.0	14.1
	4. Clay loam soils	36.6	10.6
	Others (specify):		
<b>1.5</b>	<b>Agricultural land use</b>	<b>Area ('000 ha)</b>	<b>Cropping intensity %</b>
	Net sown area	185.0	132%
	Area sown more than once	59.4	
	Gross cropped area	244.6	

<b>1.6</b>	<b>Irrigation</b>	<b>Area ('000 ha)</b>		
	Net irrigated area	23.7		
	Gross irrigated area	26.5		
	Rainfed area	161.4		
	<b>Sources of Irrigation</b>	<b>Number</b>	<b>Area ('000 ha)</b>	<b>Percentage of total irrigated area</b>
	Canals		1.5	5.50

Tanks	NA	2.6	10.0
Open wells	NA	12.02	45.2
Bore wells	NA	0.312	1.174
Lift irrigation	NA	4.4	16.6
Micro-irrigation			
Other sources		6.0	22.6
Total Irrigated Area		26.8	
Pump sets	179		
No. of Tractors	272		
<b>Groundwater availability and use* (Data source: State/Central Ground water Department /Board)</b>	No. of blocks/ Tehsils	(% area)	
Over exploited	nil		
Critical	nil		
Semi- critical	Nil		
Safe	14	61 %	
Wastewater availability and use	N.A.		
Ground water quality	Generally good		

### 1.7 Area under major field crops & horticulture etc. (2008-09)

1.7	Major Field Crops cultivated	Area ('000 ha)					
		Kharif		Rabi		Summer	Total
		Irrigated	Rainfed	Irrigated	Rainfed		
	Paddy		1.7	7.7		1.5	11.0
	Sesamum					0.2	0.2
	<b>Horticulture crops - Fruits</b>	<b>Total area</b>					
	Banana	8.7					

	<b>Horticultural crops - Vegetables</b>	<b>Total area</b>
	Cucumber	0.4
	Pumpkin	0.2
	Ash gourd	0.2
	Bitter gourd	0.1
	Ladies Finger	0.1
	<b>Medicinal and Aromatic crops</b>	<b>Total area</b>
	Medicinal plants	0.04
	Lemon grass	0.004
	<b>Plantation crops</b>	<b>Total area</b>
	Coconut	105.8
	Rubber	36.9
	Arecanut	19.5
	Pepper	6.0
	Cashew	5.4
	<b>Fodder crops</b>	<b>Total area</b>
	Fodder grass	0.04
	<b>Total fodder crop area</b>	0.04
	<b>Grazing land</b>	-
	<b>Sericulture etc</b>	-
	<b>Others (Specify) Betelvine</b>	0.2

<b>1.8</b>	<b>Livestock</b>	<b>Male ('000)</b>	<b>Female ('000)</b>	<b>Total ('000)</b>
	Non descriptive Cattle (local low yielding)	2.2	5.3	7.5
	Crossbred cattle	24.1	100.3	124.4
	Non descriptive Buffaloes (local low yielding)	1.5	2.9	4.4
	Graded Buffaloes	0.4	5.8	6.3
	Goat	73.8	78.0	151.8
	Sheep	Nil	nil	Nil
	Others (Camel, Pig, Yak etc.)	1.6	0.6	2.2
	Commercial dairy farms (Number)			150
<b>1.9</b>	<b>Poultry</b>	<b>No. of farms</b>	<b>Total No. of birds ('000)</b>	

	Commercial						
	Backyard					772.6	
<b>1.10</b>	<b>Fisheries</b> (Data source: Chief Planning Officer)						
	<b>A. Capture</b>						
	<b>i) Marine</b> (Data Source: Fisheries Department)	<b>No. of fishermen</b>	<b>Boats</b>		<b>Nets</b>		<b>Storage facilities (Ice plants etc.)</b>
			Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
		<b>86440</b>	<b>1640</b>	<b>1200</b>	<b>23678</b>	<b>364</b>	
	<b>ii) Inland</b> (Data Source: Fisheries Department)	<b>No. Farmer owned ponds</b>		<b>No. of Reservoirs</b>	<b>No. of village tanks</b>		
		<b>3519</b>			<b>93</b>		
	<b>B. Culture</b>						
		<b>Water Spread Area (ha)</b>	<b>Yield (t/ha)</b>	<b>Production ('000 tons)</b>			
	<b>i) Brackish water</b> (Data Source: MPEDA/ Fisheries Department)	45.9	1.0	0.04			
	<b>ii) Fresh water</b> (Data Source: Fisheries Department)	168.0	3.0	0.5			
	<b>Others</b>						

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

1.11	Name of crop	Kharif		Rabi		Summer		Total		Crop residue as fodder ('000 tons)
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	
<b>Major Field crops (Crops to be identified based on total acreage)</b>										
	Paddy	7.7	2068.2	17.6	2010.4	5.2	3377.5	30.7	2183.3	-
	Sesamum	-	-	-	-	0.1	366.5	0.1	366.5	-
<b>Major Horticultural crops (Crops to be identified based on total acreage)</b>										
	Coconut	-	-	-	-	-	-	864 million nuts	7788nuts/ha	-
	Rubber	-	-	-	-	-	-	50.1	1505.00	-
	Arecanut	-	-	-	-	-	-	16.6	897.00	-
	Banana	-	-	-	-	-	-	93.3	7716.25	-
	Pepper	-	-	-	-	-	-	1.2	119.00	-
Others	Cashew	-	-	-	-	-	-	5.4	546.75	-

1.12	Sowing window for 5 major field crops (start and end of normal sowing period)	Rice	Sesamum
		Khharif- Rainfed	Second fortnight of May – Second fortnight of June
Khharif-Irrigated	-	-	
Rabi- Rainfed	First fortnight of September		
Rabi-Irrigated	September - October		
Summer		December - January	

1.1 3	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 (specify)			
	Others			

1.14	Include Digital maps of the district for	Location map of district within State as Annexure I	Enclosed: No
		Mean annual rainfall as Annexure 2	Enclosed: No
		Soil map as Annexure 3	Enclosed: No

## 2.0 Strategies for weather related contingencies

### 2.1 Drought

#### 2.1.1 Rainfed situation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)  Delay by 2 weeks June 3 <sup>rd</sup> week	Tripangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Treble cropped wet land</b>	Rice- Rice- Rice	No change	<ul style="list-style-type: none"> <li>Go for direct seeding in the first crop with Short duration variety like Jyothi.</li> <li>Adopt mat nursery preparation and mechanized transplanting for 2<sup>nd</sup> and 3<sup>rd</sup> crop with short duration varieties</li> </ul>	The mechanization part can be implemented with District Panchayat and Krishi bhavan projects
	Tripangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Double cropped wet lands</b>	Rice-Rice	No change	<ul style="list-style-type: none"> <li>Direct seeding with the use of pre emergent herbicides can be taken up.</li> <li>Short duration varieties must be chosen for the first crop Mechanized transplanting and mat nursery preparation can be adopted in all areas except heavy clay soils</li> <li>Adopt closer spacing and higher dose of N if older seedlings are to be used</li> </ul>	-do-
		Rice-Rice- Vegetables			
Rice-Rice-Sesamum					
Tripangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam	Rice-Banana		<ul style="list-style-type: none"> <li>Adopt short duration varieties; Go for direct sowing of Rice to enable early planting of banana.</li> <li>Mechanized planting can be adopted in other than heavy clayey areas</li> </ul>	Link with Panchayats for mechanization	



	series gravelly clay  <b>Single cropped wet lands</b>	Rice-Tapioca		<ul style="list-style-type: none"> <li>• Adopt short duration varieties Go for direct sowing to enable early planting of Tapioca.</li> <li>• Mechanized planting can be adopted in other than heavy clayey areas</li> <li>• Select short duration varieties of Tapioca like Vellayani Hraswa</li> </ul>	The availability of SD variety of Tapioca is to be ensured with CTCRI  Link with Panchayats for mechanization
		Rice-Fallow-Pulses		<ul style="list-style-type: none"> <li>• Better to go for late planting with medium duration varieties such as Uma as the second crop season is fallow</li> </ul>	Linkage with Panchayats
		Fallow-Fallow-Rice(Typical kole lands)		<ul style="list-style-type: none"> <li>• No measures required as there is no crop during the first two crop seasons</li> </ul>	
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam <b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	No change	<ul style="list-style-type: none"> <li>• Do mulching with crop residues, dry leaves, etc.</li> <li>• Follow Micro sprinkler irrigation.</li> <li>• Do organic manuring with vermicompost.</li> </ul>	Linked with SHM scheme on micro irrigation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)					
Delay by 4 weeks July 1 <sup>st</sup>	Triprangode Series loamy sand Angadipuram series sandy clay loam	Rice- Rice- Rice	No change. But go for Short duration varieties in 3	<ul style="list-style-type: none"> <li>• Wet seeding and sowing of pre germinated seeds can be done</li> </ul>	Linkage with seed village programme

<b>week</b>	Naduvattom series clay loam Mannamkulam series gravelly clay <b>Treble cropped wet land</b>		seasons		
			Medium duration Rice for early second crop+ Vegetables	<ul style="list-style-type: none"> <li>Water , if available from water harvesting structure change in cropping system need not be adopted</li> </ul>	Department schemes on water harvesting can be linked
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Double cropped wet lands</b>	Rice-Rice	No change	<ul style="list-style-type: none"> <li>Possible with protective irrigation from water harvesting structures</li> <li>Do mulching and organic manuring for vegetables</li> <li>Adopt mechanization for Rice</li> </ul>	Department schemes on water harvesting can be linked Department schemes for mechanization + NREGS can be utilized
		Rice-Rice- Vegetables	Medium duration Rice + vegetables		
		Rice-Rice-Sesamum	Medium duration Rice + Sesamum		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Single cropped wet lands</b>	Rice-Banana	No change	<ul style="list-style-type: none"> <li>Go for short duration paddy like Hraswa adopting mechanization</li> </ul>	Panchayat schemes on mechanization + NREGS
		Rice-Tapioca	No change	<ul style="list-style-type: none"> <li>Go for short duration variety of Rice and short duration variety of Tapioca Vellayani Hrawswa</li> </ul>	
		Rice-Fallow-Pulses	No change	<ul style="list-style-type: none"> <li>Mulching + selection of short duration and hardy pulses like Greengram</li> </ul>	
		Fallow-Fallow-Rice(Typical kole lands)	No change		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam <b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	No change	<ul style="list-style-type: none"> <li>Adopting mulching practices</li> <li>Continue micro irrigation till the onset of monsoon</li> <li>Delay fertilizer application</li> <li>Adopt copious organic manure application</li> <li>Apply lime upto about 2 meters on the trunk of the coconut palms to protect from untimely high temperature</li> </ul>	Department of Agriculture Micro irrigation scheme

<b>Condition</b>			<b>Suggested Contingency measures</b>		
<b>Early season drought (delayed onset)</b>	<b>Major Farming situation</b>	<b>Normal Crop/cropping system</b>	<b>Change in crop/cropping system</b>	<b>Agronomic measures</b>	<b>Remarks on Implementation</b>
<b>Delay by 6 weeks July 3<sup>rd</sup> week</b>	Not Applicable				Department schemes on water harvesting can be utilized Linked with Pulses scheme of the Department of Agriculture

<b>Condition</b>			<b>Suggested Contingency measures</b>		
<b>Early season drought (delayed onset)</b>	<b>Major Farming situation</b>	<b>Normal Crop/cropping system</b>	<b>Change in crop/cropping system</b>	<b>Agronomic measures</b>	<b>Remarks on Implementation</b>
<b>Delay by 8 weeks August 1<sup>st</sup> week</b>	Not Applicable				Linkage with district panchayath and Dept schemes on micro irrigation

<b>Condition</b>			<b>Suggested Contingency measures</b>		
<b>Early season drought (Normal onset)</b>	<b>Major Farming situation</b>	<b>Normal Crop/cropping system</b>	<b>Crop management</b>	<b>Soil nutrient &amp; moisture conservation measures</b>	<b>Remarks on Implementation</b>
<b>Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.</b>	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Treble cropped wet land</b>	Rice- Rice- Rice	Give life saving irrigation using harvested water. Application of P and K as basal, Reduce N dose	<ul style="list-style-type: none"> <li>• Apply bulky organic manures.</li> <li>• Restrict irrigation to critical stages only</li> </ul>	Link with Lift irrigation scheme of Minor irrigation Department

<p>Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Double cropped wet lands</b></p>	Rice-Rice	Give life saving irrigation using harvested water. Application of P and K as basal, Reduce N dose	
	Rice-Rice- Vegetables	Select short duration varieties for second crop Follow micro irrigation and mulching for vegetables. Foliar application of nutrients.	
	Rice-Rice-Sesamum	Select short duration varieties for second crop. Select varieties like Thilak for third crop. Foliar application of nutrients can be done	
<p>Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Single cropped wet lands</b></p>	Rice-Banana	Give life saving irrigation using harvested water. Application of P and K as basal, Reduce N dose.	<ul style="list-style-type: none"> <li>• Apply bulky organic manures. Mulching and micro irrigation for banana</li> </ul>
	Rice-Tapioca	Give life saving irrigation using harvested water. Application of P and K as basal, Reduce N dose	<ul style="list-style-type: none"> <li>• Apply bulky organic manures.</li> </ul>
	Rice-Fallow-Pulses	Give irrigation at critical stages of the crop	

		Fallow-Fallow-Rice(Typical kole lands)			
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam <b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	<i>In situ</i> green manuring and vermicompost application	<ul style="list-style-type: none"> <li>Husk burial, mulching, intercropping with cover crops</li> </ul>	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
<b>Mid season drought (long dry spell, consecutive 2 weeks rainless (&gt;2.5 mm) period)</b>					
<b>At vegetative stage</b>	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay  <b>Treble cropped wet land</b>	Rice- Rice- Rice	Foliar application of Urea 2% at 2 weeks interval. Under semidry situation, wherein sowing is already over, practice thinning of crop stand, reduce plant population and use the biomass as mulch Life saving irrigation with available water.	Application of P and K as basal Reduce N dose.	Link with Dept. Schemes, NREGS
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum		Application of P and K as basal, Reduce N dose. Mulching, microirrigation	

	clay <b>Double cropped wet lands</b>				
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Single cropped wet lands</b>	Rice-Banana Rice-Tapioca Rice-Fallow-Pulses Fallow-Fallow-Rice(Typical kole lands)			
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam <b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	Life saving irrigation		

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Mid season drought (long dry spell)					
At flowering/ fruiting stage	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay	Rice- Rice- Rice	If the Rice crop fails it can be cut and converted to use as fodder/silage. Wherever possible provide life saving irrigation	Mulching, micro irrigation. Do frequent application of low dose of N	SHM, RKVY, NREGS, Dept. schemes

	<b>Treble cropped wet land</b>				
	<p>Tripangode Series loamy sand          Angadipuram series sandy clay loam          Naduvattom series clay loam          Mannamkulam series gravelly clay</p> <p><b>Double cropped wet lands</b></p>	<p>Rice-Rice          Rice-Rice-Vegetables          Rice-Rice-Sesamum</p>			
	<p>Tripangode Series loamy sand          Angadipuram series sandy clay loam          Naduvattom series clay loam          Mannamkulam series gravelly clay</p> <p><b>Single cropped wet lands</b></p>	<p>Rice-Banana          Rice-Tapioca          Rice-Fallow-Pulses          Fallow-Fallow-Rice          (Typical kole lands)</p>			
	<p>Tripangode Series loamy sand          Angadipuram series sandy clay loam          Naduvattom series clay loam          Mannamkulam series gravelly clay</p> <p>Vazhikkadavu series sandy clay loam</p> <p><b>Garden lands</b></p>	<p>Coconut based homesteads with Arecanut , Banana and Pepper</p>	<p>Life saving irrigation, Husk burial, cover cropping</p>	<p>Mulching, micro irrigation.          Do frequent application of low dose of N</p>	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Rabi Crop planning	Remarks on Implementation
Terminal drought	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Treble cropped wet land</b>	Rice- Rice- Rice	Give life saving irrigation If the Rice crop fails it can be cut and converted to use as fodder/silage	<ul style="list-style-type: none"> <li>• Use short duration varieties for 2<sup>nd</sup> crop</li> <li>• Maintain the soil in sub-saturated condition, follow alternate drying and wetting</li> <li>• 2<sup>nd</sup> crop of Rice can be skipped so that the vegetables can start early</li> <li>• Banana and Tapioca can be intercropped with cowpea in the initial 3 months</li> <li>• Arecanut, Banana and Pepper have to be given mulching</li> </ul>	Linked with minor irrigation Department for pumping water from Lift irrigation schemes  Link with Micro irrigation, water harvesting and seed supply schemes of the Department of Agriculture
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Double cropped wet lands</b>	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum	Adopt mulching and micro irrigation for vegetables		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Single cropped wet lands</b>	Rice-Banana Rice-Tapioca Rice-Fallow-Pulses Fallow-Fallow-Rice(Typical kole lands)	Adopt micro irrigation for banana and vegetables		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam <b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	Continue mulching practices with crop residues, dry leaves, etc. for coconut		



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	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Treble cropped wetland</b>	Rice-Rice-Rice	Rice-sesame/pulses	<ul style="list-style-type: none"> <li>• Avoid transplanting till sufficient water is received.</li> <li>• Follow stress irrigation schedule as per package.</li> <li>• Exploit harvested water</li> </ul>	Linked with NREGS for cropping activities of Sesamum and pulses
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay <b>Double cropped wet lands</b>	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Limited release of water in canals due to low rainfall	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay  <b>Treble cropped wetland</b>	Rice-Rice-Rice	Rice (short duration) - hardy pulses/Sesamum	<ul style="list-style-type: none"> <li>Irrigation at critical stages only.</li> <li>Raising community nursery</li> <li>Cultivation of drought tolerant varieties like Vaisakh, Swarnaprabha, etc</li> <li>If irrigation water is available at later stage and transplanting is delayed adopt closer spacing, increase the number of seedlings to 3-4 numbers/hill and give additional N @ 5 Kg/ha</li> <li>Bund planting/ Fringe cropping with vegetables such as cowpea can also be adopted</li> </ul>	
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay  <b>Double cropped wet lands</b>	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum	Rice (short duration) - hardy pulses/Sesamum	Irrigation at critical stages only.	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Non release of water in canals under delayed onset of monsoon in catchment	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay	Rice-Rice-Rice	Rice-pulses/sesame	Follow mulching practices, Adopt micro irrigation for rabi/summer crop	Dept. scheme on pulses and micro irrigation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
	<b>Treble cropped wetland</b>		Use short duration varieties for Rice, vegetables and Sesamum	Follow mulching practices for vegetables , Adopt micro irrigation for rabi/summer crop	Dept. scheme on pulses and micro irrigation
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay  <b>Double cropped wet lands</b>	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum			

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall	Treble cropped wet lands Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly	Rice-Rice-Rice	Rice-Rice-Sesame	Check dams, Percolation pits, Rain water harvesting, Water conservation measures	Water harvesting and micro irrigation schemes of dept., NREGS
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay  <b>Double cropped wet lands</b>	Rice-Rice Rice-Rice-Vegetables Rice-Rice-Sesamum	Rice- pulses/sesame		

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay	Rice-Banana Rice-Tapioca Rice-Fallow-Pulses Fallow-Fallow-Rice(Typical kole lands)	Rice (short duration) – short duration Tapioca		
	<b>Single cropped wet lands</b>				
	<b>Garden lands</b>	Coconut based homesteads with Arecanut , Banana and Pepper	No change		

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

Condition	Suggested contingency measure			
	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
<b>Continuous high rainfall in a short span leading to water logging</b>				
Rice	Improve drainage facility	Improve drainage facility	<ul style="list-style-type: none"> <li>Improve drainage facility, Cultivation of varieties having seed dormancy, Harvest the crop at physiological maturity.</li> </ul>	Improve storage facility/godowns
<b>Horticulture</b>	Provide drainage facilities to perennials. In case of crop failure (banana, vegetables) plant short duration varieties of vegetables, pulses, oilseeds, minor millets, tuber crops etc and store the excess rain water			
Coconut				
Arecanut				
Banana				
Pepper				
Vegetables				
<b>Heavy rainfall with high speed winds in a short span</b>				

Rice	Not applicable for Rice	Provide better storage facility to store coconut, Arecanut,
<b>Horticulture</b>		
Banana, vegetables Arecanut, Coconut, pepper	Improve drainage facility Provide Shelter belts, Follow alley cropping, Improve drainage facility, Do propping of banana, Ensure that Crop insurance is done	
<b>Outbreak of pests and diseases due to unseasonal rains</b>		
Rice	Cultivation of resistant varieties, Use disease free healthy planting material. Application of bio-control agents like Pseudomonas against fungal diseases in banana and Trichoderma enriched FYM for coconut against stem bleeding, Use of disease free seeds, Proper seed treatment, Balanced application of fertilizers, Phyto-sanitation, provide better drainage, Crop insurance	Take precautionary treatment of storage structures with chemicals against stored product pests
<b>Horticulture</b>		
Coconut		
Arecanut		
Banana		
Pepper Vegetables		

### 2.3 Floods

Condition	Suggested contingency measures			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
<b>Transient water logging/ partial inundation<sup>1</sup></b>				
Rice	Give proper drainage and gap filling in early stages. Prefer to all varieties in areas where such transient water logging is anticipated			Harvest the crop at physiological maturity, Cultivation of varieties having seed dormancy
<b>Horticulture</b>				
Coconut	Timely cleaning, de-silting and deepening of natural water reservoir and drainage channels, Construction and protection of all the flood protection embankments, ring bunds and other bunds.			
Arecanut				
Banana	Follow raised bed/mount/ridge planting/mount planting			
Pepper	Timely cleaning, de-silting and deepening of natural water reservoir and drainage channels, Construction and protection of all the flood protection embankments, ring bunds and other bunds.			
Vegetables	Follow raised bed/mount/ridge planting/mount planting and provide adequate drainage			

<b>Continuous submergence for more than 2 days</b>		
Rice	Shift to direct seeding of short duration varieties if crop fails. If the crop fails and water recedes grow short duration varieties of pulses, oilseeds, minor millets, green manure crops, Cultivation of flood tolerant varieties, Crop insurance, Improve drainage facility,	
<b>Horticulture</b>		
Coconut	Improve drainage by deepening and cleaning of drainage channels	
Arecanut		
Banana		
Pepper		
Vegetables		

#### 2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone - Nil

<b>Condition</b>	<b>Suggested contingency measures</b>
Heatwave	NA
Coldwave	NA
Frost	NA
Hailstorm	NA
Cyclone	NA

#### 2.5 Contingent strategies for Livestock, Poultry & Fisheries

##### 2.5.1 Livestock

	<b>Suggested contingency measures</b>		
	<b>Before the event</b>	<b>During the event</b>	<b>After the event</b>
<b>Drought</b>			
Feed and fodder availability	Feed can be stored and fodder converted to silage & hay. Store concentrates. Cultivation of	Fodder converted to silage and Hay can be used. Straw also can be used for feeding. Concentrates stored can be	When rain starts, fodder cuttings can be planted and seed can be sown for getting enough fodder.

	fodder trees.	utilized.	
Drinking water	Storage of water in tanks	Stored water can be used and cold water used for drinking	Rain water harvesting should be done.
Health and disease management	Vaccination of animals Planting of trees should be done around the shed	Shed should be clean. Allow cool air to flow inside the shed. Proper ventilation of shed. Grazing to be restricted during cool hours of the day. Spread insulation material over roof.	Construction of sheds with proper ventilation- cleaning of shed every day.
<b>Floods</b>			
Feed and fodder availability	Storage of feed and fodder in air tight containers to avoid fungal attack.	Feeding good quality feed and fodder	Feed and fodder - dry in sunlight
Drinking water	Storage of clean drinking water	Provide hot water for drinking	Storage of clean water - digging of wells.
Health and disease management	Provide balanced feed and vaccination of animals at proper time.	Provide dry atmosphere for the sheds. Provide drainage around cattle houses. Removal and proper disposal of carcass.	Mineral mixture feed additives should be given. Sanitation and disinfection of sheds and animals. Repair of shed and other structures.
<b>Cyclone</b>			
Feed and fodder availability	Storage of feed and fodder. Store concentrate.	Use the conserved fodder. Concentrate stored can be used	Provide balanced feed and fodder
Drinking water	Storage of water	Provide clean water for drinking	Construction of tanks for storing water
Health and disease management	Vaccination of animals	Provide balanced feed and other feed additives, medicines and veterinary aid. Removal and proper disposal of carcass.	Provide clean sheds for animals. Sanitation and disinfection of sheds and animals. Repair of shed and other structures.
<b>Heat wave</b>	Cold water spraying during heat wave conditions		
Shelter/environment management	Construction of sheds with proper ventilation. Planting trees around sheds.	Feed additives can be given. Confine animals within shed. Spray water over animals.	Dung should be removed from pits. Cleaning of surroundings.
Health and disease management	Vaccination providing adequate feed for animals	Mineral mixture and feed additives can be given. Anti stress medications.	Proper feeding of animals

## 2.5.2

## Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event	During the event	After the event	
<b>Drought</b>				Can be linked with animal husbandry and dairy development department programmes, ATMA, RKVY, NREGS
Shortage of feed ingredients	Storing of feed and ingredients	Provide kitchen waste and feed additives vitamin mineral mixtures	Cultivation of maize and other feed ingredients	
Drinking water	Storage of clean drinking water	Provide cold clean water	Water harvesting structures	
Health and disease management	Vaccination of birds	Medicated water and Balanced feed should be given. Removal and proper disposal of carcass.	Provide clean coops for shelter. Disinfection of poultry house and equipments.	
<b>Floods</b>				
Shortage of feed ingredients	Storing of feed and ingredients	Provide balanced feed	Cultivation of maize and fodder	
Drinking water	Storage of clean drinking water	Provide clean water	Construction of tanks and wells	
Health and disease management	Vaccination of birds	Provide medicated water and feed additives. Removal and proper disposal of carcass.	Provide clean coops for shelter. Disinfection of poultry house and equipments.	
<b>Cyclone</b>				
Shortage of feed ingredients	Storing of feed and ingredients	Provide feed and clean water	Cultivation of maize and other fodder	
Drinking water	Storage of water	Provide clean feed and water		
Health and disease management	Vaccination of birds	Medicated water and feed additives. Removal and proper disposal of carcass.	Provide clean shelter. Disinfection of poultry house and equipments.	
<b>Heat wave</b>				



Shelter/environment management	Planting of trees around shed. Exhaust fan should be fitted on the hoof.	Put gunny bags dipped water in the direction of wind.	Provide proper ventilation	
Health and disease management	Vaccination of birds. Provide water and feed	Close the door and ventilation when hot wind comes, during day	Provide clean coops and balanced feed	

### 2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>1) Drought</b>			
<b>A. Capture</b>			
Marine	Not applicable	Not applicable	Not applicable
Inland			
(i) Shallow water depth due to insufficient rains/inflow	Rain water harvesting methods to be adopted Existing water bodies have to be deepened and desilted Turving can be adopted to strengthen pond embankments	Raise table sized fishes in enclosures called pens of 0.1 to 0.2 ha. Indian major carps and freshwater prawns are ideal species for culture In the event of sudden rise in water level due to sudden onset of monsoon the height of the enclosures can be raised temporarily	Farmers can be trained on the frozen storage techniques and in preparing value added products. This will be an answer to the difficulties in marketing of fish harvested forcefully anticipating severe water shortage Short term culture of minor carps like silver barb and fringe lipped carp can be undertaken The services of the fish Farmers Development Agency can be utilized
(ii) Changes in water quality	Avoid entry of pollutants through run off from agricultural land into rivers	Precaution has to be taken while adopting use of manures and fertilizers to avoid onset of algal blooms and eutrophication	
(iii) Any other		Ornamental fish rearing utilizing gold fishes, koi carp mollies and guppies can be done in summer. This will ensure some income to the farmers	

<b>B. Aquaculture</b>			
(i) Shallow water in ponds due to insufficient rains/inflow	Follow low stocking density to reduce culture duration	Cost on expensive inputs like feed and manure can be reduce by taking up integrated farming involving poultry, duckery and animal husbandry along with crops. Practice air breathing fish culture Adopting minimum feeding to avoid organic loading	Onset of algal blooms has to be checked. Otherwise mass mortality of fishes will occur Shift the fish brooder stock to deeper safer areas like cement systems and utilize them for breeding on the onset of monsoon
(ii) Impact of salt load build up in ponds / change in water quality	Deepening and desilting of existing water bodies Removal of debris Rain water harvesting	Avoid organic loading by minimizing feeding	Onset of sudden heavy rains after the drought will lead to mortality. This can be avoided by controlling feeding to avoid waste accumulation on pond bottom soil.
(iii) Any other	Monitor water quality regularly	Adopt the recirculation of water Use aerators to overcome build up of ammonia and thermal stratification during high temperatures	
<b>2) Floods</b>			
<b>A. Capture</b>			
Marine	Maintain the mangrove ecosystems wherever available to mitigate the adverse impact of drought and associated problems Train the fishermen on hygienic handling of fishes, preservation techniques and on preparation of value added fish products	Avoid fishing in deeper waters	Loss incurred to fishermen should be reported to the State Fisheries Department for assessment of the damage and reimbursement
Inland			
(i) Average compensation paid due to loss of human life			As immediate measure the compensation from Fishermen Welfare Fund Board can be arranged. Compensation has to be paid as per the norms of the State
(ii) No. of boats / nets/damaged			
(iii) No. of houses damaged			

			fisheries Department. Fishermen saving cum relief Fund can be arranged in lean season
(iv) Loss of stock	Sell the available fish stock	Install gill net and cast net	
(v) Changes in water quality	Strengthening of bunds to avoid water overflow or entry of water from outside		Immediate stocking of fishes should not be carried out because of onset of toxic gases
(vi) Health and diseases	Monitor water quality parameters by weekly sampling		Fish stock has to be discarded or buried in case of ulcers and pox diseases
<b>B. Aquaculture</b>			
(i) Inundation with flood water	In areas prone to frequent flooding initiate fish culture in advance Fishes needing long duration of culture should not be encouraged	Harvest the stocked fishes immediately	
(ii) Water continuation and changes in water quality	Strengthen bunds		Apply lime to stabilize pH
(iii) Health and diseases	Water quality management by regular monitoring		Discard diseased stock Dry up confined water bodies Pond bottom may be sundried to permit release of toxic gases and other pests Apply lime to balance pH
(iv) Loss of stock and inputs (feed, chemicals etc)	Feed and medicines have to be stored on raised platforms to avoid loss		Discard stock affected by water to avoid any more fungal infections to the fish stock
(v) Infrastructure damage (pumps, aerators, huts etc)	Initiate fish culture in advance in areas frequently prone to flooding		Procedure for compensation to be initiated by the government department
<b>3. Cyclone / Tsunami</b>			

A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives	Compensation may be paid to fishermen for their loss of lives, damage to boats and nets and damage to house as per the existing government norms.		
(ii) Avg. no. of boats / nets/damaged			
(iii) Avg. no. of houses damaged			
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds	Inundation due to sea water and coastal erosion can be avoided by planting trees like Casuarina		
(ii) Changes in water quality (fresh water / brackish water ratio)	Stock fishes that can tolerate wide salinity changes like pearl spot		Application of lime to stabilize pH
(iii) Health and diseases	Manage water quality parameters by regular monitoring		Discard diseased stock Dry up confined water bodies Pond bottom may be sundried to permit release of toxic gases and other pests Apply lime to balance pH
(iv) Loss of stock and inputs (feed, chemicals etc)	Feed and medicines have to be stored on raised platforms to avoid loss		Discard stock affected by water to avoid any more fungal infections to the fish stock
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	Initiate fish culture in advance in areas frequently prone to flooding		Procedure for compensation to be initiated by the government department
<b>4. Heat wave and cold wave</b>	No occurrence		