

**State: KERALA**

**Agriculture Contingency Plan for District: ALAPPUZHA**

<b>1.0 District Agriculture profile</b>					
<b>1.1</b>	<b>Agro-Climatic/Ecological Zone</b>				
	Agro Ecological Sub Region (ICAR)	Western Ghats And Coastal Plain, Hot Humid region (19.3)			
	Agro-Climatic Region (Planning Commission)	West coast plains and Ghat region (XII)			
	Agro Climatic Zone (NARP)	Problem Areas, KE-5			
	List all the districts or part thereof falling under the NARP Zone	Alappuzha, Kollam, Kottayam and Pathanamthitta			
	Geographic coordinates of district	Latitude	Longitude	Altitude	
		9°29'39"N	76°19'39"E	2m below MSL to	
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	RRS, Moncompu, Thekkekkara P.O., Alappuzha ORARS, Kayamkulam P.O., Alappuzha district 690502			
	Mention the KVK located in the district	CPCRI KVK, Regional Station, Kayangulam, Krishnapuram, Alappuzha-690533			
<b>1.2</b>	<b>Rainfall</b>	Normal RF(mm)	Normal Rainy days (number)	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	1511	79	June 1 <sup>st</sup> week	September 1 <sup>st</sup> week
	NE Monsoon (Oct-Dec):	464	27	October 1 <sup>st</sup> week	November 2 <sup>nd</sup> week
	Winter (Jan- March)	94	5	-	-
	Summer (Apr-May)	430	20	-	-
	Annual 2005-06	2252	108	-	-

<b>1.3</b>	<b>Land use pattern of the district</b> (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
	<b>Area (Lakh ha)</b>	1.410	0.0	0.210	0.0	0.135	0.0002	0.002	0.029	0.043

<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. Laterite	18.5	14.0
	2. Clay loam soils	36.9	27.8
	3. Sandy loam soils	21.0	15.8
	4. Kari soils	36.9	27.8
	5. Coastal sandy soils	18.9	14.3
	Others (specify):	Nil	Nil
<b>1.5</b>	<b>Agricultural land use</b>	<b>Area ('000 ha)</b>	<b>Cropping intensity %</b>
	Net sown area	86.4	200-300
	Area sown more than once	18.6	
	Gross cropped area	105.0	

<b>1.6</b>	<b>Irrigation</b>	<b>Area ('000 ha)</b>		
	Net irrigated area	36.8		
	Gross irrigated area	46.6		
	Rainfed area	57.8		
	<b>Sources of Irrigation</b>	<b>Number</b>	<b>Area ('000 ha)</b>	<b>Percentage of total irrigated area</b>
	Canals		20.5	37.2
	Tanks - Ponds		16.9	30.7
	Open wells		11.4	20.7
	Bore wells			
	Lift irrigation	14	2.0	3.6
	Micro-irrigation			
	Other sources(minor irrigation)		4.2	7.74

Total Irrigated Area		55.2	
Pump sets	53650		
No. of Tractors	87		
<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	One	31	
Wastewater availability and use	nil		
Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%			

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

1.7	Major Field Crops cultivated	Area ('000 ha)					
		<i>Kharif</i>		<i>Rabi</i>		Summer	Total
		<i>Irrigated</i>	<i>Rainfed</i>	<i>Irrigated</i>	<i>Rainfed</i>		
	Paddy	8.7		7.2		18.1	34.14
	Sesamum					0.09	0.09
	Tapioca	0.4		1.2		1.600	3.27
	Sugarcane						0.06
	Pulses						0.02
	<b>Horticulture crops - Fruits</b>	<b>Total area</b>		<b>Irrigated</b>			
	Banana	0.563		0.563			
	Plantain	1.879		0.0			
	Jack	2.053		0.0			
	Mango	3.349		0.0			
	Papaya	1.012		0.0			
	<b>Horticultural crops - Vegetables</b>	<b>Total area</b>		<b>Irrigated</b>			
	Amaranthus	0.255					
	Bitter gourd	0.171					
	Snake gourd	0.149					

Others	1.496	1.509
Total	2.071	0.562
<b>Medicinal and Aromatic crops</b>	<b>Total area</b>	<b>Irrigated</b>
	0.076	
	<b>Total area</b>	<b>Irrigated</b>
<b>Spices</b>		
Pepper	1.357	
Ginger	0.081	
Turmeric	0.022	
Cloves	0.015	0.004
Nutmeg	0.215	0.035
Cinnamon	0.031	

<b>Plantation crops</b>	<b>Total area</b>	<b>Irrigated</b>
Coconut	38.859	38.859
Cashew	2.150	2.150
Cocoa	0.084	0.084
Rubber	4.300	4.300
<b>Fodder crops</b>	<b>Total area</b>	<b>Irrigated</b>
<b>Total fodder crop area</b>	0.118	
<b>Grazing land</b>		
<b>Sericulture etc</b>		
<b>Others (Specify), Other crops and trees</b>	4.477	

<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)			100.8			
	Crossbred cattle						
	Non descriptive Buffaloes (local low yielding)			2.7			
	Graded Buffaloes						
	Goat			49.2			
	Sheep			0.03			
	Others (Camel, Pig, Yak etc.)						
	Commercial dairy farms (Number)						
<b>1.9</b>	<b>Poultry</b>	<b>No. of farms</b>	<b>Total No. of birds ('000)</b>				
	Commercial	1	102.782				
	Backyard		2302.347				
<b>1.10</b>	<b>Fisheries (Data source: Chief Planning Officer)</b>						
	<b>A. Capture</b>						
	<b>i) Marine (Data Source: Fisheries Department)</b>	<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)	
		60689	6182	2274			78
	<b>ii) Inland (Data Source: Fisheries Department)</b>	<b>No. Farmer owned ponds</b>		<b>No. of Reservoirs</b>	<b>No. of village tanks</b>		
	<b>B. Culture</b>						
		<b>Water Spread Area (ha)</b>		<b>Yield (t/ha)</b>		<b>Production ('000 tons)</b>	

i) <b>Brackish water</b> (Data Source: MPEDA/ Fisheries Department)			
ii) <b>Fresh water</b> (Data Source: Fisheries Department)	1904 ha ponds + 14130 ha polders		
<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	26.254	2999	21.999	3027	55.997	3090	104.25	3053	
	Tapioca							95.578	29,211	
	Sesamum					0.078		0.078	839	
	Pulses							0.018	857.14	
	Sugar cane							0.553		
<b>Major Horticultural crops (Crops to be identified based on total acreage)</b>										
	Coconut							275 million nuts	7077nuts/ha	
	Banana							3.79	6732	
	Plantain							11.726	6241	
	Mango							16.310	4883	
	Pineapple							0.491		
Others										

<b>1.12</b>	<b>Sowing window for 5 major field crops</b> (start and end of normal sowing period)	Paddy	Sesamum	Tapioca	Vegetables	Coconut
	Kharif- Rainfed	April- May to August-September		April to January	May-June to September-October	New planting –April-May
	Kharif-Irrigated	May-June to September-October				
	Rabi- Rainfed	September- October to December-January	December-January to March-April	September to June		
	Rabi-Irrigated	October-November to January- February and December-January to March-April			December-January to March-April	

<b>1.13</b>	<b>What is the major contingency the district is prone to? (Tick mark and mention years if known during the last 10 year period)</b>	Regular	Ocassional	None
	Drought (Onattukara)			
	Flood (Kuttanadu and Onattukara )	- 2005,2007		
	Cyclone		2008	
	Hail storm			
	Heat wave			
	Cold wave			
	Frost			
	Sea water intrusion (Kayal lands and kari)		- 2004	
	Pests and diseases (specify)		-Black bug - 2009	

	Others (Acidity and iron toxicity in kari lands)			
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<b>1.14</b>	<b>Include Digital maps of the district for</b>	Location map of district within State as Annexure I	Enclosed: Yes / No
		Mean annual rainfall as Annexure 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes / No

## 2.0 Strategies for weather related contingencies

### 2.1 Drought

#### 2.1.1 Rainfed situation

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



<p><b>Delay by 2 weeks 3<sup>rd</sup> week of June</b></p>	<p>Upland</p>	<p>Rice – Vegetables/pulses/fodder</p>	<p>No change in cropping system but delay in sowing date</p>	<p>Selection of appropriate varieties with enough plasticity to adjust to changed sowing dates</p> <p>Exogenous application of organic manure for improving moisture retention capacity</p>	<p>Seed producing agencies have to be equipped to meet the seed requirement.</p> <p>Labour requirement under NREGS and CLDP</p> <p>Seed producing agencies have to be equipped to meet the seed requirement.</p> <p>Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY</p>
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	Medium lands	Rice-rice- sesame/pulses/vegetables	No change in cropping system but delay in sowing date	<p>Dibbling changed to transplanting during first crop (Kharif)</p> <p>Plant protection measures to be adopted against rice thrips and brown spot disease incidence which are likely to occur</p> <p>Medium/short duration photoinsensitive varieties instead of photo sensitive long duration varieties during second crop (Rabi)</p> <p>Irrigation due to lack of residual moisture for summer crops like sesame, pulses and vegetables</p>	
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	<p>Life saving irrigation is suggested for banana and vegetables.</p> <p>Short duration varieties of tuber crops and pulses as inter crops</p>	Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP, NFSM and RKVY

		Open uplands of homesteads	No change	Provide irrigation in initial stages of crop growth  Mechanical weed control measures	Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
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Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
<b>Early season drought (delayed onset)</b>  <b>Delay by 4 weeks (Specify month)</b> <b>July 1<sup>st</sup> week</b>	Medium lands	Rice-Rice- Sesame/pulses/vegetables	Rice –Rice –fallow  Fallow-Rice- Sesame/Veg/Pulses	Dibbling changed to transplanting during first crop (Kharif)  Medium/short duration photo insensitive varieties instead of photo sensitive long duration varieties during second crop (Rabi) Irrigation due to lack of residual moisture for summer crops like sesame, pulses and vegetables	Labour requirement under NREGS and CLDP  Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Life saving irrigation is suggested.  Short duration varieties of tuber crops and pulses as inter crops	Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
		Open uplands of homesteads	Not possible	-	-

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 3 <sup>rd</sup> week	Medium lands	Not Applicable			

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 1 <sup>st</sup> week	Medium lands	Not Applicable			

Condition			Suggested Contingency measures		
Early season drought (Normal onset)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Medium lands	Rice-Rice-Sesame/Pulses/Vegetables	Resowing necessary if germination affected  Provide irrigation facilities  Weed control measures are to be taken	Sufficient organic matter application  Insitu rain water conservation	Alternate source of seed to be ensured Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Life saving irrigation is suggested.	Irrigation facilities can be provided in link with IWMP NFSM and RKVY
		Open uplands of homesteads	Timely weed management and fertilizer application	Life saving irrigation is suggested	-do-

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, consecutive 2 weeks rainless (>2.5 mm) period)  At vegetative stage	Medium lands	Rice-Rice-Sesame/Pulses/vegetables	Provide irrigation facilities Weed control measures are to be taken	Sufficient organic matter application	Alternate source of seed to be ensured Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Life saving irrigation is suggested.	Irrigation facilities can be provided in link with IWMP NFSM and RKVY
		Open uplands of homesteads	Timely weed management and fertilizer application	-do-	-do-

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	Medium lands	Rice-Rice-sesame/pulses/vegetables	Provide irrigation facilities	Basal application of Sufficient organic matter	Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Life saving irrigation for banana and vegetables is suggested.	-do-
		Open uplands of homesteads	Provide irrigation facilities	Life saving irrigation is suggested	-do-

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Rabi Crop planning	Remarks on Implementation
Terminal drought	Medium lands	Rice-rice-sesame/pulses/vegetables	No change Harvesting at physiological maturity stage	No change	
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	Provide irrigation for inter crops like banana and vegetables	No change	Irrigation facilities in link with IWMP NFSM and RKVY
		Open uplands of homesteads	No change	No change	

### 2.1.2 Irrigated situation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed release of water in canals due to low rainfall  Irrigation is from the rivers. Delay in monsoon results in lowering of water level in the rivers	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Rice-Rice (SD)-Pulses,Sesame(SD)	Mulching for vegetables Selection of suitable cropping systems	NREGS, RKVY
	Below MSL paddy lands	Rice- Rice - Fallow	No change. Delay in sowing of first crop	Selection of short duration varieties	Source of seed to be ensured

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Limited release of water in canals due to low rainfall	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Rice-Rice (SD)-Pulses, Sesame (SD)	Mulching for vegetables Selection of suitable cropping systems	NREGS, RKVY  Source of seed to be ensured
	Below MSL paddy lands	Rice- Rice - Fallow	No change. Delay in sowing of first crop	Selection of short duration varieties for first crop	

Condition	Suggested Contingency measures				
	Major Farming situation	Normal 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	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Fallow- Rice –Pulses/ Sesame	Rain water harvesting ,Direct sowing	NREGS, RKVY
	Below MSL paddy lands	No change. Delay in sowing of first crop	Selection of short duration varieties	Source of seed to be ensured	

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Fallow- Rice –Pulses/ Sesame	Rain water harvesting, Direct sowing	NREGS, RKVY
	Below MSL paddy lands	No change. Delay in sowing of first crop	Selection of short duration varieties	Source of seed to be ensured	

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Fallow- Rice –Pulses/ Sesame	Rain water harvesting	NREGS, RKVY

**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>				
Sesamum	Provide drainage		Provide drainage Cultivation of varieties having seed dormancy, harvest crop at physiological maturity	Improve storage facilities/godown
Pulses	Provide drainage		Provide drainage ,Cultivation of varieties having seed dormancy, harvest crop at physiological maturity	
Vegetables	Provide drainage		Provide drainage	
Rice	Provide drainage		Provide drainage, immediate harvest	
<b>Horticulture</b>				
Banana		Provide drainage		
Coconut (seedlings)	Provide drainage			
Tuber crops			Provide drainage	
<b>Heavy rainfall with high speed winds in a short span</b>				
Rice	Select sturdy varieties with culm strength			
<b>Horticulture</b>				
Banana	Provide drainage	Propping		
<b>Outbreak of pests and diseases due to unseasonal rains</b>				
Rice	Provide drainage , adopt suitable control measures to avoid spread of Bacterial leaf blight		Harvest crop at physiological maturity	Improve storage facilities/godown



	Cultivate resistant varieties, Apply biocontrol agents, seed treatment, cultural practices for pest control		
Tuber crops	Use healthy planting material, prophylactic spraying of bio control agents, use resistant varieties		
<b>Horticulture</b>			
Banana	Provide drainage and adopt suitable control measures to avoid the incidence of rhizome rot disease Use healthy planting material, Use TC plants which are virus free, Prophylactic spray of bio control agents		
Vegetables	Provide drainage, Use resistant varieties, Biocontrol agents, disease free seeds, seed treatment, balanced application of fertilizers based on soil test data, phytosanitation		
Coconut	Provide drainage, Use healthy planting material, Phytosanitation, prophylactic spraying of chemicals		
Pepper	Phytosanitation, grow foot rot tolerant varieties, prophylactic spraying of chemicals, use of bio control agents, , balanced application of fertilizers		Improve storage facilities

## 2.3 Floods

Condition	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
<b>Transient water logging/partial inundation</b>				
Rice	Elevation of outer bunds around all <i>Padashekarams</i> above the flood mark. Pumping out excess water using axial flow pump. Providing adequate drainage for draining excessive stagnating water around the root system, Improve drainage facility, scientific and proper land utilization, cultivation flood tolerant varieties, Crop insurance, Increase the storage capacity of reservoir. Spraying 3% KNO <sub>3</sub> or 3% solution of Urea and MOP in 3:2 proportion at boot leaf stage if root damage already occurred.			Combine harvesters can be used for rapid harvesting of the crop. The grain may be excessively wet and if drying is difficult for few days, the harvested grain may be mixed with common salt and the produce may be sun dried at the earliest opportunity Immediately after the standing water column recedes Special harvesters are available to work in a mire situation.
<b>Horticulture</b>				
Vegetable	Providing adequate drainage for draining excessive stagnating water around the root system, Foliar spray of 2% DAP + 1% KCl (MOP)			
Banana				
Tuber				
<b>Continuous submergence for more than 2 days</b>				
Rice	Elevation of outer bunds around all <i>Padashekarams</i> above the flood mark. Pumping out excess water using axial flow pump, Cultivation flood tolerant varieties, Crop insurance, Improve drainage facility, , 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. Crop insurance, Increase the storage capacity of reservoir.			
<b>Horticulture</b>				
Vegetable	Providing adequate drainage for draining excessive stagnating water around the root system, 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. Crop insurance, Increase the storage capacity of reservoir.			
Banana				
Tuber				
<b>Sea water intrusion</b>				
Rice	Modifying the operation of <i>Thannner Mukkam</i> Barrage in accordance with crop calendar by consultation with Agricultural Scientists. Cultivate saline tolerant varieties, application of gypsum, filling and sealing of individual fields with fresh water before the operation of barrage. Avoid drying up of fields.			

Banana	Filling and sealing of channels with fresh water before the operation of barrage
Vegetables	
Tree spices	
Fisheries	Fresh water harvesting, strengthening and sealing of bunds to prevent saline water intrusion.

## 2.5 Contingent strategies for Livestock, Poultry & Fisheries

### 2.5.1 Livestock

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Drought</b>			
Feed and fodder availability	Straw enrichment and preservation, silage preparation,	Unconventional feeding with locally available feedstuffs and feeding during cooler part of the day, ie. during night time.	New planting of fodder with irrigation facilities
Drinking water	Construction of storage facility, cleaning of existing water bodies, steps to prevent water pollution	Minimise the use of clean water	Water harvesting measures with the help of local bodies
Health and disease management	Provide nutritionally balanced feed, ensure the timely availabilities of medicines and vaccines and personnel. Promote vaccination, proper disease surveillance	Ensure timely treatment and control measures	Provide curing measures with proper management.
<b>Floods</b>			
Feed and fodder availability	Ensure proper drainage facilities, Silage preparation, straw enrichment and preservation, proper storage of feedstuffs to prevent fungal infestation.	Unconventional feeding with locally available feedstuffs	Planting new fodder slips in suitable lands. Give due consideration to land management to mitigate flooding
Drinking water	Prevent contamination of potable water sources, desilting of water channels, strengthening of water	Provide clean water in required quantity; make use of water purifying techniques if contamination is	Clean polluted water bodies, desilting of water channels

	storing facilities,	suspected.	
Health and disease management	Provide nutritionally balanced feed, promote vaccination, proper disease surveillance, ensure the timely availability of medicines and vaccines and personnel.	Ensure timely treatment and control measures	Provide curing measures with proper management..
<b>Cyclone</b>			
Feed and fodder availability	Ensure preservation and storage of fodder, straw , feed concentrate	Adequate feeding , ensure the quality of feed	Replanting of high yielding fodder slips.
Drinking water	Strengthening of water storage facility	Provide clean water in required quantity; make use of water purifying techniques if contamination is suspected.	Desilting and cleaning of water bodies for enough water storage
Health and disease management	Create awareness among farmers about adverse effect of unfavourable weather. Give timely cyclone forewarning to farmers, strengthening of livestock shelter and feed store.	Protect from direct exposure to un acclimatized weather , give proper care and management	Cleanliness of surrounding, disinfection of water bodies, proper disposal of deceased animals.
<b>Heat wave and cold wave</b>			
Shelter/environment management	Timely maintenance of shelter, proper ventilation during hot days , proper insulation during very cold days	Avoid direct exposure to severe weather. In hot days- feeding during cool time with succulent feed stuffs, provide plenty of drinking water, washing during hot times,  In cold days- keep in shelter, give bedding for insulation.	Construct modern weather proof shelter with ample space like Micro water sprayer and , false ceiling  Plant trees to provide shade to shelter.
Health and disease management	Create awareness among farmers about adverse effect of unfavorable weather	Avoid thermal stress to animals, keep in shelter with proper feeding and watering, give treatment if any health problem observed.  Give more attention to infants and physiologically stressful animals.	Provide curing measures with proper management

## Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event	During the event	After the event	
<b>Drought</b>				Programmes can be linked with ATMA,RKVY and NREGS
Shortage of feed ingredients	Collection and preservation of feed ingredients in required quantity	Feeding with nutritionally balanced feed	Ensure adequate supply of ingredients for future use	
Drinking water	Construction of storage tank with adequate capacity Storage of clean drinking water	Provide cold clean drinking water Medication to reduce stress	Maintenance of existing water storing facilities and setting up of additional water sources like bore wells	
Health and disease management	Vaccination, provide stress free environment	Proper feeding and watering, maintain correct stock density, observe for health problem and give treatment if required	Observe the production and growth. Avoid weaklings. Maintain proper stock density, Provide clean coops for shelter	
<b>Floods</b>				Programmes can be linked with ATMA,RKVY and NREGS
Shortage of feed ingredients	Correct storage of feed stuffs to avoid fungal infestation, maintenance of store room , testing of feedstuff for quality	Feeding with nutritionally balanced feed	Disinfestations of surrounding premises and water bodies, proper disposal of dead birds	
Drinking water	Infrastructure reinforcement to avoid contamination of drinking water	Provide clean drinking water round the clock, medication to reduce stress	Disinfection of water bodies, provide adequate drainage	

Health and disease management	Avoid possibilities of disease outbreak, maintenance of shed to give adequate protection from flood , provide stress free environment	Timely detection of diseases and treatment , avoid chances of disease spreading , medication to reduce stress, isolation of affected birds	Proper disposal of dead birds, sanitation of surroundings, isolation of affected birds	
<b>Cyclone</b>				
Shortage of feed ingredients	Proper storage of feed stuffs to avoid fungal infestation, maintenance of store room , testing of feedstuff for quality	Avoid feeding fungal infected feed, treatment if required and provide balanced feed	Disposal of damaged feed, testing of feed for quality Cultivation of suitable foddercrops	
Drinking water	Infrastructure reinforcement to avoid contamination of drinking water	Provide clean drinking water round the clock, medication to reduce stress	Disinfection of water bodies, provide adequate drainage	
Health and disease management	Avoid possibilities of disease outbreak, maintenance of shed to give adequate protection from cyclone	Timely detection of diseases and treatment , avoid chances of disease spreading , medication to reduce stress, isolation of affected birds	Proper disposal of dead birds, sanitation of surroundings, isolation of affected birds	
<b>Heat wave and cold wave</b>				
Shelter/environment management	Timely maintenance of shelter, proper ventilation during hot days, proper insulation during very cold days. Planting trees around the shed and fitting of exhaust fan on the roof can also be recommended	<b>Hot days</b> -Avoid direct exposure to severe weather. Provisions for air circulation by providing watered gunny bags in the direction of wind <b>Cold days</b> - keep in shelter, give bedding for insulation. Provide brooding facilities	Construct modern weather proof shelter with ample space, Plant trees to provide shade to shelter.	Programmes can be linked with ATMA,RKVY and NREGS
Health and disease management	Create awareness among farmers about adverse effect of weather	Avoid thermal stress to birds, keep in shelter with proper feeding and watering, give treatment if any health	Provide curing measures with proper management	

	Give vaccination to birds Provide water and feed	problem observed. Give more attention to chicks and parent stocks, reduce stock density.	Provide clean coops and balanced feed	
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### 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	Insuring the fishers Shall be provided with life saving equipments and provide weather forecast	Facility of patrol boats/ sea rescue. Support of coast guard shall be solicited. Opening of control room	Rehabilitation package Damaged boats / gears to be repaired/ replaced
Inland			
(i) Shallow water depth due to insufficient rains/inflow	Fixing of display boards indicating navigation routes Bottom dredging of navigation routes	Arrange rescue facilities Opening of control room	Rehabilitation measures Livelihood support to the affected
(ii) Changes in water quality	Continued water quality monitoring	Amelioration measures by expert team	Rehabilitation measures and continued vigilance against pollution
<b>B. Aquaculture</b>			
(i) Shallow water in ponds due to insufficient rains/inflow	Develop varieties tolerant to low water table and warm shallow water conditions	Oxygen supply will be affected. so water filling arrangements and aeration facilities	Development of deeper ponds, by annual desilting and prevention of water loss.
(ii) Impact of salt load build up in ponds / change in water quality	Seepage proofing and Storage of sufficient water to safeguard form salinity ingressions.	Emergency harvest	Flushing with freshwater. Fixing of bore well
<b>2) Floods</b>			
<b>A. Capture</b>			

Marine	NA	NA	NA
Inland	Fore warning of calamities	Livelihood support .Opening of relief camps	Rehabilitation stocking in open waters affected by fish loss .Ranching of commercially important seeds to recoup fisheries
(i) Average compensation paid due to loss of human life		Rs. 2 .00 Lakhs	
(ii) No. of boats / nets/damaged			
(iii) No.of houses damaged			
(iv) Loss of stock			
(v) Changes in water quality		Water pH decline , Increase in organic matter content and sediment load ,	Algal blooms and fish kill possible due to blooming of algae. To counter this vigilant monitoring of water quality needed.
(vi) Health and diseases		EUS disease outbreak possible with lowering of temperature	EUS disease outbreak possible with lowering of temperature and consequent fish kill and unemployment and fisher folks.
<b>B. Aquaculture</b>			
(i) Inundation with flood water	Raising of pond dykes above flood mark. Provision of protective fencing to protect fish loss. Insurance cover	Rapid action to protect the stock against breach of dykes and protective maintenance of the outer bund.	Assessment of loss and compensation measures against loss. Supply of seed for fresh crop.
(ii) Water continuation and changes in water quality		pH decline.. Productivity decline- primary productivity of water body. Fish growth affected	Algal blooming and fish kill.
(iii) Health and diseases		EUS disease outbreak possible with lowering of temperature. Fungal, bacterial and protozoan disease outbreak	Fish kill to be compensation and pond treatment against agents of disease
(iv) Loss of stock and inputs (feed, chemicals etc)	Insurance cover to be ensured	Loss of valuable germplasm / Brood stock possible. Stored Feed	Compensation for loss. Livelihood Support to the affected. Support by



		can loose its quality, aflatoxin problem. Loss of feed/ chemicals in storage system possible	providing critical inputs seed/ feed for fresh crop
(v) Infrastructure damage (pumps, aerators, huts etc)	Insurance cover.	Craft, gears, pumps. Aerators etc can become damaged	Compensation. Repair and replacement of macjinery and craft and gears
<b>3. Cyclone / Tsunami</b>			
A. Capture			
Marine	Protecting shoreline by afforestation by forming a mangrove belt Strict enforcement of CRZ regulation Construction of tsunami resistant housing and dwelling places. Forewarning system	Speedy rescue Operation to save the affected . Provision for shelter to the affected. . Rapid health care Drinking water can become saline	Assessment of loss and compensation. Rehabilitation housing, Livelihood support , Action to prevent epidemic outbreak
(i) Average compensation paid due to loss of fishermen lives		Rs 5 lakh / person	
(ii) Avg. no. of boats / nets/damaged			
(iii) Avg. no. of houses damaged			
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds		Salination of pond systems affecting freshwater fish stock and fish kill	Assessment of loss and compensation. Loss of fish stock to be compensated by seed supply and support for building stock
(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)			

<b>4. Heat wave and cold wave</b>			
<b>A. Capture</b>		Fish availability will be affected fish shoal can move to deeper waters. Tropical fish close to their upper tolerance limit so fish availability will be affected	Rehabilitation of the coastal fishers. Alternate livelihood enterprises.
Marine			
Inland		Rivers can go dry affecting fish germplasm and stock will affect livejood of inland fishers	Rehabilitation of the fishers affected
<b>B. Aquaculture</b>		Perennial pond can become seasonal. Cropping intensity will be reduced. The product ivy will be affected	Facilities for water storage. Deepening of ponds to store more water .Annual desilitign should become necessary
(i) Changes in pond environment (water quality)	Develop and popularize temperature tolerant eurythermal species for culture systems. Develop water storage systems and water reservoirs to tide over adversity. Insurance cover against drought	Low DO. Warming of waters. Fish kill in summer. Breeding of fishes will be affected. Seed availability will be affected. Severe shortage for fish seeds possible	Supply of fish seeds from other places might become necessary. Can upset the inland fish production programe as fish spawning and seed production is affected. Compensatiing clamity.
(ii) Health and Disease management		Disease outbreak especially parasitic diseases possible. Do decline and recurrent fish mortality.	Rehabilitation package. Fresh stocking support. Replacement with Healthy seeds

Annexure-2 Annual rainfall 1995 to 2010

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Total
1995	0.0	0.0	69.6	144.8	324.9	592.6	585.6	425.9	343.1	281.4	177.8	0.0	2945.7
1996	18.8	0.0	0.0	135.6	116.6	473.4	516.6	236.2	387.0	283.5	211.7	39.4	2418.8
1997	0.0	2.2	79.2	169.7	49.0	473.5	845.0	460.0	554	359.0	179.0	198.0	3368.6
1998	28.0	0.0	7.4	123.0	195.2	795.5	386.0	608.1	699.9	466.9	55.4	150.4	3515.8
1999	0.0	0.0	36.0	335.8	507.3	759.9	445.4	266.5	130.9	690.5	161.7	0.0	3334.0
2000	20.0	176.4	72.0	90.4	128.4	608.2	234.5	549.7	301.0	243.8	121.0	41.0	2586.4
2001	81.7	63.6	13.0	177.6	368.6	627.6	845.0	248.0	426.2	340.8	95.2	14.2	3301.5
2002	0.0	3.0	22.2	96.2	445.7	568.6	220.2	375.6	85.0	448.5	302.0	0.0	2567.0
2003	0.0	59.0	60.0	161.7	110.4	504.2	430.2	345.2	93.8	496.9	95.4	0.0	2356.8
2004	3.8	0.0	53.4	100.4	827.8	519.8	324.0	306.5	195.8	508.5	253.0	0.0	3093.0
2005	16.4	63.6	37.4	200.2	206.8	602.6	451.7	132.1	312.8	251.2	119.4	73.4	2467.6
2006	43.0	0.0	46.0	107.4	511.0	505.5	430.4	309.2	349.1	407.6	188.2	0.0	2897.4
2007	0.0	22.2	3.6	200.4	264.4	596.9	861.3	418.8	363.4	279.7	168	13	3191.7
2008	0	60	200.9	145.8	62	392.8	641.5	236.8	273.1	308.9	171	8.8	2501.6
2009	0	0	78.2	99.1	286.7	629.9	563.8	207	214.4	165.7	299.2	97.2	2641.2
2010	23.4	0	42.2	191.8	346.5	537.4	469.4	253.2	253.6	561.4	241.8	131	3051.7