

State: KERALA

Agriculture Contingency Plan for District: ALAPPUZHA

| 1.0 District Agriculture profile | | | | | |
|----------------------------------|--|---|----------------------------|------------------------------|--------------------------------|
| 1.1 | Agro-Climatic/Ecological Zone | | | | |
| | 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 | | | |
| 1.2 | Rainfall | Normal RF(mm) | Normal Rainy days (number) | Normal Onset | Normal Cessation |
| | SW monsoon (June-Sep): | 1511 | 79 | June 1 st week | September 1 st week |
| | NE Monsoon (Oct-Dec): | 464 | 27 | October 1 st week | November 2 nd week |
| | Winter (Jan- March) | 94 | 5 | - | - |
| | Summer (Apr-May) | 430 | 20 | - | - |
| | Annual 2005-06 | 2252 | 108 | - | - |

| | | | | | | | | | | |
|------------|---|-------------------|-------------|---------------------------------|--------------------|----------------------|--|------------------------------|-----------------|---------------|
| 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 (Lakh ha) | 1.410 | 0.0 | 0.210 | 0.0 | 0.135 | 0.0002 | 0.002 | 0.029 | 0.043 |

| | | | |
|------------|--|-----------------------|-----------------------------|
| 1.4 | Major Soils (common names like shallow red soils etc.,) | Area ('000 ha) | Percent (%) of total |
| | 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 |
| 1.5 | Agricultural land use | Area ('000 ha) | Cropping intensity % |
| | Net sown area | 86.4 | 200-300 |
| | Area sown more than once | 18.6 | |
| | Gross cropped area | 105.0 | |

| | | | | |
|------------|---------------------------------|-----------------------|----------------|------------------------------------|
| 1.6 | Irrigation | Area ('000 ha) | | |
| | Net irrigated area | 36.8 | | |
| | Gross irrigated area | 46.6 | | |
| | Rainfed area | 57.8 | | |
| | Sources of Irrigation | Number | Area ('000 ha) | Percentage of total irrigated area |
| | 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 | | |
| Groundwater availability and use* (Data source: State/Central Ground water Department /Board) | 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 |

| Horticulture crops - Fruits | | Total area |
|----------------------------------|--|------------|
| Banana | | 0.563 |
| Plantain | | 1.879 |
| Jack | | 2.053 |
| Mango | | 3.349 |
| Papaya | | 1.012 |
| Horticultural crops - Vegetables | | Total area |
| Amaranthus | | 0.255 |

| | | |
|--|-------------------------------------|-------------------|
| | Bitter gourd | 0.171 |
| | Snake gourd | 0.149 |
| | Others | 1.496 |
| | Total | 2.071 |
| | Medicinal and Aromatic crops | Total area |
| | | 0.076 |
| | | Total area |
| | Spices | |
| | Pepper | 1.357 |
| | Ginger | 0.081 |
| | Turmeric | 0.022 |
| | Cloves | 0.015 |
| | Nutmeg | 0.215 |
| | Cinnamon | 0.031 |

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

| 1.8 | Livestock | Male ('000) | Female ('000) | Total ('000) |
|-----|--|-------------|---------------|--------------|
| | 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) | | | | | | |
| 1.9 | Poultry | No. of farms | Total No. of birds ('000) | | | | |
| | Commercial | 1 | 102.782 | | | | |
| | Backyard | | 2302.347 | | | | |
| 1.10 | Fisheries (Data source: Chief Planning Officer) | | | | | | |
| | A. Capture | | | | | | |
| | i) Marine (Data Source: Fisheries Department) | No. of fishermen | Boats | | Nets | | Storage facilities (Ice plants etc.) |
| | | | Mechanized | Non-mechanized | Mechanized (Trawl nets, Gill nets) | Non-mechanized (Shore Seines, Stake & trap nets) | |
| | | 60689 | 6182 | 2274 | | | 78 |
| | ii) Inland (Data Source: Fisheries Department) | No. Farmer owned ponds | | No. of Reservoirs | | No. of village tanks | |
| | | | | | | | |
| | B. Culture | | | | | | |
| | | Water Spread Area (ha) | Yield (t/ha) | | Production ('000 tons) | | |
| | i) Brackish water (Data Source: MPEDA/ Fisheries Department) | | | | | | |
| | ii) Fresh water (Data Source: Fisheries Department) | 1904 ha ponds + 14130 ha polders | | | | | |
| | Others | | | | | | |

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) | |
| Major Field crops (Crops to be identified based on total acreage) | | | | | | | | | | |
| | 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 | | |
| Major Horticultural crops (Crops to be identified based on total acreage) | | | | | | | | | | |
| | Coconut | | | | | | | 275 million nuts | 7077nuts/ha | |
| | Banana | | | | | | | 3.79 | 6732 | |
| | Plantain | | | | | | | 11.726 | 6241 | |
| | Mango | | | | | | | 16.310 | 4883 | |
| | Pineapple | | | | | | | 0.491 | | |
| Others | | | | | | | | | | |

| 1.12 | Sowing window for 5 major field crops (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 | |

| 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 | 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) | √ | | |

| 1.14 | Include Digital maps of the district for | | Enclosed: Yes / No |
|------|--|---|--------------------|
| | | 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 | Suggested Contingency measures | | |
|---|-------------------------|------------------------------------|---|--|---|
| | | | Change in crop/cropping system | Agronomic measures | Remarks on Implementation |
| Early season drought (delayed onset) | | | | | |
| Delay by 2 weeks 3 rd week of June | Upland | Rice – Vegetables/pulses/fodder | No change in cropping system but delay in sowing date | Selection of appropriate varieties with enough plasticity to adjust to changed sowing dates Exogenous application of organic manure for improving moisture retention capacity | Seed producing agencies have to be equipped to meet the seed requirement. Labour requirement under NREGS and CLDP Seed producing agencies have to be equipped to meet the seed requirement. Irrigation facilities can be provided in link with Micro irrigation schemes, IWMP and RKVY |

| | | | | | |
|--|--------------|---|---|---|--|
| | 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 |
|--|--|----------------------------|-----------|---|--|

| 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 (Specify month) July 1 st week | 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 rd 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 st 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) | 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 |
| At flowering/ fruiting stage | | 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 |
| Continuous high rainfall in a short span leading to water logging | | | | |
| 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 | |
| Horticulture | | | | |
| Banana | | Provide drainage | | |
| Coconut (seedlings) | Provide drainage | | | |
| Tuber crops | | | Provide drainage | |
| Heavy rainfall with high speed winds in a short span | | | | |
| Rice | Select sturdy varieties with culm strength | | | |
| Horticulture | | | | |
| Banana | Provide drainage | Propping | | |
| Outbreak of pests and diseases due to unseasonal rains | | | | |
| 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 | | |
| Horticulture | | | |
| 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 |
| Transient water logging/partial inundation | | | | |
| 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 ₃ 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. |
| Horticulture | | | | |
| Vegetable | Providing adequate drainage for draining excessive stagnating water around the root system, Foliar spray of 2% DAP + 1% KCl (MOP) | | | |
| Banana | | | | |
| Tuber | | | | |
| Continuous submergence for more than 2 days | | | | |
| 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. | | | |
| Horticulture | | | | |
| 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 | | | | |
| Sea water intrusion | | | | |
| 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 |
| Drought | | | |
| 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. |
| Floods | | | |
| 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.. |
| Cyclone | | | |
| 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. |
| Heat wave and cold wave | | | |
| 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 | |
| Drought | | | | 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 | |
| Floods | | | | 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 | |
| Cyclone | | | | |
| 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 | |
| Heat wave and cold wave | | | | |
| 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 | Hot days -Avoid direct exposure to severe weather. Provisions for air circulation by providing watered gunny bags in the direction of wind Cold days - 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 | |
|--|---|--|---------------------------------------|--|

2.5.3 Fisheries/ Aquaculture

| | Suggested contingency measures | | |
|--|--|--|--|
| | Before the event | During the event | After the event |
| 1) Drought | | | |
| A. Capture | | | |
| 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. Aquaculture | | | |
| (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 ingressión. | Emergency harvest | Flushing with freshwater. Fixing of bore well |
| 2) Floods | | | |
| A. Capture | | | |

| | | | |
|---|---|--|--|
| 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. Aquaculture | | | |
| (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 |
| 3. Cyclone / Tsunami | | | |
| 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) | | | |

| | | | |
|---|---|---|---|
| 4. Heat wave and cold wave | | | |
| A. Capture | | 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 livefood of inland fishers | Rehabilitation of the fishers affected |
| B. Aquaculture | | 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 desiltign 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. Compensatiiong 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 |