



भारतीय कृषि
ICAR

INDIAN COUNCIL OF
AGRICULTURAL RESEARCH

DISTRICT WISE CONTINGENCY PLAN TO DEAL WITH **EL NIÑO**

PREPAREDNESS | RESPONSE | RESILIENCE



**BUILDING A
DROUGHT RESILIENT
KERALA**

KERALA



PADDY



TAPIOCA



EARLY WARNING
& MONITORING



WATER
MANAGEMENT



SUSTAINABLE
AGRICULTURE



COMMUNITY
PARTICIPATION

TOGETHER, LET'S BUILD A RESILIENT KERALA

PREPARE TODAY • PROTECT TOMORROW • PROSPER TOGETHER

Kerala

Kerala is located along the southwestern coast of India and is characterized by a humid tropical climate with high rainfall and rich biodiversity. Agriculture plays an important role in the state's economy, supporting rural livelihoods and contributing significantly to plantation and horticultural production. Unlike many other Indian states, Kerala's agriculture is dominated by plantation crops, spices, coconut, rubber, and paddy. The state has diverse agro-climatic zones ranging from coastal plains to midlands and high ranges, enabling cultivation of a wide variety of crops.

Major Kharif crops include Paddy, coconut, tapioca, banana, black pepper, ginger, turmeric, and vegetables. Plantation crops such as rubber, coffee, tea, cardamom, cocoa, and arecanut are cultivated throughout the year depending on the region. During the Rabi season, Paddy, pulses, vegetables, and fodder crops are grown in suitable areas. Kerala receives an average annual rainfall of 2,500–3,500 mm, with nearly 70–75% received during the southwest monsoon (June–September). Agricultural production is therefore highly dependent on the onset, intensity, and distribution of monsoon rainfall.

Historical Impact of El Niño on Kerala

Kerala is highly vulnerable to El Niño-induced monsoon variability, which often leads to below-normal southwest monsoon rainfall, delayed monsoon onset, and prolonged dry spells. Reduced rainfall lowers reservoir storage, groundwater recharge, and soil moisture, affecting both rainfed and irrigated agriculture. Major crops such as paddy, coconut, rubber, black pepper, coffee, tea, and spices experience moisture stress, reduced flowering, poor fruit set, and lower productivity. Plantation crops are particularly sensitive to prolonged drought, while increased temperatures during El Niño years further reduce crop yields and adversely affect rural livelihoods.

Effects on Major Crops

- Paddy: Delayed transplanting, poor tillering, reduced grain filling, and lower yields.
- Coconut: Reduced nut setting, immature nut falls and decline in copra production.
- Rubber: Reduced latex yield due to moisture stress and high temperatures.
- Black Pepper: Poor flowering, spike shedding, and reduced berry formation.
- Coffee: Reduced blossom showers, poor fruit setting, and lower bean yield.
- Tea: Reduced leaf flush and decline in green leaf production.
- Cardamom: Reduced capsule development due to moisture stress.
- Banana: Poor bunch development and reduced fruit size.
- Ginger & Turmeric: Poor rhizome development and lower productivity.
- Vegetables: Reduced growth, flower drop, and lower marketable yield.

Contingency Plans for Major Crops Grown in Kerala

Crop	El Niño Situation	Recommended Contingency Measures
Paddy	Delayed monsoon	Community nursery, direct-seeded Paddy (DSR), short-duration varieties, moisture conservation
Coconut	Moisture stress	Basin mulching, drip irrigation, coconut husk burial, rainwater harvesting
Rubber	Prolonged dry spell	Mulching, cover crops, protective irrigation in young plantations
Black Pepper	Rainfall deficit	Mulching, shade regulation, drip irrigation
Coffee	Reduced blossom showers	Protective irrigation, mulching, shade management
Tea	High temperature & drought	Mulching, sprinkler irrigation, pruning
Cardamom	Moisture stress	Drip irrigation, mulching, shade regulation
Banana	Water scarcity	Drip irrigation, mulching, propping
Ginger	Delayed rainfall	Mulching, raised beds, irrigation
Turmeric	Moisture stress	Organic mulching, supplemental irrigation

Agriculture in Kerala is highly dependent on the southwest monsoon and is therefore vulnerable to El Niño-induced rainfall deficits. Delayed monsoon onset, prolonged dry spells, and increased temperatures reduce the productivity of paddy, plantation crops, spices, and horticultural crops. Adoption of drought-resilient varieties, efficient water management, mulching, rainwater harvesting, micro-irrigation, and climate-smart agricultural practices will help improve the resilience and sustainability of Kerala's agriculture under El Niño conditions.

Area under major crops

Crop	Area (Lakh ha)
Paddy	1.77
Tapioca	0.5

Districts vulnerable to El Nino

Highly	Medium	Low
Trivandrum, Cannanore, Pattanamtitta, Kottayam, Wayanad, Malappuram, Idukki	Kasaragod, Alleppey	Nil

Actionable Comprehensive Plans for Contingency

State	KERALA	District	ALLEPPEY
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	1643	More than 19%	Less than 1330.83
June	551.7		
July	461.5		
August	321.6		
September	308.2		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	34491	Gross irrigated area:	48012
Net Rainfed area	47935	Gross rainfed area	62567

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	3506	4881
Wells	6314	8789
Tanks	149	207
Other sources	24522	34135

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	6471	6301	170
2	Jowar	-	-	
3	Maize	8	8	0
4	Bajra	-		
5	Ragi	35	35	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	18	18	0
2	Groundnut	6	6	0
3	Sesamum	342		342
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	38	38	0
2	Tobacco	-		
3	Guar seed	-		42
4	Other Fodder crops	108	66	42

Crop Plan- Beginning of the season

Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures
Delay by 4 weeks July 1st week	Medium lands	Rice-Rice- Sesame/pulses/ vegetables	Rice –Rice –fallow Fallow- RiceSesame/Veg/Pulses	Direct seeding of short duration photo insensitive varieties (Manuratna, Annapurna, Hraswa) instead of photo sensitive long duration varieties, Resort to seed hardening with potassium chloride In transplanting areas a greater number of seedlings/ hill, closer spacing Medium/short duration photo insensitive varieties instead of photo sensitive long duration varieties during second crop (Rabi). Foliar spray of 2% DAP + 1% KCl (MOP) during critical stages of flowering

				and grain formation, 50 % more of recommended K 3% Kaolin spray at critical stages of moisture stress Foliar spray of 2% DAP + 1% KCl (MOP) during critical stages of flowering and grain formation Irrigation due to lack of residual moisture for summer crops like sesame, pulses and vegetables
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	1. Planting with onset of monsoons 2. Drip/pitcher irrigation 3. Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith 4. For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Life saving irrigation is suggested. Short duration varieties of tuber crops and pulses as inter crops Banana Protecting pseudostem of standing crop by wrapping with the drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Use short duration varieties and resort to direct sowing Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring
		Open uplands of homesteads	No Change	1. Planting with onset of monsoons 2. Drip/pitcher irrigation 3. Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith 4. For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Life saving irrigation is suggested. Short duration varieties of tuber crops and pulses as inter crops Banana Protecting pseudo stem of standing crop by wrapping with the drooping dry leaves Application of bulky organic manures

				Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Use short duration varieties and resort to direct sowing Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring
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Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At vegetative stage	Medium lands	Rice-Rice-Sesame/Pulses/vegetables	Provide irrigation facilities Weed control measures are to be taken Spraying of anti transparent like Kaolin	Split application of N & K fertilizers, need based irrigation, Use of biofertilizers in Rice Spraying 3% Kaolin spray at critical stages of moisture stress, Use of Biofertilizers, Irrigate after the disappearance of water Application of potassium or calcium silicate @ 5gm/lit at vegetative stage Foliar application of PPFM @1%
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Provide life saving irrigation Drip/pitcher irrigation Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Provide life saving irrigation. Banana Application of bulky organic manures. Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring Foliar application of water-soluble fertilizers Use hydrogels
		Open uplands of homesteads	Timely weed management and fertilizer application	Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith

				For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Provide life saving irrigation. Banana Application of bulky organic manures. Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring Foliar application of water-soluble fertilizers Use hydrogels
Condition			Suggested Contingency measures	
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure
At flowering/ fruiting stage	Medium lands	Rice- Rice/sesame/pulses/vegetables	Improve the Bulk density of the soil by organic manure addition, thereby water holding capacity. (Soil compaction techniques in paddy fields)	Basal application of Sufficient organic matter. Irrigate after the disappearance of the ponded water in the case of rice. Application of potassium or calcium silicate @ 5gm/lit at vegetative stage Foliar application of PPFM @1%
		Coconut based cropping system in garden lands with Banana, tuber crops and vegetables as inter crops	No change	Provide life saving irrigation Drip/pitcher irrigation Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Provide life saving irrigation. Banana Application of bulky organic manures. Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring Foliar application of water-soluble fertilizers Use hydrogels
		Open uplands of homesteads	Provide irrigation facilities	Provide life saving irrigation Drip/pitcher irrigation Organic manure application, Mulching the soil with dried leaves. Burial of coconut husk or coir pith

				For coconut, Mix 50 g of Azospirillum, 50 g of Phosphobacteria (or) 100 g Azophos and 50 g of VAM in sufficient quantity of compost or FYM and apply near feeding roots once in 6 months / palm starting from planting Provide life saving irrigation. Banana Application of bulky organic manures. Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring Foliar application of water-soluble fertilizers Use hydrogels
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Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^e
	Medium lands	Rice-rice-sesame/pulses/vegetables	No change Harvesting at physiological maturity stage	Use of short duration varieties/crops. Use of Drought tolerant varieties/crops, Harvesting at physiological maturity, termination of irrigation two weeks before harvest
		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	Mulching and cover cropping
		Open uplands of homesteads	No change	No change

Drought - Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Delayed release of water in canals due to low rainfall	Loamy sand soils	Rice-rice-sesame/pulses/vegetables	Rice-Rice (SD)-Pulses, Sesame (SD)	Mulching. Organic manure addition, Life saving irrigation, Delayed planting, Mulching for vegetables Selection of suitable cropping systems. Micro irrigation methods from the available sources	NREGS

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	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 ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	Limited release of water in canals due to low rainfall	Rice-rice-sesame/pulses/vegetables	Rice-Rice (SD)-Pulses, Sesame (SD)	Organic manure addition Mulching for vegetables Selection of suitable cropping systems. Adoption of micro irrigation	NREGS
	Below MSL paddy lands:	Rice- Rice - Fallow	No change. Delay in sowing of first crop	Selection of short duration varieties for first crop	Source of seed to be ensured

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	Non release of water in canals under delayed onset of monsoon in catchment	Rice-rice-sesame/pulses/vegetables	Fallow- Rice –Pulses/ Sesame	Rain water harvesting ,Direct sowing	NREGS
	Below MSL paddy lands	No change. Delay in sowing of first crop	Selection of short duration varieties (Manuratna, Annapurna, Hraswa), Direct sowing	Source of seed to be ensured	

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

Resource management technologies

- **Coir-pith mulching**
- **Husk burial**
- **Drip irrigation in coconut and arecanut garden**
- **Liming in Kari soil**
- **Sub surface drainage in water logged areas**

Actionable Comprehensive Plans for Contingency

State	KERALA	District	CANNANORE
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	2623	More than 19%	Less than 2124.63
June	879.1		
July	884.2		
August	531.7		
September	328		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	12834	Gross irrigated area:	17676
Net Rainfed area	165626	Gross rainfed area	192268

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	1421	1957
Wells	8627	11882
Tanks	796	1097
Other sources	1990	2740

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	1994	0	
2	Jowar	-	-	
3	Maize	8	8	0
4	Bajra	0	0	0
5	Ragi	2	2	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	10		10
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	1	1	0
2	Tobacco	-		
3	Guar seed	-		111
4	Other Fodder crops	180	69	111

Crop Plan- Beginning of the season

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

Delay by 4 weeks (July first Week)	Sandy clay loam Clay loam Sandy loam soils	Rice-Rice Rice-Vegetables Rice -Pulse Arecanut + Pepper Coconut + Pepper Rice –Pulse Coconut + Banana Arecanut + Banana + Pepper Coconut + Pepper	Rice-Rice Rice-Vegetables Rice -pulse	Direct seeding for the first crop Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) Prepare mat nursery and adopt community nursery Adopt closer spacing and increase the number of seedlings to 3-4 numbers/hill and give additional N @5 kg/ha Spray of B and K increases drought tolerance Apply silica mulching organic manuring Sprinkler Irrigation/micro irrigation/supplemental irrigation. Wet seeding of short duration varieties Adopt single crop of long duration variety (Ponmani, Karuna) Coconut Husk burial, mulching, bulky organic manures. For seedlings, white washing, mulching, shading and lifesaving irrigation for Coconut and Arecanut. Drip irrigation Banana Protecting pseudostem of standing crop by covering with dropping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to application of fertilizers Drip irrigation
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Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures

At vegetative stage	Sandy clay loam Clay loam Sandy loam	Rice-Rice Rice-Vegetables Rice- Sesamum	Suppresses weed growth, Make Shelterbelts, spraying potassium chloride, thinning of 33–50% population anti-transpirant spray. Mulching Foliar application of nutrients according to the need and crop stages o be followed to have a profitable yield.	Irrigate at 1 to 4 days after disappearance of ponded water, In-situ rainwater conservation, Application of P and K as basal, Reduce N dose, Apply bulky organic manures. Collection and conservation of rain water, Intermittent flooding, maintaining the soil in sub saturated condition, Alternate drying and wetting.
		Coconut + Banana Arecanut + Banana + Pepper Coconut + Pepper Pepper + Arecanut	Suppresses weed growth, Make Shelterbelts Establishment of leguminous cover crop, Shading the young plants, white washing the main stem, Antitranspirants spray	Zero tillage, Mulching, Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation Terracing, Husk burial, Removal of lower leaves mulching with plant residues and polythene sheets for upland crops like pepper, Arecanut and vegetables are to be promoted

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures
At flowering/ fruiting stage	Sandy clay loam Clay loam Sandy loam	Rice-Rice Rice-Vegetables Rice- Sesamum Pepper + arecanut	Formation of Shelterbelts. Antitranspirants spray Spraying with borax @1-2 g per litre with spray adjuvant to improve seed setting and thereby to have uniform shaped fruits in fruits and vegetables	Irrigate at 1 to 4 days after disappearance of ponded water, Insitu rainwater conservation, Collection and conservation of rain water,Intermittent flooding, maintaining the soil in sub saturated condition alternate drying and wetting.
		Coconut + Banana Arecanut + Banana + Pepper Coconut + Pepper	Sprinkler irrigation (especially for pepper), Suppresses weed growth Formation of Shelterbelts, Antitranspirants spray Drip irrigation and irrigation scheduling	Mulching, Sub-surface storing of ground water,Less exploitation of ground water, Drip irrigation,Terracing

		Pepper + arecanut		
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Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
	Sandy clay loam Clay loam Sandy loam	Rice-Rice Rice-Vegetables Rice- Sesamum Coconut + Banana Arecanut + Banana + Pepper Coconut + Pepper Pepper + arecanut	Terminate the irrigation 14 to 17 days before harvest, Harvesting at physiological maturity or premature harvesting to save the crops for arecanut and pepper Establishment of leguminous cover crop, Shading, Pruning of coffee Antitranspirants spray	Maintaining the soil in sub saturated condition Alternate drying and wetting. Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial, Leaf cutting

Drought - Irrigated situation (canal Irrigation not available)

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Delayed release of water in canals due to low rainfall	Sandy clay loam Clay loam Sandy loam	Rice-Rice Rice-Vegetables	Rice (SD)-Rice (SD) Rice(SD)-Vegetables	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery	NREGAS Seed village program for SD varieties

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Limited release of water in canals due to low rainfall	Sandy clay loam Clay loam Sandy loam	Rice-Rice	Rice (SD)-Rice	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery Reduce the area under cultivation, Increase spacing	NREGS, Seed village program for SD varieties. Capacity building of padasekhara samithy
		Rice-Vegetables	Rice (SD)-Pulses		

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Non release of water in canals under delayed onset of monsoon in catchment	Sandy clay loam Clay loam Sandy loam	Rice-Rice	Rice (single crop)/Pulses	Rain water harvesting, Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt	NREGS

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				community nursery	
		Rice-Vegetables		• Delayed sowing • Direct seeding for the first crop. • Adopt phasic stress irrigation for the first crop. • Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) • In transplanted crop prepare mat nursery and adopt community nursery	

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Sandy clay loam Clay loam Sandy loam	Rice-Rice	Rice (single crop)/Pulses	• Rain water harvesting, • Direct sowing, • Prefer short duration varieties (Harsha, Kanchana, Manuratna, Jyothi, Annapurna, Mattathriveni)	Low cost GI checkdams in paddy fields to conserve water
		Rice-Vegetables		• Delayed sowing • Direct sowing, • Prefer short duration varieties (Harsha, Kanchana, Manuratna, Jyothi, Annapurna, Mattathriveni)	

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Insufficient groundwater recharge due to low rainfall	Sandy clay loam Clay loam Sandy loam	Rice-Rice	Rice-Rice	• Check dams, • Percolation pits, • Rain water harvesting • Water conservation measures	Soil and water conservation measures using MGNREGA

Resource management technologies

- Husk burial in coconut gardens
- Mulching along with soil test based nutrient management
- Drip irrigation in banana var. Nendran
- Field bunds in rice
- Enhanced water storage in check dam

Actionable Comprehensive Plans for Contingency

State	KERALA	District	IDUKKI
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	2574.3	More than 19%	Less than 2085.183
June	735.7		
July	796.7		
August	605.6		
September	436.3		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	47850	Gross irrigated area:	57298
Net Rainfed area	155189	Gross rainfed area	190233

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	1467	1757
Wells	13856	16591
Tanks	25801	30896
Other sources	6726	8054

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	21	21	0
2	Jowar	-	-	
3	Maize	3	3	0
4	Bajra	-		
5	Ragi	14	14	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	0		0
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	562	562	0
2	Tobacco	-		
3	Guar seed	-		1047
4	Other Fodder crops	1199	152	1047

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures
Early season drought (delayed onset)	Major Farming situation ^a	Normal Crop/cropping system ^b	Agronomic measures ^d
Delay by 4 weeks (July 1st week)	Manakkad series Gravelly Sandy clay –clay loam soils	Coconut based mixed cropping with Pepper, Pineapple, Tapioca and rubber	Mulching(with organic source), Bulk organic manuring, Sprinkler Irrigation Collection and conservation of rainwater (on farm), De silting, repairing and renovation of irrigation channels Raise leguminous cover crops
	Thommankuthu series Clay loam to gravelly clay loam soils:	Forest Vegetation, Rubber, Coconut	Mulching, Bulk organic manuring, Cover cropping, Husk Burial Raise leguminous cover crops
	Chinnar series	Forest Vegetation, Tea	Coir pith mulching (composted or semi composted) For tea

	Sandy loam to Sandy clay loam soils		
	Venmani Series Loam to clay loam soils	Coconut based mixed cropping with Pepper, Arecanut, Tapioca, Cocoa, Coffee, Turmeric, ginger and rubber	Mulching (composted or semi composted), Bulk organic manuring, Sprinkler Irrigation Collection and conservation of rainwater (on farm), De silting, repairing and renovation of irrigation channels. Cover crops for rubber
	Pampadumpara Series Silty clay to clay soils	Cardamom, Coffee, Pepper	Mulching, and earthing up the base of clump Bulk organic manuring, Sprinkler Irrigation Collection and conservation of rainwater, De silting, repairing and renovation of irrigation channels
	Anamudi Series Silty loam to clay loam soils	Forest vegetation, Tea	Coir pith mulching(composted or semi composted) For tea

Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	NormalCrop/cropping system	Crop management	Soil nutrient & moisture conservation measure^s
At vegetative stage	Manakkad series Gravelly Sandy clay –clay loam soils	Coconut based mixed cropping with Pepper, Pineapple, Tapioca and rubber	Providing additional shade (using shade net) for cardamom. Postponing shade lopping and trashing operations. Establishment of leguminous cover crop wherever possible in rubber and coffee plantations during early years , providing adequate mulching to the younger plants , white washing the main stem, Antitranspirants spray according to the situation in plantations. Pampadumpara series are most susceptible ones for physical degradation because this part gets less rainfall hence put under lower rainfall category. Crops such as cardamom, pepper and coffee are the most susceptible.	Zero tillage, Mulching, Sub-surface storing of surface runoff water , judicious use of ground water, Drip irrigation, Mist irrigation, other micro irrigation systems Terracing and ridging Husk burial. Manakkad, Thommankuthu and Chinnar series are the most prone to soil degradation particularly chemical and physical means and therefore conservation practices are to be implemented without second thought Planting of environmentally safer tree saplings in all major farming situations in Idukki. .
	Thommankuthu series Clay loam to gravelly clay loam soils:	Forest Vegetation, Rubber, Coconut		
	Chinnar series Sandy loam to Sandy clay loam soils	Forest Vegetation, Tea		
	Venmani Series Loam to clay loam soils	Coconut based mixed cropping with Pepper, Arecanut, Tapioca, Cocoa, Coffee, Turmeric, ginger and rubber		

	Pampadumpara Series Silty clay to clay soils	Cardamom, Coffee, Pepper		
	Anamudi Series Silty loam to clay loam soils	Forest vegetation, Tea		
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	NormalCrop/cropping system	Crop management	Soil nutrient & moisture conservation measure^s
At flowering/ fruiting stage	Manakkad series Gravelly Sandy clay –clay loam soils	Coconut based mixed cropping with Pepper, Pineapple, Tapioca and rubber	Providing additional shade (by net) for cardamom. Postponing shade lopping and trashing operations. Establishment of leguminous cover crop wherever possible in rubber and coffee plantations during early years , providing adequate mulching to the younger plants , white washing the main stem, Antitranspirant spray according to the situation in plantations. Spraying pesticides that are safe to honey bees and ecosystem processes must be used as per the recommendations of the GAP or POP of the KAU or Spices Board or Coffee Board or Coconut Board.	Zero tillage, Mulching, Sub-surface storing of surface runoff water, judicious use of ground water , Drip irrigation, Mist irrigation, other micro irrigation systems Terracing, Husk burial, planting of environmentally safer tree saplings (notified trees) in all major farming situation in Idukki. Fertilizers and manures must be applied in splits according to crop and soil and site-specific condition analytical report or as per the recommendations of the GAP or POP of the KAU or Spices Board or Coffee Board or Coconut Board.
	Thommankuthu series Clay loam to gravelly clay loam soils:	Forest Vegetation, Rubber, Coconut		
	Chinnar series Sandy loam to Sandy clay loam soils	Forest Vegetation, Tea		
	Venmani Series Loam to clay loam soils	Coconut based mixed cropping with Pepper, Arecanut, Tapioca, Cocoa, Coffee, Turmeric, ginger and rubber		
	Pampadumpara Series Silty clay to clay soils	Cardamom, Coffee, Pepper		
	Anamudi Series Silty loam to clay loam soils	Forest vegetation, Tea		

Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation^a	NormalCrop/cropping system^b	Crop management^c	Rabi Crop planning^d
	Manakkad series Gravelly Sandy clay –clay loam soils	Coconut based mixed cropping with Pepper, Pineapple, Tapioca and rubber	Establishment of leguminous cover crop, Shading and mulching by organic sources. Antitranspirant spray at appropriate dose (as per POP or GAP) when necessary. Early	

	Thommankuthu series Clay loam to gravelly clay loam soils:	Forest Vegetation, Rubber, Coconut	withdrawals of SW and NE monsoon rain will affect all types of farming situations. Pampadumpara series will be the most affected ones irrespective of season. Besides, annual crops like ginger can be another target by this situation. The situation will also lead to spike shedding in pepper and bean dropping in coffee. Therefore, adequate soil moisture conservation and providing irrigation during the fog end of December along with mulching and earthing up could be useful. In case of cardamom other forms of irrigations like fogger and mist irrigation would be beneficial as these would improve the cardamom microclimate for time being. Soil fertility improvement programmes have to be taken up in Sandy and stoney or gravelly soils. Soil conservation programmes have to be taken up across all series according to the slope gradients as well as rainfall intensity and its distribution.	
	Chinnar series Sandy loam to Sandy clay loam soils	Forest Vegetation, Tea		
	Venmani Series Loam to clay loam soils	Coconut based mixed cropping with Pepper, Arecanut, Tapioca, Cocoa, Coffee, Turmeric, ginger and rubber		
	Pampadumpara Series Silty clay to clay soils	Cardamom, Coffee, Pepper		
	Anamudi Series Silty loam to clay loam soils	Forest vegetation, Tea		

Drought - Irrigated situation

Condition	Suggested Contingency measures				
	Major Farming situation ^f	NormalCrop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Insufficient groundwater recharge due to low annual rainfall	Pampadumpara Series Silty clay to clay	Cardamom, Coffee, Pepper	No Change is possible as it is coming under cardamom hill reserve (CHR)	Check Dams, Percolation Pits, Rain water harvesting structures. Water conservation Measures	Spices/Coffee/Coconut Board, NREGS

Resource management technologies

- Rain water harvesting and recharge pit
- Bio shielding
- Mulching

Actionable Comprehensive Plans for Contingency

State	KERALA	District	KASARAGOD
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	2846.2	More than 19%	Less than 2305.422
June	982.4		
July	941.5		
August	591.7		
September	330.6		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	56446	Gross irrigated area:	71027
Net Rainfed area	90964	Gross rainfed area	86581

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	169	213
Wells	44520	56021
Tanks	9451	11892
Other sources	2306	2901

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	1427	487	940
2	Jowar	-	-	
3	Maize	2	2	0
4	Bajra	2	2	0
5	Ragi	1	1	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	11	11	0
2	Groundnut	-		
3	Sesamum	0		0
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	4	4	0
3	Guar seed	-		6
4	Other Fodder crops	110	104	6

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures	
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures
Delay by 4 weeks	Arathil Series (Gravelly clay loam)	Cashewnut Coconut Rubber	No change	Agronomic practices like fertilizer application, liming, opening of basins: delayed for 4 weeks Mulching of the entire field for moisture conservation. Other moisture conservation practices like Mulching of basins Husk Burial Rain water harvesting pits

				Lifesaving irrigation. Stop the tapping. Harvesting of tender coconut, removal of older leaves of coconut, mulching around basins. Antitranspirants to young plants.
	Meeyanganam Series (clay to clay loamy)	Coconut Rubber Pepper	No change	Agronomic practices like fertilizer application, liming, opening of basins: delayed for 4 weeks Mulching of the entire field for moisture conservation Other moisture conservation practices Mulching of basins Husk Burial Rain water harvesting pits Lifesaving irrigation Covering the whole wine with plated coconut leaves, Kaolin spray
		Banana	No change	Integrated nutrient management, liming, Mulching, Organic manuring. Covering psuedostem with older leaves, pitcher irrigation. Drip Irrigation
	Edanad Series (Moderately shallow clay loam to sandy clay loam)	Cashew Coconut Pepper	No change	Agronomic practices like fertilizer application, liming, opening of basins: delayed for 4 weeks Mulching of the entire field for moisture conservation Other moisture conservation practices Mulching of basins Husk Burial Rain water harvesting pits and measures Lifesaving irrigation
		Banana		Integrated nutrient management, liming, Mulching organic manuring Drip irrigation.
	Thekkila Series (Clay to clay loam)	Rice-Rice Rice-Vegetables Rice-Maize/Sweet potato Areca nut	No change	Direct seeding with short duration varieties such as Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni, Irrigate at 1 to

				4 days after disappearance of ponded water
	Palayam series (Clay	Coconut Arecanut Pepper Rubber Cashew	No change	Agronomic practices like liming, fertilizer application, opening of basins: delayed for 4 weeks Mulching of the entire field for moisture conservation. Other moisture conservation practices like Mulching of basins, Husk Burial, Rain water harvesting pits and measures, Lifesaving irrigation
	Kolathur series (Rock out crop	Cashew Coconut	No change	-do-

Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At vegetative stage	Arathil Series (Gravelly clay loam soils)	Cashew Coconut Rubber	Weeding, Make Shelterbelts, Establishment of leguminous cover crop, Shading the young plants, white washing the main stem, Anti-transpirant spray	Zero tillage, Mulching, Subsurface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial, leaf removal
	Meeyanganam Series (clay to clay loamy soils)	Coconut Rubber Pepper Banana	Weeding, Make Shelterbelts, Establishment of leguminous cover crop, Shading the young plants, white washing the main stem, Anti-transpirant spray	Zero tillage, Mulching, Subsurface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial, leaf removal
	Edanad Series (Moderately shallow clay loam to sandy clay loam soils)	Cashew Coconut Pepper Banana	Weeding, Make Shelterbelts, Establishment of leguminous cover crop, Shading the young plants, white washing the main stem, Anti-transpirant spray	Zero tillage, Mulching, Subsurface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial, leaf removal
	Thekkila Series (Clay to clay loam soils)	Rice-Rice	Weeding, Make Shelterbelts, spraying	Irrigate at 1 to 4 days after disappearance of ponded water,

		Rice-Vegetables Rice-Maize/Sweet potato Areca nut	potassium chloride, thinning of 33–50% population, anti-transpirant spray	Insitu rainwater conservation, Application of P and K as basal, Reduce N dose, Apply bulky organic manures. Collection and conservation of rain water, Intermittent flooding, maintaining the soil in sub saturated condition, alternate drying and wetting. Spray of water-soluble fertilizers
	Payalam series (Clay)	Coconut Areca nut		
		Pepper Rubber Cashew		
		Kolathur series (Rock out crop) Coconut Cashew		
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure^s
At flowering/ fruiting stage	Arathil Series (Gravelly clay loam)	Cashew Coconut Rubber	Formation of Shelterbelts. Antitranspirants spray	Insitu rainwater conservation, Collection and conservation of rain water, mulching, liming, integrated nutrient management, husk bur, Drip irrigation
	Meeyanganam Series (clay to clay loamy)	Coconut Rubber Pepper Banana	Formation of Shelterbelts. Antitranspirants spray	Insitu rainwater conservation, Collection and conservation of rain water, mulching, liming, integrated nutrient management, husk bur, Drip irrigation
	Edanad Series (Moderately shallow clay loam to sandy clay loam)	Cashew Coconut Pepper Banana	Formation of Shelterbelts. Antitranspirants spray	Insitu rainwater conservation, Collection and conservation of rain water, mulching, liming, integrated nutrient management, husk bur, Drip irrigation
	Thekkila Series (Clay to clay loam)	Rice-Rice Rice-Vegetables Rice-Maize/Sweet potato	Sprinkler irrigation (especially for coffee and pepper), Suppresses weed growth, Formation of Shelterbelts, Antitranspirant spray	Liming, integrated nutrient management, Mulching, irrigate at 1 to 4 days after disappearance of ponded water, Insitu rainwater conservation, Collection and conservation of rain water, Intermittent flooding, maintaining the soil in sub saturated condition, alternate drying and wetting. Spray of water-soluble fertilizers. Spray PPFM
	Kolathur series (Rock out crop)	Coconut Cashew	Formation of Shelterbelts. Antitranspirant spray	Liming, integrated nutrient management,

	Payalam series (Clay)	Coconut Arecanut Pepper Rubber Cashew	Formation of Shelterbelts. Antitranspirant spray	Mulching, Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing
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Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought	Major Farming situation ^a	Normal Crop/cropping system ^b	Crop management ^c	Rabi Crop planning ^d
	Arathil Series (Gravelly clay loam)	Cashew Coconut Rubber	Establishment of leguminous cover crop, Shading, Pruning of coffee, Anti transpirant spray	Liming, integrated nutrient management, Mulching, Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial, leaf removal.
	Meeyanganam Series (clay to clay loamy)	Coconut Rubber Pepper Banana		
	Edanad Series (Moderately shallow clay loam to sandy clay loam soils)	Cashew Coconut Pepper Banana		
	Thekkila Series (Clay to clay loam)	Rice-Rice	Terminate the irrigation 14 to 17 days before harvest, Harvesting at physiological maturity,	Liming, integrated nutrient management, Mulching, Maintaining the soil in sub-saturated condition, alternate drying and wetting, drip irrigation.
		Rice-Vegetables		
		Rice-Maize/Sweet potato		
		Areca nut	Establishment of leguminous cover crop, Shading, Pruning of coffee, Antitranspirant spray	Liming, integrated nutrient management, Mulching, Sub-surface storing of ground water, less exploitation of ground water, Drip irrigation, Terracing, Husk burial, leaf cutting.
	Payalam series (Clay)	Coconut Areca nut Pepper Rubber Cashew		
	Kolathur series (Rock out crop)	Coconut Cashew		

Resource management technologies

- Contour Trenching in coconut garden
- Inter cultivation and coconut husk burial in coconut garden using garden tiller
- Micro-irrigation (Vegetables and Banana)
- Recycling of crop residues through vermicomposting
- Raised Bed Cultivation (Vegetables & Pulses)
- Integrated Farming (Crops + Livestock/Fish)
- Windbreaks and Shelterbelts (Coastal areas) with Casurina /Glyricidia

Actionable Comprehensive Plans for Contingency

State	KERALA	District	KOTTAYAM
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	1905.3	More than 19%	Less than 1543.293
June	641.8		
July	544.1		
August	382.6		
September	336.8		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	19628	Gross irrigated area:	24996
Net Rainfed area	138582	Gross rainfed area	187181

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	269	343
Wells	3520	4483
Tanks	392	500
Other sources	15447	19670

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	2003	2003	0
2	Jowar	-	-	
3	Maize	0	0	0
4	Bajra	0	0	0
5	Ragi	8	8	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	25	25	0
2	Groundnut	-		
3	Sesamum	0		0
4	SOyabean	-		
5	Sunflower	0	0	0
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	26	26	0
2	Tobacco	-		
3	Guar seed	-		350
4	Other Fodder crops	365	15	350

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures	
Early season drought (delayed onset)	Major Farming situation ^a	Normal Crop/cropping system ^b	Change in crop/cropping system ^c	Agonomic measures ^d
Delay by 4 weeks (Specify month)	Low land (Acid Sulfate Soil)	Rice-Rice	Use extra short duration Varieties (Hraswa)	Wet seeding of sprouted seeds Resort to seed hardening with potassium chloride In transplanted crop prepare, mat nursery and adopt community nursery Adopt closer spacing and increase the number of seedlings to 3-5 per hill Apply addition dose of N @ 5 Kg/ha Desilting and renovation of irrigation canals
		Puncha Crop (October-March)	No Change	
		Coconut	No Change	1.Sprinkler irrigation 2.Burial of coconut husk in circular trenches taken around

				the palm 3. Give shade to young coconut seedlings up to onset of monsoon 4. Application of organic manure will help to conserve soil moisture for thriving the summer drought 5. Mulching basins 6. Raise leguminous cover crops. 7. Painting the trunk white to reflect the sunlight and thus keep the bark cooler
		Vegetable	No Change	Planting can be delayed Mulching Drip irrigation Protected cultivation Go for short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea
		Banana	No Change	Delay planting up to the onset of Monsoon Mulching Irrigation Organic manuring Protecting pseudostem of standing crop by covering with dropping dry leaves Life saving irrigation, prior to the time of application of fertilizers
	Midland	Rice:	Phasic stress irrigation with available water if onset of Monsoon is delayed in June	Use short duration Varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) Direct sowing Mat nursery and mechanized Transplanting (Community nursery) Spray of B and K to increase drought tolerance
		Virippu (April-Sept)		
		Mundakan (Sept-January)	If Mundakan Crop is delayed due to delay in harvesting of Virippu Crop use only non-photo Sensitive varieties which can be harvested by Dec-January	Do not use photo sensitive varieties recommended for Mundakan if harvesting will be Delayed Use medium/short duration photo insensitive varieties (Jyothi, Kairali, Pournami, Varsha, Aishwarya, Vaishakh/Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni)
		Puncha (Dec-April)	If Puncha crop is delayed due to delay in harvesting of Mundakan use short duration varieties (Harsha, Kanchana,	Phasic stress irrigation with available water for economizing water use in summer

			Manuratna, Annapurna, Mattathriveni)	
		Coconut	No change	1. Micro irrigation 2. Burial of coconut husk in circular trenches taken around the palm 3. Give shade to young coconut seedlings up to onset of monsoon 4. Application of organic manure will help to conserve soil moisture for thriving the summer drought 5. Mulching basins 6. Raise leguminous cover crops. 7. Painting the trunk white to reflect the sunlight and thus keep the bark cooler
		Nutmeg	No change	Mulching basins Application of organic manure Providing shade to young seedlings Provide life saving irrigation Drip/micro sprinkler irrigation
		Rubber	No change	White washing the stem using lime/china clay and providing shade for young plants Cover crops Rain harvesting pits
		Tapioca	No change	Short duration var (Nidhi, Kalpaka, Vellayani Hraswa, Uthama, Sree Jaya, Sree Vijaya, Sree Swarna, Sree Prakash), cover crops Mulching Life saving irrigation
		Ginger	No change	Delayed planting Mulching Life saving irrigation Organic manuring
		Pepper	No change	Mulching Covering young plants with dried leaves Micro irrigation Organic manuring
		Banana	No change	Delay planting up to the onset of monsoon Drip irrigation Organic manuring Protecting pseudostem and bunch of standing crop with the drooping dry leaves Mulching with crop residues, life saving irrigation

Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At vegetative stage	Midland	Rice	Suppress weed growth	Irrigate at 1-4 days after disappearance of standing water, Foliar spray of 2% DAP + 1% KCl (MOP) during critical stages of flowering and grain formation. 3% Kaolin (Antitranspirant) spray at critical stages of moisture stress
		Vegetables	No change	Drip irrigation Organic matter application Mulching Go for foliar spray of water-soluble fertilizers
		Banana	Irrigation Organic matter application mulching Rain water harvesting	
		Coconut		
		Nutmeg		
		Condition		
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At flowering/ fruiting stage	Midland	Rice	Suppress weed growth, Spraying 3% KNO ₃ or 3% solution of Urea and MOP in 3:2 proportions at boot leaf stage if root damage already occurred	Irrigate at 1-4 days after disappearance of standing water
		Vegetables	Micro irrigation Mulching Rain water harvesting	Organic matter application, Terracing Establish rainwater harvesting structures like rain pits. Raise leguminous cover crops Micro irrigation
		Banana	Irrigation Organic matter application mulching Rain water harvesting	
		Coconut		
		Nutmeg		

Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal Crop/cropping system	Crop management	Rabi Crop planning
	Midland	Rice	Use extra short duration variety and drought tolerant variety based on weather prediction (Hraswa)	

			Stop the irrigation 14-15 days before harvest, Harvest at physiological maturity	Establish rainwater harvesting structures like rain pits, check dams etc. Raise leguminous cover crops Micro irrigation
		Vegetables	Micro irrigation Mulching Rain water harvesting	
		Banana	Irrigation Organic matter application Mulching Cover crops Rain water harvesting	
		Coconut		
		Nutmeg		

Resource management technologies

- **Mulching for rubber, pepper and cardamom**
- **Drip irrigation in nutmeg and coconut**
- **Trenching in rubber and spice crops**
- **Rainwater harvesting pits**

Actionable Comprehensive Plans for Contingency

State	KERALA	District	MALAPPURAM
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	1956.5	More than 19%	Less than 1584.765
June	624.1		
July	643.4		
August	393.8		
September	295.2		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	31933	Gross irrigated area:	43645
Net Rainfed area	136582	Gross rainfed area	195794

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	3271	4471
Wells	20269	27703
Tanks	3005	4107
Other sources	5388	7364

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	201	42	159
2	Jowar	-	-	
3	Maize	0		
4	Bajra	-		
5	Ragi	4	4	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	36		36
4	SOyabean	-		
5	Sunflower	0	0	0
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		102
4	Other Fodder crops	217	115	102

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Major Farming situation
Delay by 4 weeks (July 1st week)	Triprangode Series loamy sand	Rice- Rice- Rice	No change. But go for Short duration varieties in 3 seasons (Harsha, Manurathna, Jyothi, Kanchana, Annapurna)	Wet seeding and sowing of pre germinated seeds can be done	Linkage with seed village programme
	Angadipuram series sandy clay loam				
	Naduvattom series clay loam				
	Mannamkulam series gravelly clay				
	Treble cropped wet land				
		Rice-Rice	No change		

	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice-Vegetables	Medium duration Rice Medium duration Rice (Uma, Kairali, Pournami, Varsha, Aishwarya) + vegetables	Possible with protective irrigation from water harvesting structures Provide irrigation at critical stages Provide irrigation 2 days after disappearance of standing water Do mulching and organic manuring for vegetables For vegetables go for drip irrigation with fertigation Adopt mechanization for Rice	Department schemes on water harvesting can be linked Department schemes for mechanization + NREGS can be utilized
		Rice-Rice-Sesamum	Medium duration Rice (Uma, Kairali, Pournami, Varsha, Aishwarya) + Sesamum Medium duration rice + short duration pulses		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Single cropped wet lands	Rice-Banana	No change	Go for short duration paddy like Hraswa adopting mechanization	Panchayat schemes on mechanization + NREGS
		Rice-Tapioca	No change	Go for short duration variety of Rice and short duration variety of Tapioca Nidhi, Kalpaka, Vellayani Hraswa, Uthama, Sree Jaya, Sree Vijaya, Sree Swarna, Sree Prakash	
		Rice-Fallow-Pulses	No change	Mulching + selection of short duration and hardy pulses like Greengram	
		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 Garden lands	Coconut based homesteads with Arecanut, Banana and Pepper	No change	Adopting mulching practices Continue micro irrigation till the onset of monsoon Delay fertilizer application Adopt copious organic manure application Apply lime up to about 2 meters on the trunk of the coconut palms to protect from untimely high temperature	Department of Agriculture Micro irrigation scheme

Contingency measures- Mid season

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures	
Mid-season drought (long dry spell, consecutive 2 weeks rainless)			Crop management	Soil nutrient & moisture conservation measure ^s

(>2.5 mm) period)				
At vegetative stage	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Treble cropped wet land	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.
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice	PPFM spray/SOP spray	Application of P and K as basal, Reduce N dose. Mulching, micro irrigation
		Rice-Rice-Vegetables		
		Rice-Rice-Sesamum		
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattomseries clay loam Mannamkulam series gravelly clay Single cropped wet lands	Rice-Banana	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 PPFM spray/SOP spray	Application of P and K as basal Reduce N dose.
		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 Garden lands	Coconut based homesteads with Arecanut, Banana and Pepper	Life saving irrigation	Mulching, bulky organic manures, Micro-irrigation for coconut. Delayed planting of annual crops. Husk burial. White washing, shadingand lifesaving irrigation for Coconut. Drip irrigation BananaProtecting psuedostem of standing crop by covering with dropping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation Vegetables Planting can be delayed Mulching Drip irrigation Go for short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea

Condition				
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At flowering/ fruiting stage	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Treble cropped wet land	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 As a long-term strategy, go for rain water harvesting and conservation Spray 0.5 to 1 % K ₂ SO ₄ to mitigate drought Life saving irrigation at critical stage PPFM 2% spray
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice Rice-Rice- Vegetables Rice-Rice- Sesamum	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 As a long-term strategy, go for rain water harvesting and conservation Spray 0.5 to 1 % K ₂ SO ₄ to mitigate drought Life saving irrigation at critical stage PPFM 2% spray
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Single cropped wet lands	Rice-Banana Rice-Tapioca Rice-Fallow- Pulses Fallow-Fallow- Rice (Typical kole lands)	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 As a long-term strategy, go for rain water harvesting and conservation Spray 0.5 to 1 % K ₂ SO ₄ to mitigate drought Life saving irrigation at critical stage PPFM 2% spray
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Vazhikkadavu series sandy clay loam Garden lands	Coconut based homesteads with Arecanut, Banana and Pepper		Coconut Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana

				Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Mechanical weed control measures Banana Protecting pseudostem of standing crop by covering with dropping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation
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Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal Crop/ cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Treble cropped wet land	Rice- Rice- Rice	Give life saving irrigation. If the Rice crop fails it can be cut and converted to use as fodder/silage	Use short duration varieties (Harsha, Manurathna, Jyothi, Kanchana, Annapurna) for 2nd crop Maintain the soil in sub-saturated condition, follow alternate drying and wetting 2nd crop of Rice can be skipped so that the vegetables can start early Banana and Tapioca can be intercropped with cowpea in the initial 3 months Coconut Raise leguminous cover crops. Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Mechanical weed control measures Banana

				Protecting pseudostem of standing crop by covering with dropping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation
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Drought - Irrigated situation

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
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 Treble cropped wetland	Rice-Rice-Rice	Rice-sesame/pulses	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery Use pre-emergence herbicides Use organic manures	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 Double cropped wet lands	Rice-Rice Rice-Rice- Vegetables Rice-Rice-Sesamum	Rice-sesame/pulses		

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
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 Treble cropped wetland	Rice-Rice-Rice	Rice (short duration) – heat tolerant pulses/Sesamum	• Irrigation at critical stages only. • Raising community nursery • Cultivation of drought tolerant varieties like Vaisakh, Swarnaprabha, etc • 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 • Bund planting/ Fringe cropping with vegetables such as cowpea can also be adopted	

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice Rice-Rice-Vegetables Rice-RiceSesamum	Rice (short duration) - hardy pulses/Sesamum	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery Use pre-emergence herbicides Use organic manures	

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Non release of water in canals under delayed onset of monsoon in catchment	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattomseries clay loam Mannamkulam series gravelly clay Treble cropped wetland	Rice-Rice-Rice	Rice-pulses/sesame	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery Use pre-emergence herbicides Use organic manures	Dept. scheme on pulses and micro irrigation

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	Triprangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice Rice-Rice- Vegetables Rice-RiceSesamum	Use short duration varieties for Rice, vegetables and Sesamum	Direct seeding for the first crop. Adopt phasic stress irrigation for the first crop. Prefer short duration varieties (Harsha, Kanchana, Manuratna, Annapurna, Mattathriveni) In transplanted crop prepare mat nursery and adopt community nursery Use pre-emergence herbicides Use organic manures Follow mulching practices for vegetables , Adopt micro irrigation for rabi/summer crop	Dept. scheme on pulses and micro irrigation

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
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

	Tripangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Double cropped wet lands	Rice-Rice Rice-Rice- Vegetables Rice-Rice-Sesamum	Rice- pulses/sesame		
	Tripangode Series loamy sand Angadipuram series sandy clay loam Naduvattom series clay loam Mannamkulam series gravelly clay Single cropped wet lands	Rice-Banana Rice-Tapioca Rice-FallowPulses Fallow-FallowRice(Typical kole lands)	Rice (short duration) – short duration Tapiocasuch as Nidhi, Kalpaka, VellayaniHraswa, Uthama, Sree Jaya, Sree Vijaya, Sree Swarna, Sree Prakash		
	Garden lands	Coconut based homesteads with Arecanut , Banana and Pepper	No change	Contour terracing Bunding, rainwater harvesting pits, small check dams, growing more vegetative cover over ground	

Resource management technologies

- **Earthen bunds along the contour**
- **Farm ponds and check dams**

Actionable Comprehensive Plans for Contingency

State	KERALA	District	PATTANAMTITTA
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	1572.7	More than 19%	Less than 1273.887
June	508.6		
July	457.4		
August	316.4		
September	290.3		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	6024	Gross irrigated area:	7968
Net Rainfed area	71875	Gross rainfed area	100152

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	1562	2066
Wells	2453	3244
Tanks	27	36
Other sources	1982	2622

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	21	21	0
2	Jowar	-	-	
3	Maize	0		
4	Bajra	-		
5	Ragi	-		

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	1		1
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	19	19	0
2	Tobacco	-		
3	Guar seed	-		158
4	Other Fodder crops	158	0	158

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Major Farming situation
Delay by 4 weeks (Specify month)	Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	Rice (short duration) – rice (SD)- fallow Pulse- fallow-rice	Direct seeding of short duration photoinensitive varieties (Manuratna, Annapurna, Hraswa) In transplanting areas more number of seedlings/ hill, closer spacing Plant pulse crops, green gram/ black gram Cropping pattern can be altered with less duration pulse crop	Ensure availability of seeds of short duration rice and pulses
		Vegetables as pure crop in rice	-do-	1. Micro irrigation	Micro irrigation scheme, and SHM

		fallows as well as garden lands		2. Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Use short duration varieties and resort to direct sowing Organic manuring Supply NPK as foliar application Use hydrogels to conserve water	
		Sugarcane as mono crop	-do-	No management since irrigated	
	Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	Tubers as inter crop during initial stage of growth especially cassava which require less moisture	1. Swabbing with kaolinite from base to a height of 1.5 m Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing	Rubber board schemes
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	No Change	Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss	CDB schemes
		Vegetables as pure crop	No Change	Micro irrigation Mulching pit basin with organic matter, coir pith compost, coconut leaves etc.	Micro irrigation scheme, and SHM
	Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop Banana with tubers a intercrop	No Change	Protecting psuedostem of standing crop by covering with drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers	SHM

				Drip irrigation	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss	CDB schemes
		Vegetables as pure crop	-do-	1. Micro irrigation 2. Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Use short duration varieties and resort to direct sowing Organic manuring Supply NPK as foliar application Use hydrogels to conserve water	Micro irrigation scheme and SHM
		Sugarcane as mono crop	-do-	No management since irrigated	
	Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Swabbing with kaolinite from base to a height of 1.5 m Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing	Rubber board schemes
		Banana as monocrop Banana with tubers a intercrop	-do-	Protecting pseudostem of standing crop by covering with drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation	SHM
		Coconut as monocrop	-do-	Raise leguminous cover crops	CDB schemes

		Coconut with intercrops such as banana, tubers etc.		Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss	
	Gudarakal (Clay loam – sandy clay) Very strongly acidic	Vegetables as pure crop	Vegetables as pure crop	Micro irrigation with fertigation Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Use short duration varieties and resort to direct sowing Organic manuring Supply NPK as foliar application Use hydrogels to conserve water	Micro irrigation scheme, and SHM

Contingency measures- Mid season

Condition			Suggested Contingency measures	
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures
At vegetative stage	Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	Weed population should be arrested, Seed hardening to tackle the intermittent drought. Spraying of anti transpirant like Kaolin	Foliar nutrition with N, P and K after initiation of rain. Application of organic manures Maintain weed free condition Spraying 3% Kaoline spray at critical stages of moisture stress, Use of Biofertilizers, Irrigate after the disappearance of water
		Vegetables as pure crop in rice fallows as well as garden lands	Improve the Bulk density of the soil by organic manure addition, thereby	Irrigation through drip system Foliar nutrition Application of AMF

			water holding capacity. Mulching, intercropping, pitcher irrigation techniques are to be followed. Drip irrigation	
		Sugarcane as mono crop	-do-	Trash Mulching Earthing up Foliar nutrition of N, P and K additionally Removal of water shoots for moisture conservation Application of 3% Kaoline spray at critical stages of moisture stress Foliar spray of 500 ppm Cycocel (1 ml of commercial product per litre of water) Foliar spray of 0.5% zincsulphate + 0.3 % boric acid + 0.5 % Ferrous sulphate + 1% urea
	Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	Swabbing kaolinite up to trunk portion Mulching Raise cover crops Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Pitcher irrigation (using porous mud pots) Surveillance for the attack of termites and adopt proper control measures Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana

				Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss
		Vegetables as pure crop	-do-	Micro irrigation with fertigation Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Organic manuring Supply NPK as foliar application Use hydrogels to conserve water
	2. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	Banana with tubers a intercrop	Protecting psuedostem of standing crop by covering with drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation/Pot irrigation Increase of dose of P and K nutrient to the tune of 25 % of recommended dose
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	Coconut as monocrop Coconut with intercrops such as banana, tubers etc	Provide shade to seedlings Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Surveillance for the attack of termites and adopt proper control measures
		Vegetables as pure crop	Vegetables as pure crop	Micro irrigation with fertigation

				Mulching in the basin with organic matter, coir pith compost, coconut leaves etc. Organic manuring Supply NPK as foliar application Use hydrogels to conserve water
		Sugarcane as monocrop	Sugarcane as monocrop	Trash Mulching Earthing up Foliar nutrition of N, P and K additionally Removal of water shoots for moisture conservation Application of 3%Kaoline spray at critical stages of moisture stress Foliar spray of 500 ppm Cycocel (1 ml of commercial product per litre of water) Foliar spray of 0.5% zinc sulphate + 0.3 % boric acid + 0.5 % Ferrous sulphate + 1% urea
	Kumaranperur (Gravelly clay loam, slightly acidic	Rubber as monocrop after three years	No Change	Swabbing kaolinite up to trunk portion Mulching Raise cover crops Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing
		Banana as monocrop	-do-	Moisture conservation measures such as mulching Pot irrigation Micro sprinkler irrigation Increase of dose of P and K nutrient to the tune of 25 % of recommended dose
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Pitcher irrigation (using porous mud pots) Surveillance for the attack of termites and adopt proper control measures Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture

				Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss
	Gudarakal (Clay loam – sandy clay) Very strongly acidic	Vegetables as pure crop	Vegetables as pure	1. Micro irrigation with fertigation 2. Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Organic manuring Supply NPK as foliar application Use hydrogels to conserve water
	Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice –fallow-rice Fallow-fallow-rice	Arrest weed population Spraying of anti transpirant like Kaolin	1. Foliar nutrition of N, P and K 2. Fertigation 3. Foliar application of PPFM @1%
		Vegetables as pure crop in rice fallows as well as garden lands	-do-	1. Life saving irrigation 2. Removal of drier leaves and unproductive fruits 3. Fertigation/ foliar application of mineral nutrients 4. Mulching 5. Organic manure addition
		Sugarcane as mono crop	-do-	1. Harvest the crop for cane/cane crushing 2. Detrashing

Condition			Suggested Contingency measures	
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure
At flowering/ fruiting stage	Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	1. Swabbing kaolinite up to trunk portion 2. Mulching 3. Raise cover crops Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing
		Coconut as monocrop Coconut with	-do-	1. Pitcher irrigation (using porous mud pots)

		intercrops such as banana, tubers etc.		2. Surveillance for the attack of termites and adopt proper control measures Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss
		Vegetables as pure	-do-	1. Micro irrigation with fertigation 2. Mulching pit basin with organic matter, coir pith compost, coconut leaves etc. Organic manuring Supply NPK as foliar application Use hydrogels to conserve water
	Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	Banana with tubers a intercrop	Protecting pseudostem of standing crop by covering with drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation/Pot irrigation Increase of dose of P and K nutrient to the tune of 25 % of recommended dose
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer

				Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Surveillance for the attack of termites and adopt proper control measures
		Vegetables as pure crop	Vegetables as pure crop	Micro irrigation with fertigation Mulching in the basin with organic matter, coir pith compost, coconut leaves etc. Organic manuring Supply NPK as foliar application Use hydrogels to conserve water
		Sugarcane as mono crop	Sugarcane as mono crop	Trash Mulching Earthing up Foliar nutrition of N, P and K additionally Removal of water shoots for moisture conservation Application of 3%Kaoline spray at critical stages of moisture stress 13. Foliar spray of 500 ppm Cycocel (1 ml of commercial product per litre of water) 14. Foliar spray of 0.5% zinc sulphate + 0.3 % boric acid + 0.5 % Ferrous sulphate + 1% urea
	Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Swabbing kaolinite up to trunk portion 2. Mulching 3. Raise cover crops Construction of water harvesting pits in plantations, improving the green surface cover by planting more cover crops, contour terracing
		Banana as monocrop	-do-	Protecting pseudostem of standing crop by covering with drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation, prior to the time of application of fertilizers Drip irrigation/Pot irrigation Increase of dose of P and K nutrient to the tune of 25 % of recommended dose
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc.

				Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Surveillance for the attack of termites and adopt proper control measures
	Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Vegetables as pure crop	1. Life saving irrigation 2. Removal of dried leaves and unproductive fruits 3. Fertigation/ foliar application of mineral nutrients 4. Mulching pit basin with organic matter, coir pith compost, coconut leaves etc

Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situationa	Normal Crop/cropping systemb	Crop managementc	Rabi Crop planningd
	Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	Spraying 3% KNO ₃ or 3% solution of Urea and MOP in 3:2 proportion at boot leaf stage if root damage already occurred.	Use of short duration varieties/crops. Use of Drought tolerant varieties/crops, Harvesting at physiological maturity, termination of irrigation two weeks before harvest
		Vegetables as pure crop in rice fallows as well as garden lands	Use short duration varieties	1. Harvest the crop
		Sugarcane as mono crop	-	1. Trash mulching 2. Early harvest 3. Plant seasonal crops for yield loss compensation 4. Grow early varieties in such areas
	Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	1. Arrest tapping 2. Plant is given a rest period
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc	-do-	1. Husk burial 2. Increase in K nutrition 3. Pitcher irrigation 4. Salt application for 50 % of K

		Vegetables as pure crop	-do-	1. Harvest the crop
	Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	No Change	1. Harvest the crop for culinary purpose 2. Removal of dried and unwanted leaves 3. Earthing up 4. Propping 5. Nutrition with K at 2.5 % to bunches 6. Weed control measures
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	1. Husk burial 2. Increase in K nutrition 3. Pitcher irrigation 4. Salt application for 50 % of K
		Vegetables as pure crop	-do-	1. Harvest the crop
		Sugarcane as mono crop	-do-	Trash mulching Early harvest Plant seasonal crops for yield loss compensation Grow early varieties in such areas
	4. Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Arrest tapping 2. Plant is given a rest period
		Banana as monocrop	-do-	1. Harvest the crop for culinary purpose 2. Removal of dried and unwanted leaves 3. Earthing up 4. Propping 5. Nutrition with K at 2.5 % to bunches 6. Weed control measures
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	1. Husk burial 2. Increase in K nutrition 3. Pizer irrigation 4. Salt application for 50 % of K
	5. Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Vegetables as pure crop	1. Harvest the crop

Drought - Irrigated situation

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Delayed release of water in canals due to low rainfall	1. Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	Rice (SD)- rice (SD)- fallow Rice (SD) -fallow-rice Fallow-fallow-rice	1. Planting short duration varieties (Manuratna, Annapurna, Mattathriveni) Direct sowing Dapog nursery (community nursery)	Ensure availability of seeds

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				Provide irrigation in the critical stages	
		Vegetables as pure crop in rice fallows as well as garden lands	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3. Mulching 4. Drip irrigation with fertigation 5. Foliar application of water soluble fertilizers	SHM
		Sugarcane as mono crop	-do-	1. Delayed planting 2. early (8 months)	ICAR schemes
	2. Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc	-do-	1. Husk burial 2. Coir pith application 3. Mulching with crop residues	CDB schemes
		Vegetables as pure crop	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3. Mulching 4. Drip irrigation with fertigation 5. Foliar application of water soluble fertilizers	SHM
	3. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	No Change	1. Planting date adjusted according to release of water 2. Fertiliser application delayed	SHM

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				3. Provision of shade made	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	4. Husk burial 5. Coir pith application 6. Mulched with crop residues	CDB schemes
		Vegetables as pure crop	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3. Mulching	SHM
		Sugarcane as mono crop	-do-	1. Delayed planting 2. early (8 months)	ICAR schemes
	Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Banana as monocrop	-do-	Planting date adjusted according to release of water Fertiliser application delayed Provide shade	SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc	-do-	Husk burial Coir pith application Mulching with crop residues Drip irrigation	CDB schemes
	5. Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Vegetables as pure crop	1. Delay planting 2. Mulching	SHM

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Limited release of water in canals due to low rainfall	1. Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	No Change	1. Saturated condition is maintained during seedling stage, tillering phase, panicle initiation stage (critical stages)	

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				2. Water level is maintained at 5 cm level at reproductive stage 3. Adopt SRI technology 4. Foliar application of nitrogenous fertilizer over and above basal dose when moisture is available (limited water)	
		Vegetables as pure crop in rice fallows as well as garden lands	Cropping system altered with short duration tapioca short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea	Mulching Selection of drought tolerant varieties Drip irrigation with fertigation	SHM
		Sugarcane as mono crop	-do-	1. Alternate furrow irrigation + mulching 2. Alternate furrow irrigation + mulching 3. Paired row planting + mulching	ICAR schemes
	2. Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Husk burial Cair pith application Mulching with crop residues Drip irrigation	CDB schemes
		Vegetables as pure crop	Cropping system can be altered with short duration tapioca short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea	Mulching Selection of drought tolerant varieties Drip irrigation with fertigation	SHM
	3. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	No Change	1. Basin irrigation + mulching 2. Drip irrigation 3. Fertilizer application through fertigation	SHM
		Coconut as monocrop Coconut with intercrops	-do-	Husk burial	CDB schemes

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
		such as banana, tubers etc.		Coir pith application Mulching with crop residues Drip irrigation	
		Vegetables as pure crop	Cropping system altered with short duration tapioca short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea	Mulching Selection of drought tolerant varieties Drip irrigation with fertigation	SHM
		Sugarcane as mono crop	No change	1. Alternate furrow irrigation + mulching 2. Alternate furrow irrigation + mulching 3. Paired row planting + mulching	ICAR schemes
	4. Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as mono crop after three years	No Change	1. Not applicable	
		Banana as mono crop	-do-	1. Basin irrigation + mulching 2. Drip irrigation 3. Fertilizer application through fertigation	SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	3. Basin irrigation + mulching 4. Drip irrigation	CDB schemes
	5. Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Cropping system altered with short duration tapioca short duration vegetables such as cucumber, watermelon, bush type vegetable cowpea	Mulching Selection of drought tolerant varieties Drip irrigation with fertigation	SHM

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Non release of water in canals under delayed onset of monsoon in catchment	1. Airavan (Wet land soil, medium – strongly acidic)	Rice- Rice-fallow Rice -fallow-Rice Fallow-fallow- Rice	Rice (SD)- rice (SD)-fallow Rice (SD) -fallow- rice Fallow-fallow-rice Tapioca (SD) Sesame as catch crop	Planting short duration varieties (Manuratna, Annapurna, Mattathriveni) Direct sowing Dapog nursery (community nursery) Provide irrigation in the critical stages	Ensure availability of seeds and planting materials
		Vegetables as pure crop in rice	Grow cassava Green manure crops	Mulching Selection of drought tolerant varieties	SHM

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
		fallows as well as garden lands	Fodder crops Forage crops		
		Sugarcane as mono crop	-do-	1. Plant any subsidiary crop such as sesamum/pulses Such horsegram/blackgram/greengram	ICAR schemes and planting materials from KAU
	2. Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	1. Husk burial 2. Mulching 3. Raise green manure crops as cover crops under rainfed cover	CDB schemes
		Vegetables as pure crop	Grow cassava Green manure crops Fodder crops Forage crops	Mulching Selection of drought tolerant varieties	SHM
		Sugarcane as mono crop	No change	1. Plant any subsidiary crop such as sesamum/pulses Such horsegram/blackgram/greengram	ICAR schemes and planting materials from KAU
	3. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	Grow pineapple instead of banana Switch on to tuber crops		SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	No Change	Husk burial Mulching Raise green manure crops as cover crops under rainfed cover	CDB schemes
		Vegetables as pure crop	Grow cassava Green manure crops Fodder crops Forage crops	Mulching Selection of drought tolerant varieties	SHM
		Sugarcane as mono crop	No Change	1. Plant any subsidiary crop such as sesamum/pulses Such horsegram/blackgram/greengram	ICAR schemes and planting materials from KAU
	4. Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Banana as monocrop	-do-	1. Grow pineapple instead of banana 2. Switch on to tuber crops	SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc	-do-	Husk burial Mulching Raise green manure crops as cover crops under rainfed cover	CDB schemes

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	5.Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Vegetables as pure crop	1. Delay planting 2. Mulching	SHM

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	1. Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	Rice (SD)- rice (SD)-fallow Rice (SD) -fallow-rice Fallow-fallow-rice Short duration cassava Sesame as catch crop	1. Planting short duration varieties (Manuratna, Annapurna, Mattathriveni) Direct sowing Dapog nursery (community nursery) Provide irrigation in the critical stages	
		Vegetables as pure crop in rice fallows as well as garden lands	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3.Mulching 4. Drip irrigation with fertigation 5. Foliar application of water soluble fertilizers	SHM
		Sugarcane as mono crop	-do-	Plant any subsidiary crop such as sesamum/pulses such horsegram/blackgram/greengram	ICAR schemes
	2. Adoor (Sandy clay loam, very strongly acidic)situation:	Rubber as monocrop after three years	No Change	1. Not applicable	
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	Husk burial Mulching Raise green manure crops as cover crops under rainfed cover	CDB schemes
		Vegetables as pure crop	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3.Mulching 4. Drip irrigation with fertigation 5. Foliar application of water soluble fertilizers	SHM
	3. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as monocrop	Grow pineapple instead of banana Switch on to tuber crops	Provide mulching Provide life saving irrigation	SHM
		Coconut as monocrop Coconut with	No change	Husk burial Mulching	CDB schemes

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
		intercrops such as banana, tubers etc.		Raise green manure crops as cover crops under rainfed cover	
		Vegetables as pure crop	-do-	1. Delay planting 2. Vegetable with less water requirement especially bush vegetables, cowpea, ridge gourd, bottle gourd etc. shall be grown 3. Mulching 4. Drip irrigation with fertigation 5. Foliar application of water soluble fertilizers	SHM
		Sugarcane as mono crop	-do-	1. Plant any subsidiary crop such as sesamum/pulses such as horsegram/blackgram/greengram	ICAR schemes
	4. Kumaranperur (Gravelly clay loam, slightly acidic)	Rubber as monocrop after three years	No Change	1. Not applicable	
		Banana as monocrop	-do-	Grow pineapple instead of banana Switch on to tuber crops	SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers	-do-	Husk burial Mulching Raise green manure crops as cover crops under rainfed cover	CDB schemes
	Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables as pure crop	Vegetables as pure crop	1. Delay planting 2. Mulching	SHM

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Insufficient groundwater recharge due to low rainfall	1. Airavan (Wet land soil, medium – strongly acidic)	Rice- rice-fallow Rice -fallow-rice Fallow-fallow-rice	No Change	1. Raise aerobic rice varieties 2. Short duration vegetables, bush cowpea 3. Raise pulse crop 4. Green manure crops	
		Vegetables as pure crop in rice fallows as well as garden lands	-do-	1. Drip irrigation 2. Short duration vegetables of 2½ months 3. Basin irrigation + mulching	SHM
		Sugarcane as mono crop	-do-	1. Alternate furrow irrigation 2. Paired row irrigation 3. bed irrigation	ICAR schemes

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
	2. Adoor (Sandy clay loam, very strongly acidic)	Rubber as monocrop after three years	Rubber as monocrop after three years	1. Water harvesting techniques to recharge ground water infiltration 2. Soil conservation measures to recharge ground water infiltration 3. Raise cover crops	Rubber board schemes
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	Coconut as monocrop. Coconut with intercrops such as banana, tubers etc	1. Drip irrigation + mulching 2. Husk burial 3. Contour terracing Bunding, rainwater harvesting pits 4. growing more vegetative cover over ground	CDB schemes
		Vegetables as pure crop	Vegetables as pure crop	Drip irrigation Short duration vegetables of 2½ months Basin irrigation + mulching	SHM
	3. Ayroor (Loam – sandy loam, extremely to medium acidic)	Banana as mono crop	No Change	1. Drip irrigation 2. Recharge ground water through water conservation measures mulching, raising, green manure crops	SHM
		Coconut as mono crop Coconut with intercrops such as banana, tubers etc.	-do-	1. Drip irrigation + mulching 2. Husk burial 3. Contour terracing Bunding, rainwater harvesting pits 4. growing more vegetative cover over ground	CDB schemes
		Vegetables as pure crop	-do-	Drip irrigation Short duration vegetables of 2½ months Basin irrigation + mulching	SHM
		Sugarcane as mono crop	-do-	Alternate furrow irrigation	ICAR schemes

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				Paired row irrigation Bed irrigation	
	Kumaranperur (Gravelly clay loam, slightly acidic	Rubber as monocrop after three years	No Change	1. Water harvesting techniques to recharge ground water infiltration 2. Soil conservation measures to recharge ground water infiltration 3.Raise cover crops	Rubber board schemes
		Banana as monocrop	-do-	Drip irrigation Recharge ground water through water conservation measures mulching, raising, green manure crops	SHM
		Coconut as monocrop Coconut with intercrops such as banana, tubers etc.	-do-	1. Drip irrigation + mulching 2. Husk burial 3. Contour terracing Bunding, rainwater harvesting pits 4. growing more vegetative cover over ground	CDB schemes
	5. Gudarakal (Clay loam – sandy clay) Very strongly acidic	Cool season Vegetables	As irrigated crop	Drip irrigation Short duration vegetables of 2½ months Basin irrigation +Mulching	SHM

Resource management technologies

- **Mulching**
- **Contour trench**
- **Stone bund**
- **Husk burial**
- **Liming**
- **Drainage channels in areas prone to water logging**

Actionable Comprehensive Plans for Contingency

State	KERALA	District	TRIVANDRUM
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	0	More than 19%	Less than 0
June			
July			
August			
September			

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	6969	Gross irrigated area:	11042
Net Rainfed area	113276	Gross rainfed area	149862

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	3384	5362
Wells	2957	4686
Tanks	25	39
Other sources	603	955

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	683	683	0
2	Jowar	-	-	
3	Maize	0	0	0
4	Bajra	-		
5	Ragi	0	0	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	0	0	0
3	Sesamum	0		0
4	SOyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		210
4	Other Fodder crops	223	13	210

Crop Plan- Beginning of the season

Condition		Suggested Contingency measures
Early season drought	Normal Crop / Cropping system	Agronomic measures
(delayed onset, Delay by 4 weeks (July 1st week))	Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Rice Wet seeding of sprouted seeds of short duration drought tolerant varieties (Manuratna, Annapurna, Hraswa) Resort to seed hardening with potassium chloride In transplanted crop prepare, mat nursery and adopt community nursery Adopt closer spacing and increase the number of seedlings to 3-5 per hill Apply addition dose of N @ 5 Kg/ha Apply silica 100 kg/ha

		Coconut Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Raise leguminous cover crops Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Tubers Selection of tuber crops which can tolerate drought Provide life saving irrigation Mulch with available organic materials. Banana Protecting pseudostem of standing crop by wrapping with the drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Vegetables Use short duration varieties and resort to direct sowing Drip Irrigation/pitcher irrigation Give heavy mulching Organic Manuring Supply NPK through Foliar fertilizer application Use hydrogels to conserve water
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Contingency measures- Mid season

Condition		Suggested Contingency measures
Mid-season drought (long dry spell, consecutive 2 weeks rainless, at vegetative stage)	Normal Crop / Cropping system	Agronomic measures
	Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Rice Integrated Weed Management to control weeds In the direct seeding/upland area, midterm correction i.e. Thinning of 30-50 % of population. Use the weed biomass for mulching and moisture conservation. Anti-transparent spray Supply N & K fertilizers through foliar application. Spray 0.5 to 1 % K₂SO₄ to mitigate drought. Life saving irrigation at critical stage (tillering stage). PPFM 2% spray Coconut Raise leguminous cover crops Husk burial in trenches to conserve moisture

		Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Raise leguminous cover crops Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Tubers Selection of tuber crops which can tolerate drought Provide life saving irrigation Mulch with available organic materials. Banana Protecting pseudostem of standing crop with the drooping dry leaves Application of bulky organic manures Mulching with crop residues Life saving irrigation coinciding with the time of application of fertilizers Drip irrigation Cutting of lower leaves to reduce transpiration loss Vegetables Give life-saving irrigation Give heavy mulching Organic Manuring Supply NPK through foliar fertilizer application Use hydrogels
Condition		Suggested Contingency measures
Mid-season drought	Normal Crop / Cropping system	Agronomic measures
At flowering / fruiting stage	Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Rice Spray 0.5 to 1 % K₂SO₄ to mitigate drought. Life saving irrigation at critical stage. PPFM 2% spray In severe situations convert to fodder purpose Coconut Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Raise leguminous cover crops Painting the trunk white to reflect the sunlight and thus keep the bark cooler

		Cutting of lower leaves to reduce transpiration loss. Tubers Selection of tuber crops which can tolerate drought Provide life saving irrigation Mulch with available organic materials. Banana Protecting pseudostems of standing crop with the drooping dry leaves Mulching with crop residues Life saving irrigation Foliar K₂SO₄ spray on bunches Covering of bunches to protect from direct sun Vegetables Give lifesaving irrigation Give heavy mulching Organic manuring Supply NPK through Foliar fertilizer application
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Contingency measures- End of the season

Condition		Suggested Contingency measures
Terminal drought	Normal Crop / Cropping system	Agronomic measures
(Early withdrawal of monsoon)	Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Rice Spray 0.5 to 1 % K₂SO₄ to mitigate drought. Life saving irrigation at critical stage. PPFM 2 % spray Early harvest on attaining physiological maturity Coconut Raise leguminous cover crops Husk burial in trenches to conserve moisture Application of bulky organic manures like farm yard manure, green leaf manure etc. Deepening of trenches in the inter row spaces to conserve moisture Mulching with dried coconut leaves and other available crop residues. Dust mulching made by breaking up the top few inches of the soil creating a finely textured layer Adopt drip irrigation for main crop and intercropped Banana Raise leguminous cover crops Painting the trunk white to reflect the sunlight and thus keep the bark cooler Cutting of lower leaves to reduce transpiration loss Tubers Selection of tuber crops which can tolerate drought Provide life saving irrigation Mulch with available organic materials. Early harvest on attaining physiological maturity Banana Protecting pseudostem and bunch of standing crops with the drooping dry leaves

		Mulching with crop residues Life saving irrigation Vegetables Give life-saving irrigation Give heavy mulching
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Drought - Irrigated situation

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation
Delayed release of water in canals due to low rainfall		Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	The second crop of Rice can be skipped and Pulses can be cultivated utilizing available water.	Rice • Direct seeding, • Dapog nurseries. • Avoid transplanting till sufficient water is received • Use of mulches • Foliar nutrition • Life saving irrigation Coconut • Mulching • Husk burial • Drip irrigation Banana • Application of organic manures • Life saving irrigation • Mulching • Vegetables • Life saving irrigation • Mulching	SHM, MGNREGS

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Limited release of water in canals due to low rainfall		Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Not required	General • More concentration should be given to conserve the available water. Mulching • Selection of more tolerant varieties Rice • Direct seeding of rice	MGNREGS

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
				• Use dapog nursery seedlings • Adopt SRI technology • Irrigation at critical stages • Foliar application of nitrogenous fertilizer over and above basal dose when moisture is available (limited water)	

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Non release of water in canals under delayed onset of monsoon in catchment		Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Rice single crop	Recharging of wells and ponds, rainwater harvesting, direct sowing, conservation of available water	MGNREGS SHM

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Lack of inflows into tanks due to insufficient /delayed onset of monsoon			Not required	Conservation of available water Filling of tanks with rainwater during season	MGNREGS

Condition	Suggested Contingency measures				
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Insufficient groundwater recharge due to low rainfall		Homestead cultivation - Coconut + Tapioca/ other Tubers / Banana / Pepper; Rice – Rice- Vegetable/ Pulses; Banana + Vegetables in low lands; Tapioca + Vegetables in low lands	Not required	Contour terracing Bunding, rainwater harvesting pits, small check dams, growing more vegetative cover over ground	MGNREGS

Resource management technologies

- Husk burial
- Drip irrigation in high land and mid land for rubber and pepper
- Percolation pits
- Bench terracing in western Ghats
- Cover crops

Actionable Comprehensive Plans for Contingency

State	KERALA	District	WAYANAD
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	2464.7	More than 19%	Less than 1996.407
June	703.6		
July	876.5		
August	569.2		
September	315.4		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	15169	Gross irrigated area:	17726
Net Rainfed area	96739	Gross rainfed area	142552

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	-	-
Wells	23	27
Tanks	25	30
Other sources	15121	17669

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	0	0	
2	Jowar	-	-	
3	Maize	25	25	0
4	Bajra	-		
5	Ragi	3	3	0

Pulses & Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	0		0
4	SOyabean	-		
5	Sunflower	1	1	0
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		1179
4	Other Fodder crops	1259	80	1179

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures	
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures
Delay by 4 weeks (July 1st week)	Battuvady Series Sandy clay loam soils	Rice-Rice	No change	Direct seeding, Irrigate at 1 to 4 days after disappearance of stagnant measures soil application of VAM.
		Rice-Vegetables	No change	
		Rice- Sesamum	Rice- Sesamum +Cowpea	
	Pulpally Series Clay loam soils	Coffee	No change	Mulching, Bulk organic manuring, Collection and conservation of rainwater, Make the field weed free, Desilting, repairing and renovation of irrigation channels. Greenleaf manure application, Protecting
		Pepper		
		Areca nut + Coffee+ Pepper		
		Coconut- +Coffee +Pepper		
	Mananthavady Series Sandy clay soils	Coffee		
		Pepper		
		Coffee-Pepper		
		Coconut- +Coffee +Pepper		

	Sulthanbathery Series Sandy loam soils	Arecanut + Coffee+ Pepper		the arecanut palms by applying lime on the stem Providing shade to young palms.
		Coffee		
		Pepper		
		Coconut +Pepper		
		Coffee+ Pepper		
	Periya Series Sandy clay loam soils	Coffee	No change	Mulching, Providing lifesaving irrigation. Bulk organic manuring, Make the field weed free, Collection and conservation of rainwater, Micro Irrigation

Contingency measures- Mid season

Contingency measures - mid season			Suggested Contingency measures	
Condition				
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure ^s
At vegetative stage	Battuvady SeriesSandy clay loam	Rice-Rice	Suppresses weed growth, Make Shelterbelts, spraying potassium chloride, thinning of 33–50% population, Anti-transpirant spray	Irrigate at 1 to 4 days after disappearance of ponded water Insitu rainwater conservation Application of P and K as basal Reduce N dose, Apply bulky organic manures. Collection and conservation of rain water Intermittent flooding maintaining the soil insub saturated condition alternate drying and wetting.
		Rice-Vegetables		
		Rice- Sesamum		
	Pulpally Series Clay loam soils, Mananthavady Series Sandy clay soils and Sulthanbathery Series Sandy loam	Coffee	Weeding Make Shelterbelts Establishment of leguminous cover crop,Shading the young plants white washing the main stem Antitranspirant spray Mulching and application of Trichoderma	Zero tillage Mulching Sub-surface storing of ground water Less exploitation of ground water Drip irrigation Terracing Husk burial leaf cutting.
		Pepper		
		Arecanut- +Coffee+ Pepper		
		Coconut+ Coffee+Pepper		
Condition				
Mid-season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measure
At flowering/ fruiting stage	Battuvady Series- Sandy clay loam soils	Rice-Rice	Formation of Shelterbelts. Antitranspirant spray	Irrigate at 1 to 4 days after disappearance of ponded water, Insitu rainwater conservation, Collection and conservation of rain water, Intermittent flooding,
		Rice-Vegetables		
		Rice- Sesamum		

				Maintaining the soil in sub saturated condition, Alternate drying and wetting.
	Pulpally Series Clay loam soils Mananthavady Series Sandy clay soils and Sulthanbathery Series Sandy loam soils	Coffee Pepper Arecanut+ Coffee+Pepper Coconut+ Coffee+Pepper	Sprinkler irrigation (especially for coffee and pepper) Weeding Formation of Shelterbelts, Application of 2% lime or Kaoline spray combined with 0.5 % Potassium	Mulching, Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing

Contingency measures- End of the season

Condition			Suggested Contingency measures	
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal Crop/cropping system	Crop management	Rabi Crop planning
	BattuvadySeriesSandy clay loam	Rice-Rice Rice-Vegetables Rice- Sesamum	Terminate the irrigation 14 to 17 days before harvest, Harvesting at physiological maturity	Maintaining the soil in sub saturated condition, alternate drying and wetting.
	Pulpally Series Clay loam, / Mananthavady Series Sandy clay and Sulthanbathery Series Sandy loam	Coffee Pepper Arecanut- Coffee- Pepper Coconut- Coffee- Pepper	Apply mixture of 1 kg Urea, 1 kg Super Phosphate, 750 g MOP, 1 kg Zinc Sulphate in 200 litres of water by spraying, 500 litre spray volume of the above mixture would be required for 1 acre of Coffee plantation Establishment of leguminous cover crop, Shading, Pruning of coffee, Antitranspirant spray	Sub-surface storing of ground water, Less exploitation of ground water, Drip irrigation, Terracing, Husk burial leaf cutting.

Drought - Irrigated situation

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Delayed release of water in canals due to low rainfall	Battuvady SeriesSandy clay loam soils	Rice-Rice Rice -Vegetables	Rice (SD)-Rice Rice(SD)-Vegetables	• Go for direct seeding in the first crop with Short duration variety like Harsha, Manurathna, Jyothi, Kanchana, Annapurna. • Adopt mat nursery preparation and mechanized transplanting	NREGS

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Limited release of water in canals due to low rainfall	Battuvady Series- Sandy clay loam soils	Rice-Rice	Rice (SD)-Rice	• Go for direct seeding in the first crop with Short duration variety like Harsha, Manurathna, Jyothi, Kanchana, Annapurna. • Adopt mat nursery preparation and mechanized transplanting Go for foliar spray of fertilizers Weeding and mulching with weeds Irrigation at critical stages	NREGS, RKVY
		Rice-Vegetables	Rice(SD)-Pulses		

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Non release of water in canals under delayed onset of monsoon in catchment	Battuvady SeriesSandy clay loam soils	Rice-Rice	Rice (single crop)/Pulses	Rain water harvesting, Direct sowing, Delayed sowing	NREGS, RKVY
		Rice-Vegetables			

Condition			Suggested Contingency measures		
	Major Farming situation ^f	Normal Crop/cropping system ^g	Change in crop/cropping system ^h	Agronomic measures ⁱ	Remarks on Implementation ^j
Insufficient groundwater recharge due to low rainfall	Battuvady Series- Sandy clay loam soils	Rice-Rice	Rice-Rice	Check dams, Percolation pits, Rain water harvesting, Water conservation measures	NREGS, RKVY
			Rice-Vegetables		

Resource management technologies

- **Mulching**
- **Cover crops**
- **Check dams**
- **Contour bunds**