State: ANDHRA PRADESH

Agriculture Contingency Plan for District: EAST GODAVARI

1.0 District Agriculture Profile					
1.1	**Agro-climatic/Ecological Zone**				
	Agro Ecological Sub Region (ICAR)	Eastern Coastal plain, hot sub-humid to semi arid eco region (12.1, 18.4)			
	Agro-Climatic Region (Planning Commission)	East Coast plain and hill region (XI)			
	Agro climatic Zone (NARP)	Krishna Godavari Zone (AP-1)			
	List all the districts or part thereof falling under the NARP Zone	Krishna, Guntur, West Godavari, major parts of East Godavari and parts of Prakasam			
	Geographic coordinates of district	Latitude	Longitude	Altitude	
		16º 58' 60"N	18º 46' 60" E	13m AMSL	
	Name and address of the concerned ZRS/ZARS/RARS/RRS/RRTTS	Regional Agricultural Research Station, Maruteru, West Godavari-534122			
	Mention the KVK located in the district	CTRI KVK, Kalavalcherla, Rajahmundry, West Godavari district			
1.2	**Rainfall (is it average , how many years pl mention, if last year, give year in brackets**	Normal RF(mm)	Normal Rainy days (no)	Normal Onset (specify week and month)	Normal cessation (specify week and month)
	SW monsoon (June-Sept)	752		1st week of June	2nd week of October
	NE monsoon (Oct –Dec)	320		3rd week of October	4th week of December
	Winter (Jan-Feb)	20			
	Summer (Mar – May)	126			
	Annual	1218			

1.3	**Land use pattern of the district**	**Geographical area**	**Forest area**	**Land under non agrl**	**Permanent**	**Cultivable**	**Land under misc tree**	**Barren and**	**Current fallows**	**Other fallows**

				use	**pasture s**	**wastela nd**	**crops and grooves**	**unculti vable land**		
	Area (‘000 ha)	1080.7	323.2	142.8	20.7	18.1	8.6	79.1	16.4	33.8

1.4	**Major Soils (common names like shallow red soils etc)**	**Area (‘000 ha)**	**Percent (%) of total**
	1. Clay loamy soils	42	39
	2. Red sandy loams	17	16
	3. Sandy clay loams	48	45
1.5	**Agricultural land use**	**Area (000’ ha)**	**Cropping intensity %**
	Net sown area	418.1	183.3
	Area sown more than once	348.4	
	Gross cropped area	766.5	

1.6	**Irrigation**	**Area (000’ha)**		
	Net irrigated area	277.8		
	Gross irrigated area	490.6		
	Rainfed area	140.3		
	Sources of irrigation	Number	Area (000’ha)	Percentage of total irrigated area
	Canals		180.9	61.6
	Tanks		36	12.3
	Open wells		-	
	Bore wells		64.5	22.0
	Tube wells and filter points			
	Lift irrigation			
	Micro irrigation			
	Other sources		12.0	4.1
	Total irrigated area		293.5	100.0

	Pump sets	20526		
	No. of tractors	4352		
	Groundwater availability and use * (data source: State/Central Ground water department /Board)	No. of blocks/Tehsils	% area	
	Over exploited			
	Critical			
	Semi-critical			
	Safe			
	Wastewater availability and use			
	Ground water quality			
* over-exploited: groundwater utilization >100%; critical:90-100%: semi-critical ;70-90%; safe:<70%				

Area under major field crops and horticulture etc (2008-09)

1.7		Major field crops cultivated	Area (000'ha)					
			Kharif		***Rabi***		***Summer***	***Total***
			Irrigated	**Rainfed**	**Irrigated**	**Rainfed**		
	1	Paddy	231	9	170	-	-	410
	2	Sugarcane	17	-	-	-		
	3	Cotton	-	9	-	-	-	9
	4	Greengram	-	-	-	-	44	44
	5	Blackgram	-	-	-	-	32	32
		Horticulture crops – fruits	**Total area**					
	1	Mango	19.2					
	2	Banana	15.5					
	3	Lemon	2.3					
		Horticulture crops –vegetables	**Total area**					
	1	Tapioca	15.4					
	2	Brinjal	3.2					
	3	Bhendi	2.1					
	4	Gourds	2.0					
	5	Chillies	1.9					
		Plantation crops	**Total area**					

	1	Coconut	49.7
	2	Cashew	33.6
	3	Oil palm	13.7
		Fodder crops	**Total area**
		Total fodder crop area	
		Grazing land	
		Sericulture	
		Others (specify)	

1.8	**Livestock**	**Male (number)**	**Female (number)**	**Total (number)**
	Non descriptive Cattle (local low yielding)	82.3	118.6	200.9
	Crossbred cattle	14.9	76.6	91.5
	Non descriptive Buffaloes (local low yielding)	90.0	595.0	685.0
	Graded Buffaloes			
	Goat			200.0
	Sheep			146.3
	Others (Camel, Pig, Yak etc.)			26.5
	Commercial dairy farms (Number)			
1.9	**Poultry**	**No. of farms**	**Total No. of birds (number)**	
	Commercial		15965425	
	Backyard		1736498	

1.10 **Fisheries** (Data source: Chief Planning Officer)

A. Capture

i) Marine (Data Source: Fisheries Department)	**No. of fishermen**	**Boats**		**Nets**		**Storage facilities (Ice plants etc.)**
		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
	22029	338	1194/3360	1106/118644	204 / 0	29 / 6

ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
	1855	6	174

	B. Culture			
		Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
	i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	3500	-	5.2
	ii) **Fresh water** (Data Source: Fisheries Department)	1681593	-	6.7
	Others		-	80.3

1.11	**Production and productivity of major crops** (Average of last 5 years 2004,05,06,07,08)	Kharif		Rabi		Summer		Total		
		Production (000't)	Productivity (kg/ha)	Production (000't)	Productivity (kg/ha)	Production (000't)	Productivity (kg/ha)	Production (000't)	Productivity (kg/ha)	Crop residue as fodder (000 tons)
Major Field Crops (Crops to be identified based on total acreage)										
1	Paddy	717	2983	796	4690	-	-	1513	3690	
2	Sugarcane	1488	88386	-	-	-	-	1488	88386	
3	Blackgram	-	-	-	-	8	267	8	267	
4	Greengram	-	-	-	-	12	276	12	276	
5	Cotton	18 ('000 bales of 170kg each)	398	-	-	-	-	18	398	
Major horticultural crops										
Horticulture crops – Fruits										
1	Mango							158	8267	
2	Banana							463	30000	
3	Lemon							34	1.7	
Horticultural crops – Vegetables										
1	Tapioca							310	20167	
2	Brinjal							58	18667	
3	Bhendi							30	14333	
4	Gourds							27	13667	
5	Chillies							5.0	2750	
Spices and crops										

1	Coconut							0.7	-	
2	Cashew							21.1	627	
3	Oil palm							65.0	4667	

1.12	**Sowing window for 5 major field crops (start and end of normal sowing period)**	**Paddy**	**Sugarcane**	**Blackgram**	**Greengram**	**Cotton**
	Kharif - rainfed	June 1st week - July 1st week				July1st fortnight – July 2nd fortnight
	Kharif – irrigated	July 1st week- July last week				
	Rabi – rainfed			March 2nd week - March 3rd week	March last week - April I week	
	Rabi – irrigated	December 2nd fortnight – January 1st fortnight	January 1st fortnight – March 1st fortnight			

1.13	**What is the major contingency the district is prone to?**	Regular	Occasional	Never
	Drought		√	
	Flood	√		
	Cyclone	√		
	Hail storm			
	Heat wave			
	Cold wave			
	Frost			
	Sea water intrusion			
	Pests and diseases (specify)	Rice: Blast Redgram: Maruca and Helicoverpa Cotton: Sucking pest complex		

		Blackgram : YMV		

1.14	**Include Digital maps of the district for**	Location map of the district within state as Annexure 1	Enclosed : Yes /No
		Mean annual rainfall as Annexure 2	Enclosed : Yes/No
		Soil map as Annexure 3	Enclosed : Yes/No


N
MANDAL WISE
NORMAL RAINFALL (mm)
EAST GODAVARI DISTRICT

Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition	Suggested contingency measures				
Early season drought (delayed onset)	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
Delay by 2 weeks (June 3rd week)	Uplands-Rainfed	Paddy	No change		
		Cotton			
	Agency area - Rainfed	Paddy			

Condition	**Suggested contingency measures**				
Early season drought (delayed onset)	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
Delay by 4 weeks (July 1st week)	Upland - Rainfed	Paddy	No change	Direct seeding can be taken up with short duration varieties under dry conditions and later converted to wet paddy after receipt of good rainfall	
		Cotton		-	
	Agency area – Rainfed	Paddy		Direct seeding can be taken up with short duration varieties under dry conditions and later converted to wet paddy after receipt of good rainfall.	

Condition		Suggested contingency measures			
Early season drought (delayed monsoon)	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
Delay by 6 weeks (July 3rd week)	Upland – Rainfed	Paddy	No change	Adopt direct seeding of paddy with short duration varieties by following proper weed management practices	
		Cotton		--	
	Agency area – Rainfed	Paddy		Adopt direct seeding of paddy with short duration varieties by following proper weed management practices	

Condition		**Suggested contingency measures**			
Early season drought (delayed onset)	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
Delay by 8 weeks (August 1st week)	Upland – Rainfed	Paddy	Redgram (sole crop), Redgram + blackgram, Blackgram, Green gram.	Recommended package of practices	Source of seed: RARS, Maruteru and ARS, Peddapuram
		Cotton			
	Agency area – Rainfed	Paddy			

Condition	Suggested contingency measures				
Early season drought (Normal onset)	**Major farming situation**	**Normal crop/cropping system**	**Crop management**	**Soil nutrient and moisture conservation measures**	**Remarks on implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Upland – Rainfed	Paddy	To prevent withering of nurseries, foliar application with 2% urea can be taken up	Instead of top dressing with N fertilizers, foliar application can be taken up for efficient use of N. any urea concentration may be given here	
		Cotton	Gap filling is to be taken up by pot watering 7-10 after sowing if the crop stand is poor	-	
	Agency area – Rainfed	Paddy	To prevent withering of nurseries, foliar application of 2% urea	Instead of top dressing with N fertilizers, foliar application can be taken up for efficient use of N	

Condition	Suggested contingency measures				
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5mm period)	**Major farming situation**	**Normal crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on implementation**
	Upland – Rainfed	Paddy	Foliar application of 2% urea	Interculture operations	
		Cotton	1. Foliar application with 2% urea 2. Stem application of systemic insecticide to control sucking pests	Intercultivate periodically to conserve soil moisture	
	Agency – Rainfed	Paddy	Foliar application with 2% urea		

Condition		**Suggested contingency measures**			
Mid season drought (long dry spells)	Major farming situation	Normal crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on implementation
At reproductive stage	Upland – Rainfed	Paddy		Foliar application with 2%urea + MOP	
		Cotton		Frequent intercultivation to create soil mulch Spray urea 2% &$KNO_3$1% to supplement nutrition	
	Agency-Rainfed	Paddy		Foliar application with 2%urea + MOP	

Condition		**Suggested contingency measures**			
Terminal drought	Major farming situation	Normal crop/cropping system	Crop management	Rabi crop planning	Remarks on implementation
	Upland - Rainfed	Paddy	Foliar application with 2%urea + MOP to supplement nutrition	--	
		Cotton	Spray urea 2% urea or KNO_3 Topping to prevent formation of new vegetative and reproductive flush		
	Agenc area - Rainfed	Paddy	Foliar application of 2%urea + MOP		

2.1.2 Irrigated situation

Condition	Suggested contingency measures				
Delayed release of water in canals due to low rainfall	**Major farming situation**	**Normal crop;/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
	Godavari Delta Tail End Areas	Paddy – Paddy - blackgram/greengram	Paddy-Paddy-Greengram	• Over aged seedlings can be transplanted up to August • Adopt closer spacing by planting 4-6 plants/hill • Apply entire P and K and two third N as basal and remaining one third N as basal • If nurseries are dried up, direct sown paddy can be taken up till August with short duration varieties • If rabi rice harvesting is delayed, avoid blackgram in rice fallows. Instead, greengram or green manure crops can be taken up	
	Godavari Delta Tail End Areas Saline / Alkaline soils	Paddy – Paddy – Blackgram / Greengram	Paddy – Paddy-Blackgram/Greengram		
		Paddy – Paddy-Blackgram/Greengram	Paddy-Paddy – blackgram /greengram.		

		Sugarcane	No change	• Short or medium duration varieties of sugarcane need to be taken up • Adopt recommended plant protection practices for control of shoot borer • Adopt crop rotation with pulse crop	

Condition	**Suggested contingency measures**				
Limited release of water in canals due to low rainfall	**Major farming situation**	**Normal crop/ cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
	Godavari Delta Tail End Areas	Paddy-Paddy-pulses	Paddy – Blackgram /Greengram	• Adopt alternate wetting and drying upto primordial initiation stage to save water • Irrigate upto a depth of 3-5cm from PI stage to maturity • Adopt timely weed management practices **Rabi** • Avoid paddy wherever irrigation water is insufficient • Blackgram i(any variety is ok) can be taken up in rabi in rice fallows	Source of seed: RARS, Maruteru and ARS, Peddapuram
	Godavari Delta Tail End Areas Saline / Alkaline soils	Paddy-Paddy-pulses	Paddy – Blackgram /Greengram	**Rabi** • Avoid paddy wherever irrigation water is insufficient • Blackgram can be taken up in rabi in rice fallows (mention as above)	Source of seed: RARS, Maruteru and ARS, Peddapuram

	Godavari Delta – Middle and Upper Reaches	Paddy – Paddy-Blackgram/Greengram	Paddy - Blackgram	• Adopt alternate wetting and drying upto primordial initiation stage to save water • Irrigate upto a depth of 3-5cm from PI stage to maturity • Adopt timely weed management practices **Rabi** • Avoid paddy wherever irrigation water is insufficient • Blackgram can be taken up in rabi in rice fallows	
		Sugarcane	No change	• Short and medium duration sugarcane varieties • Adopt proper weed management practices • Avoid paddy in rabi, instead greengram can be taken up	Source of setts: RARS, Anakapalli and ARS, Vuyyur

Condition	**Suggested contingency measures**				
Non release of water in canals under delayed onset of monsoon in catchment (This situation arises only in rabi in the	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
	Godavari Delta Tail End Areas	Paddy-Paddy-pulse	Paddy – Blackgram /Greengram	• Avoid paddy in rabi • LBG 752 & PU 31 YMV tolerant blackgram varieties	

district)	Godavari Delta Tail End Areas Saline / Alkaline soils	Paddy-Paddy-pulses	Paddy – Blackgram /Greengram	• Avoid paddy in rabi • YMV tolerant blackgram varieties n rice fallows	
	Godavari Delta – Middle and Upper Reaches	Paddy – Paddy-Blackgram/Greengram	Paddy – Blackgram /Greengram	• Avoid paddy in rabi • YMV tolerant blackgram varieties can be taken up in rice fallows • Green manure crops should be incorporated into the soil at right stage and allow it to decompose	
		Sugarcane – Paddy	Greenmanure-blackgram/greengram - sesame	• Pulse crop can be taken up in September first fortnight • After harvest of pulse crop, sesame can be taken in December	

Condition	**Suggested contingency measures**				
Lack of inflows into tanks due to insufficient/delayed onset of monsoon	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
	Upland Yeluru other Reservoirs	Paddy – Paddy – pulse	Redgram/Greengram /Blackgram-Fallow	• If paddy nurseries are not taken up till August, pulses can be taken up in 1st week of September • Redgram can be raised as sole crop or intercropped with blackgram	Seed production of pulse crop can be encouraged under NFSM

	Uplands - Tankfed	Paddy-Paddy-Pulse	Redgram/Greengram /Blackgram-Fallow	• If paddy nurseries are not taken up till August, pulses can be taken up in 1st week of September • Redgram can be raised as sole crop or intercropped with blackgram	
		Sugarcane - Paddy	Sugarcane-pulses/sesame	• Plant short duration varieties • Adopt trash mulching to conserve moisture • Spray 2% urea to withstand moisture stress	

	Agency- Reservoirs	Paddy-Paddy-falow	Redgram/Greengram /Blackgram- Fallow	• If paddy nurseries are not taken up till August, pulses can be taken up in 1st week of September • Redgram can be raised as sole crop or intercropped with blackgram	
	Agency-Tankfed	Paddy-Paddy-fallow	Redgram/Greengram /Blackgram - Fallow	• If paddy nurseries are not taken up till August, pulses can be taken up in 1st week of September • Redgram can be raised as sole crop or intercropped with blackgram	

Condition	**Suggested contingency measures**				
Insufficient groundwater recharge due to low rainfall	**Major farming situation**	**Normal crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on implementation**
	Uplands-borewells & lift irrigation	Paddy –Paddy –Pulse	Redgram/Greengram /Blackgram- Fallow	• If paddy nurseries are not taken up till August, green gram& black gram can be taken up in 1st week of September • Redgram can be raised as sole crop or intercropped with blackgram	
Any other condition					

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

Condition - Continuous high rainfall in a short span leading to water logging and Heavy rainfall with high speed winds in a short span				
Crop	**Suggested contingency measure**			
	Vegetative stage	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Rice	1. Drain the excess water as early as possible 2. Apply 20 kg urea + 10 kg MOP /acre after draining excess water 3. Take up gap filling either with available nursery or by splitting the tillers from the surviving hills 4. Take up proper weed control Measures 5. Take up suitable plant protection Measures in anticipation of pest & disease outbreaks	1. Drain the excess water as early as possible 2. Apply 20 kg urea+ 15 kg MOP/acre after draining excess water 3. Take up suitable plant protection Measures in anticipation of pest & disease outbreaks (BPH, Blast)	1. Drain the excess water as early as possible 2. Take up suitable plant protection measures in anticipation of pest & disease outbreaks	1. Drain out water and spread sheaves loosely in field or field bunds where there is no water stagnation 2. Spray common salt at 3% on panicles to prevent sprouting and moulds 3. Thresh after drying the sheaves properly 4. Ensure proper grain moisture before storing (means drying)
Cotton	1.Drain the excess water as early as possible in black soils 2.Apply 20 kg N + 10 kg K /ha after draining excess water 3.Take up inter cultivation at optimum soil moisture condition to loosen and aerate the soil and to control weeds 4.To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 @ 1% to support nutrition 5.Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times	1.Drain the excess water as early as possible 2.Apply 20 kg N + 10 kg K /ha after draining excess water 3.To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 4.Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals to control Bacterial leaf blight, wilt alternaria leaf spot and grey	1.Drain the excess water as early as possible 2.To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 3.Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% against boll not. 4.Take up timely control measures against bollworms	1.Dry the produce properly before baling and sending to market

	by rotating the chemicals 6.Take up timely control measures against sucking pests	mildew 5.Take up timely control measures against sucking pets and bollworms.	and whitefly	
Blackgram	1. Drain the excess water as early as possible 2. Apply 4-5 kg N /acre after draining excess water 3. Spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 5. Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals 6. Take up timely control measures against the outbreak of pests like *Spodoptera* etc.	1. Drain the excess water as early as possible 2. Apply 4-5 kg N /acre after draining excess water 3. spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 4. Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals 5. Take up timely control measures against the out break of pests like *Maruca* .	1. Drain the excess water as early as possible 2. Allow the crop to dry completely before harvesting	1. Spread the bundles drenched in rain on field bunds or drying floors to quicken the drying 2. Thresh the bundles after they are dried properly 3. Dry the grain to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage

Greengram	1. Drain the excess water as early as possible 2. Apply 4-5 kg N /acre after draining excess water 3. Spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 5. Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals 6. Take up timely control measures against the out break of pests like *Spodoptera* etc.	1. Drain the excess water as early as possible 2. Apply 4-5 kg N /acre after draining excess water 3. spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 4. Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals 5. Take up timely control measures against the out break of pests like Maruca.	1. Drain the excess water as early as possible 2. Allow the crop to dry completely before harvesting	. Spread the bundles drenched in rain on field bunds or drying floors to quicken the drying 2. Thresh the bundles after they are dried properly 3. Dry the grain to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage
Sugarcane	1. Drain the excess water as early as possible 2. Apply 50 urea+ 50 kg MOP/acre after draining excess water 3. Take up inter cultivation at optimum soil moisture condition to loosen and aerate the soil and to control weeds 4. Adopt timely plant protection measures.	**Grand Growth stage** 1. Drain the excess water as early as possible 2.Apply 50 urea+ 50 kg MOP/acre after draining excess water 3. Take up timely control measures against the out break of pests.	**Formative Phase** 1. Drain the excess water as early as possible 2. Apply 50kg MOP/ acre in early season varieties and 50kg urea +50 kg MOP in mid season and late season varieties 3. Take up timely plant protection measures	**Maturity stage** Harvest the cane at appropriate time
Horticulture				
Cashew	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Separate seed from the fruits and dry the seeds separately. • Store the fruits in well-ventilated place temporarily before it can

			• Harvest the mature fruits as soon as possible	be marketed. • Market the fruits as soon as possible or use for the preparation of processed products.
Mango	Same as above	Same as above	Same as above	Same as above
Banana	• Drain the excess water as soon as possible • Inter-cultivate the soil with gorru for aeration. • Spray 0.5 % KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • If the age of the plant is less than three months and submergence up to three feet better to replant the garden.	• Drain the excess water as soon as possible • Spray 0.5 % KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals. • If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months. • Staking with bamboos to prevent further lodging.		
Lemon	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Foliar spray of micronutrient mixture is also to be taken up. • Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections. • If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied. • Plant protection measures may be taken for control of insect vectors and diseases. • Soil drenching with Bordeaux mixture/COC to avoid fungal infections.	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Foliar spray of micronutrient mixture is also to be taken up. • Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections. • If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied. • Plant protection measures may be taken for control of insect vectors and diseases.		

		• Soil drenching with Bordeaux mixture/ COC to avoid Fungal infections.		
Horticulture vegetables				
Tapioca	1.Drain the excess water as soon as possible 2. Spray Urea 2% solution 2-3 times. 3. Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	1.Drain the excess water as soon as possible 2. Spray Urea 2% solution 2-3 times. 3. Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	1.Drain the excess water as soon as possible 2. Spray Urea 2% solution once.	1. Drain the excess water as soon as possible. 2. Harvest the mature tubers when conditions come to normal. 3. Store the produce in well-ventilated place temporarily before it can be marketed. 4. Market the tubers as soon as possible.
Brinjal	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, resowing with the same crop or sowing of best alternative crop must be taken up.	Same as above	• Drain the excess water as soon as possible • Harvest the marketable fruits in a clear sunny day'	• Store the harvested fruits in well-ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.
Bhendi	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to july resown the same crop or further delayed go for alternate crop	Same as above	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	Same as above

Gourds	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, sowing of best alternative crop must be taken up.	Same as above	Same as above	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Chillies	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, sowing of best alternative crop must be taken up.	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Harvest the matured fruits in a clear sunny day.	• Dry the pods on concrete floor immediately after the appearance of sunlight (or). • Use poly house solar driers for quick drying • Grade the pods and market as soon as possible. • Do not store such produce for long periods.
Horticulture spice&plantation				
Oil palm and Coconut	• Planting should be done on mounts or bunds • Drainage system, suited to local conditions may be provided to remove surplus water from root zone • Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface	• Drain the excess water as soon as possible • Apply booster dose of NPK fertilizers	• Drain the excess water as soon as possible • Apply booster dose of NPK fertilizers Harvest the mature nuts as soon as possible.	• Store the produce in well ventilated place temporarily before it can be marketed • Market the nuts as soon as possible.

Condition - Outbreak of pests and diseases due to unseasonal rains				
Rice	Stem rot and Sheath blight - need based plant protection measures to be initiated based on incidence levels	BPH, Blast, Sheath blight incidence may increase due to unseasonal rains - need based plant protection measures to be initiated	Climbing cutworm and neck blast	-
Cotton	Jassids, Wilt and root rot & leaf spots - Need based plant protection	Jassids, *Spodoptera*, Wilt, root rot and leaf spots - Need based plant	Dusky cotton bug, Grey mildew - Need based plant protection	Dry the seed cotton properly after picking and store it under shade in

	measures to be initiated	protection measures to be initiated	measures to be initiated	aerated place
Sugarcane	ESB, root grub and mealy bug – Need based plant protection measures to be initiated	Internode borer, mealy bug and root grub – Need based plant protection measures to be initiated	Top shoot borer, scale and smut- need based plant protection measures to be initiated	-
Blackgram	Spodoptera - Need based plant protection measures to be initiated	*Maruca* caterpillar Leaf spots, Powdery mildew - Need based plant protection measures to be initiated	Powdery mildews , rust - Need based plant protection measures to be initiated	Dry the grain to optimum seed moisture content (8 %) to avoid damage in storage
Greengram	Spodoptera - Need based plant protection measures to be initiated	*Maruca* caterpillar, Leaf spots, Powdery mildew - Need based plant protection measures to be initiated	Powdery mildews, rust - Need based plant protection measures to be initiated	Dry the grain to optimum seed moisture content (8 %) to avoid damage in storage

2.3 Floods

Condition	**Transient water logging/ partial inundation**[1]			
	Suggested contingency measure[o]			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Rice	1. Drain the excess water at the earliest 2. Apply booster dose of 20 kg urea/acre after drain outing 3. Take up proper weed control measures	1. Drain excess water at the earliest 2. Take up gap filling either with available nursery or by splitting the tillers from the surviving hills 3.Apply a booster dose of 20 kg urea/acre +15kg MOP /acre after drain out 4. Take up need based plant protection measures	1. Drain the excess water at the earliest 2. Take up need based plant protection measures	1. Drain water .Spread sheaves loosely in field or field bunds where there is no water stagnation 2. Spray common salt at 3% on panicles to prevent germination and spoilage of straw from moulds 3. Thresh after drying the sheaves properly 4. Ensure proper grain moisture before storing
Cotton	1. Drain the excess water at the earliest 2. Take up the gap filling at the earliest 3. Inter cultivate at optimum field moisture condition	1. Drain the excess water at the earliest 2. Inter cultivate at optimum field moisture condition	1. Drain the excess water at the earliest 2. spray KNO_3 1 % or water soluble fertilizers	1. Kapas picking should be done carefully to prevent admixtures with waste plant material

	4. Apply 20 kg N + 10 kg K /acre after draining excess water 5. Spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 6. Take up plant protection measures against possible pests and disease incidence	3. Apply 20 kg N+ 10 kg K/acre after draining excess water 4. To spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 5. Spray micronutrients two times at 7-10 days interval 6. Take up plant protection measures against possible pests and disease incidence	@ 1% to support nutrition 3. Take up plant protection measures against possible pests and disease incidence	
Sugarcane	1. Drain the excess water at the earliest 2. Inter cultivate at optimum field moisture condition 3. Apply 50 kg urea + 50kg MOP/acre after draining excess water	**Grand growth stage** 1. Drain the excess water at the earliest 2. Inter cultivate at optimum field moisture condition 3..Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants 4. Apply 50 kg urea + 50kg MOP/acre after draining excess water	**Formative stage** 1. Drain the excess water at the earliest 2. Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants 3. Apply 50 kg urea + 50kg MOP/acre in late season and mid season varieties, 50 kg MOP /acre in early varieties after draining excess water 4. Take up plant protection measures against possible pests and disease incidence	**Maturity stage** 1.Drain the excess water at the earliest 2. Harvest the crop when the field condition permits
Horticulture fruits				
Cashew	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in

				well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Mango	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature fruits as soon as possible. • Store the fruits in well-ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.
Banana	.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant in two to three splits at monthly intervals. • If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Stake the plants with bamboos to prevent further lodging.	• Drain the excess water as soon as possible. • Harvest the mature bunches as soon as possible. • Use ripening chambers for quick and uniform ripening • Store the harvested bunches in well-ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.
Lemon	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Plant protection measures may be taken for control of insect vectors and diseases.	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Foliar spray of micronutrient mixture is also to be taken up. • Sand casting around the tree trunks	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce

		should be removed up to the collar region of the tree to prevent fungal infections. • If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied. • Plant protection measures may be taken for control of insect vectors and diseases.		in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Horticulture vegetables				
Tapioca	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.

	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Bhendi		• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Gourds		• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3	• Drain the excess water as soon as possible • Spray Urea 2% solution	• Drain the excess water as soon as possible. • Harvest the mature

		times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, go for resowing	once. •	produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Chillies	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Dry the pods on concrete floor/ tarpaulins. • Spray any drying oil after the pods are free from surface moisture for quick drying. • Use poly house solar driers for quick drying • Remove the pest and disease infected pods. • Market the produce as soon as possible .
Horticulture spices & plantation crops				
Oil palm & Coconut	• Planting should be done on mounts or bunds • Drainage system, suited to local conditions may be	• Drain the excess water as soon as possible	• .Drain the excess water as soon as	• Harvest the mature nuts as soon as

	provided to remove surplus water from root zone • Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface	• Apply booster dose of NPK fertilizers	possible • .Apply booster dose of NPK fertilizers	possible. • Market the produce as soon as possible.

Condition - Continuous submergence for more than 2 days				
	Suggested contingency measures[o]			
Rice	1. Top dressing with 20 kg urea per acre immediately after recede of flood water 2. Adopt weed control through mechanical or Chemical measures	1. Drain the excess water at the earliest 2. Take up gap filling either with available nursery or by splitting the tillers from the surviving hills if the gaps are < 30% if more go for replanting 3. Apply 20 kg urea+ 10 kg MOP /acre after draining excess water 4. Proper weed control measures to be taken up 4. Timely plant protection measures for pest and disease out break	1. Drain the excess water at the earliest 2. Take up need based plant protection measures	1. Drain water spread sheaves loosely in field or field bunds where there is no water stagnation 2. Spray common salt at 3% on panicles to prevent germination and spoilage of straw from moulds 3. Thresh after drying the sheaves properly 4. Ensure proper grain moisture before storing
Cotton	1. Mortality is most likely hence resowing to be taken up 2. Select short duration hybrids 3. Adopt closer spacing of 90X45 or 90X30 cm	1. To drain the excess water at the earliest 2. Apply 20 kg N + 10 kg K /acre after draining excess water 3. Spray micronutrient mixture for 2 to 3 times at an interval of 7-10 days 4. Spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 5. Intercultivate to smother weeds and to loosen and aerate the soil 6. Need based plant protection measures to be taken up	1. Drain the excess water at the earliest 2. Spray micronutrient mixture for 2 to 3 times at an interval of 7-10 days 3. Spray KNO_3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition 4. Need based plant protection measures to be taken up	1.Drain the water as early as possible 2. Kapas picking should be done carefully to avoid admixtures with plant waste
Sugarcane	1.Drain excess water at the	1. Take up inter cultivation to	1. Drain excess water	1. Drain excess water

	earliest 2. Apply 50 kg urea + 50kg MOP/acre after draining excess water 3. Adopt proper plant protection measures	smother the weeds and to aerate the soil 2.Earthing up is to be taken up to provide anchorage to plants 3. Apply 50 kg urea + 50kg MOP/acre after draining excess water	form the field 2.Earthing up is to be taken up to provide anchorage to plants 3. Apply 50 kg urea + 50kg MOP/acre in late and mid season varieties and 50 kg MOP per acre in early season varieties after draining excess water Need based plant protection measures to be taken up	as early as possible 2. Harvest the crop at appropriate time
Horticulture				
Cashew	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Mango	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature fruits as soon as possible. • Store the fruits in well-ventilated place temporarily before it can be

				marketed. • Market the fruits as soon as possible.
Banana	.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant in two to three splits at monthly intervals. • If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Stake the plants with bamboos to prevent further lodging.	• Drain the excess water as soon as possible. • Harvest the mature bunches as soon as possible. • Use ripening chambers for quick and uniform ripening • Store the harvested bunches in well-ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.
Lemon	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Plant protection measures may be taken for control of insect vectors and diseases.	• Drain the excess water as soon as possible. • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Foliar spray of micronutrient mixture is also to be taken up. • Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections. • If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied.	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Horticulture vegetables				
Tapioca	• Drain the excess water as	• Drain the excess water as soon	• Drain the excess water	• Drain the excess water

	soon as possible	as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	as soon as possible • Spray Urea 2% solution once.	as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Brinjal	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP+ 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Bhendi		• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.

Gourds		• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, go for resowing	• Drain the excess water as soon as possible • Spray Urea 2% solution once.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Chillies	• Drain the excess water as soon as possible	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Dry the pods on concrete floor/ tarpaulins. • Spray any drying oil after the pods are free from surface moisture for quick drying. • Use poly house solar driers for quick drying • Remove the pest and disease infected pods. • Market the produce as soon as possible .
Horticulture spices & plantation crops				

Oil palm and Coconut	• Planting should be done on mounts or bunds • Drainage system, suited to local conditions. may be provided to remove surplus water from root zone • Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface	• Drain the excess water as soon as possible • Apply booster dose of NPK fertilizers	• Drain the excess water as soon as possible • Apply booster dose of NPK fertilizers	• Harvest the mature nuts as soon as possible. • Market the produce as soon as possible.
Sea water intrusion	-	-	--	-

2.4 Extreme events : Heat wave/Cold wave/Frost/Hailstrom/Cylcone

Condition	Suggested contingency measure			
	Seedling/nursery stage	Vegetative stage	Reproductive stage	At harvest stage
Heat wave Cold wave Frost Hailstrom	NA	NA	NA	NA
Cyclone				
Sugarcane	1Drain out the excess water at the earliest 2. Inter cultivate at optimum field moisture condition 3. Apply 50 kg urea + 50kg MOP/acre after draining excess water	1.Drain out the excess water at the earliest 2. Inter cultivate at optimum field moisture condition 3. Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants 4. Apply 50 kg urea + 50kg MOP/acre after draining excess water 5. Take up plant protection measures against possible pests	1. Drain out the excess water at the earliest 2. Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants 3.Apply 50 kg urea + 50kg MOP/acre in late and mid season varieties and 50kg MOP /acre in early varieties after draining excess water	1. Drain out the excess water at the earliest 2. Harvest the crop when the field condition permits

		and disease incidence	4. Take up plant protection measures against possible pests and disease incidence	
Horticulture fruits				
Cashew	• Drain the excess water as soon as possible • Spray 1% KNO3 or Urea 2% solution 2-3 times. • Prevent spread of diseases. • Provide support to the young plants	• Drain the excess water as soon as possible • Tress fallen on ground may be lifted and earthed up • Broken and damaged branches may be pruned and applied with Bordeaux paste	• Drain the excess water as soon as possible • Tress fallen on ground may be lifted and earthed up • Broken and damaged branches may be pruned and applied with Bordeaux paste	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible.
Mango		• Trees fallen on ground may be lifted and earthed up • Manuring and plant protection measures have to be taken up. • Broken and damaged branches may be pruned and applied with Bordeaux paste	• Tress fallen on ground may be lifted and earthed up • Manuring and plant protection measures have to be taken up.	• Drain the excess water as soon as possible. • Harvest the mature fruits as soon as possible. • Collect the fallen fruits and sell immediately or go for preparation of processed products. • If to store, store the produce in well-ventilated place temporarily before it can be marketed.
Banana		• Wind damaged plants should	• Wind damaged plants	• Wind damaged plants should be

		be pruned using disinfected secaetures and cut ends must be smeared with Bordeaux paste • Drain the excess water as soon as possible • The fallen tress may be cut leaving two suckers • Inter-cultivate the soil with gorru for aeration. • Spray 0.5 % KNO3 or Urea 2% solution 2-3 times. • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • If the age of the plant is less than three months and submergence up to three feet better to replant the garden.	should be pruned using disinfected secaetures and cut ends must be smeared with Bordeaux paste • Drain the excess water as soon as possible • The fallen tress may be cut leaving two suckers • Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals • Mature bunches on the completely damaged plants be covered with Leaves and harvested with in 15-20days	pruned using disinfected secaetures and cut ends must be smeared with Bordeaux paste • Drain the excess water as soon as possible. • Harvest the mature bunches as soon as possible. • Use ripening chambers for quick and uniform ripening • Store the harvested bunches in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible. • 3-4 foliar application of KNO3on immature/developing bunches and leaves at weekly intervals. • Staking with bamboo for support .
Lemon	• If the damage is severe, go for resowing.	• Tress fallen on ground may be lifted and earthed up • Manuring and plant protection measures have to be taken up. • Broken and damaged branches may be pruned and applied with Bordeaux paste	• Tress fallen on ground may be lifted and earthed up • Manuring and plant protection measures have to be taken up. • Broken and damaged branches may be pruned and applied with Bordeaux paste	• Drain the excess water as soon as possible. • Harvest the mature fruits as soon as possible. • Collect the fallen fruits and sell immediately or go for preparation of processed products. • If to store, store the produce in well-ventilated place temporarily before it can be marketed.
Tapioca	• Uprooted plants may be	• Uprooted plants may be lifted	• Drain the excess water	• Harvest the tubers in a clear

	lifted and earthed up • Gap filling must be done immediately • If damage is more, go for replanting • Drain the excess water as soon as possible • Spray Urea 2% solution once.	and earthed up • Drain the excess water as soon as possible • Spray Urea 2% or KNO3 1% solution once.	as soon as possible • Harvest the marketable tubers in a clear sunny day'	sunny day • Store the harvested tubers in well-ventilated place temporarily before it can be marketed. • Market the tubers as soon as possible.
Brinjal	• Grow nursery on raised beds. • If damage is more go for replanting	• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Gap filling must be done immaditeatly • Spray Urea 2% solution 2-3 times. • If damage is more go for replanting	• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Gap filling must be done immediately • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. • Market the produce as soon as possible. • Collect the fruits and sell immediately or go for preparation of processed products.
Bhendi		• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible. • If damage is more, go for resowing	• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Harvest the mature fruits as soon as possible. • Store the fruits in well-ventilated place temporarily before it can be marketed. • Market the fruits as soon as possible.

Gourds		• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible. • Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop. • In case of severe damage (considered as complete economical loss), and the contingency period is between June to August, go for resowing	• Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Harvest the mature produce as soon as possible. • Store the produce in well-ventilated place temporarily before it can be marketed. Market the produce as soon as possible.
Chillies	• Grow nursery on raised beds.	• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Gap filling must be done immediately • If damage is more go for replanting Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Uprooted plants may be lifted and earthed up • Drain the excess water as soon as possible • Spray Urea 2% solution 2-3 times. • Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.	• Drain the excess water as soon as possible. • Dry the pods on concrete floor/ tarpaulins immediately • use poly house solar driers for quick drying • Remove the pest and disease infected pods. .
Horticulture spices & plantation crops				
Oil palm and Coconut	• Planting should be done on mounts or bunds • Drainage system suited to local conditions. may be provided to remove	• Drain the excess water as soon as possible • Twisted leaves may be cut and removed • Apply booster dose of NPK	• Drain the excess water as soon as possible • Hanging bunches may be provided with supports wherever	• Twisted leaves may be cut and removed • Hanging bunches may be provided with supports wherever possible

	surplus water from root zone • Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface	fertilizers • The palms have fallen with root system still having contact with the soil, they need to be brought to position and provided with soil mound and support	possible Apply booster dose of NPK fertilizers • The palms have fallen with root system still having contact with soil they need to be brought to position and provided with soil mound and support	• Harvest the mature nuts as soon as possible. • Market the produce as soon as possible.

2.5 Contingency strategies for livestock, poultry & fisheries

2.5.1 General contingency plan for Livestock

Before the event	During the event	After the event
Feed and fodder availability		
1.Conserving fodder/crop residues/ forest grass by silage / hay making either by individual or on community basis 2. Preparing complete diets and storing in strategic locations 3. Organize procurement of dry fodders / feed ingredients from surplus areas 4. Establish fodder banks and feed banks 5. Livestock relief camps during floods/cyclones must be planned in the vicinity of relief camps for people 6. Capacity building and preparedness	1.Organise relief camps 2.Supply silage / hay to farmers with productive stock on subsidized rates 3.Segregate old, weak and unproductive stock and send for slaughter 4. Supply mineral mixture to avoid deficiencies 5. Dry fodder must be offered to the livestock in little quantities for number of times 6.Concentrate feed or complete feed must be offered to only productive and young stock only	1. Capacity building to stake holders on drought /cyclone/flood mitigation in livestock sector 2. Promote fodder cultivation. 3. Flushing the stock to recoup 4. Avoid soaked and mould infected feeds / fodders to livestock 5. Replenish the feed and fodder banks 6.Promote fodder preservation techniques like silage / hay making
Drinking water		

1.Construct drinking water tanks in herding places, village junctions and in relief camp locations 2.Plan for sufficient number of tanks for water transportation 3.Identify bore wells, which can sustain demand. 4.Procure sufficient quantities of water Sanitizers	1.Regular supply of clean drinking water to all tanks 2.Cleaning the tanks in regular intervals 3.Keep the livestock away from contaminated flood/cyclone/stagnated waters 3.Add water sanitizers	1.Hand over the maintenance of the structures to panchayats 2.Sensitize the farming community about importance of clean drinking water
Health and disease Management		
1.Procure and stock emergency medicines and vaccines for important endemic diseases of the area 2. All the stock must be immunized for endemic diseases of the area 3. Carry out deworming to all young stock 4. Keep stock of bleaching powder and lime 5.Carry out Butax spray for control of external parasites 6.Identify the Clinical staff and trained paravets and indent for their services as per schedules 7.Identify the volunteers who can serve in need of emergency	1.Keep close watch on the health of the stock 2.Sick animals must be isolated and treated Separately. 3. Carry out deworming and spraying to all animals entering into relief camps 4. Clean the animal houses regularly and apply disinfectants. 5.Safe and hygienic disposal of dead animal carcasses 6. Organize with community daily lifting of dung from relief camps	1.keep close surveillance on disease outbreak. 2.Undertake the vaccination depending on need 3.Keep the animal houses clean and spray disinfectants

2.5 Detailed Contingent strategies for Livestock, Poultry & Fisheries

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			

Feed and Fodder availability	Available paddy straw and sugar cane tops should be properly stored for future use. Chopping of fodder should be made as mandatory in every village through supply and establishment of good quality chaff cutters. Harvesting and collection of perennial vegetation particularly grasses which grow during monsoon Proper drying, bailing and densification of harvested grass from previous season Creation of permanent fodder, feed and fodder seed banks in all drought prone areas	Harvest and use biomass of dried up crops especially Rice material as fodder. Harvest the tree fodder (Neem, Subabul, Acasia, Pipal etc) and unconventional feeds resources available and use as fodder for livestock (LS). Available feed and fodder should be cut from CPRs and stall fed in order to reduce the energy requirements of the animals Hay should be transported to the needy areas from the near by districts in case of mild drought Advise the farmers about the practice of mixing available kitchen waste with dry fodder while feeding	Short duration fodder crops of sorghum/bajra/maize(UP chari, MP chari, HC-136, HD-2, GAINT BAJRA, L-74, K-677, Ananad/African Tall, Kisan composite, Moti, Manjari, B1-7 should be sown in unsown and crop failed areas where no further routine crop sowing is not possible
Cyclone	Harvest all the possible wetted grain (Rice/backgram/green gram etc) and use as animal feed. As the district is chronically prone for cyclone, arrange for storing minimum required quantity of hay (25-50 kg) and concentrates (10-25 kg) per animal in farmer's / LS keepers house/ shed for feeding during cyclone. Stock of anti-diarrheal drugs and electrolytes should be made available for emergency transport Don't allow the animals for grazing in case of early forewarning (EFW) of cyclone Incase of EFW of severe cyclone, shift the animals to safer places.	Treatment of the sick, injured and affected animals through arrangement of mobile emergency veterinary hospitals / rescue animal health workers. Diarrhea out break may happen. Health camps should be organized In severe cases un-tether **or** let loose the animals Arrange transportation of highly productive animals to safer place Spraying of fly repellants in animal sheds	Repair of animal shed Deworm the animals through mass camps Vaccinate against possible disease outbreaks like HS, BQ, FMD and PPR Proper dispose of the dead animals / carcasses by burning / deep burying (4-8 feet) with lime powder (1kg for small ruminants and 5kg for large ruminants) in pit Bleach / chlorinate (0.1%) drinking water or water resources Collect drowned crop material, dry it and store for future use Sowing of short duration fodder crops in unsown and water logged areas when crops are damaged and no chance to replant

			Application of urea (20-25kg/ha) in the inundated areas and CPR's to enhance the bio mass production.
Floods	In case of early forewarning (EFW), harvest all the crops (Rice/backgram/green gram) that can be useful as fodder in future (store properly) Don't allow the animals for grazing if severe floods are forewarned As regularly flood prone district, arrange for storing minimum required quantity of hay (25-50kg) and concentrates (25kgs) per animals in farmer / LS keepers house / shed for feeding animals during floods Arrangement for transportation of animals from low lying area to safer places and also for rescue animal health workers to get involve in rescue operations	Transportation of animals to elevated areas Stall feeding of animals with stored hay and concentrates Proper hygiene and sanitation of the animal shed In severe floods, un-tether or let loose the animals Emergency outlet establishment for required medicines or feed in each village Spraying of fly repellants in animal sheds	Repair of animal shed Bring back the animals to the shed Cleaning and disinfection of the shed Bleach (0.1%) drinking water / water sources Deworming with broad spectrum dewormers Vaccination against possible disease outbreaks like HS, BQ, FMD and PPR Proper disposable of the dead animals / carcasses by burning / deep burying (4-8 feet) with lime powder (1kg for small ruminants and 5kg for large ruminants) in pit Drying the harvested crop material and proper storage for use as fodder.
Health and Disease management	List out the endemic diseases (species wise) in that district and store vaccines for those diseases Timely vaccination (as per enclosed vaccination schedule) against all endemic diseases	Constitution of Rapid Action Veterinary Force Procurement of emergency medicines and medical kits Rescue of sick and injured animals and their treatment	Conducting mass animal health camps Conducting fertility camps Mass deworming camps

	Surveillance and disease monitoring network to be established at Joint Director (Animal Husbandry) office in the district		
Insurance	Encouraging insurance of livestock	Listing out the details of the dead animals	Submission for insurance claim and availing insurance benefit Purchase of new productive animals
Drinking water	Identification of water resources Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals)	Restrict wallowing of animals in water bodies/resources	Bleach (0.1%) drinking water / water sources Provide clean drinking water

Vaccination programme for cattle and buffalo:

Disease	**Age and season at vaccination**
Anthrax	In endemic areas only, Feb to May
Haemorrhagic septicaemia (HS)	May to June
Black quarter (BQ)	May to June
Foot and mouth disease (FMD)	July/August and November/December

Vaccination schedule in small ruminants (Sheep & Goat)

Disease	**Season**
Foot and mouth disease (FMD)	Preferably in winter / autumn
Peste des Petits Ruminants (PPR)	Preferably in January
Black quarter (BQ)	May / June
Enterotoxaemia (ET)	May
Haemorrhagic septicaemia (HS)	March / June
Sheep pox (SP)	November

2.5.2 Poultry

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Shortage of feed ingredients	Storing of house hold grain like maize, broken rice, bajra etc, in to use as feed in case of severe drought	Supplementation only for productive birds with house hold grain Supplementation of shell grit (calcium) for laying birds Culling of weak birds	Supplementation to all survived birds
Drinking water		Use water sanitizers or offer cool drinking water	
Health and disease management	Culling of sick birds. Deworming and vaccination against RD and fowl pox	Mixing of Vit. A,D,E, K and B-complex including vit C in drinking water (5ml in one litre water)	Hygienic and sanitation of poultry house Disposal of dead birds by burning / burying with lime powder in pit
Floods			
Shortage of feed ingredients	In case of early forewarning of floods, shift the birds to safer place Storing of house hold grain like maize, broken rice etc,	Use stored feed as supplement Don't allow for scavenging Culling of weak birds	Routine practices are followed Deworming and vaccination against RD
Drinking water		Use water sanitizers or offer cool drinking water	

Health and disease management	In case of EFW, add antibiotic powder (Terramycin/Ampicilline/ Ampiclox etc., 10g in one litre) in drinking water to prevent any disease outbreak	Prevent water logging surrounding the sheds through proper drainage facility Assure supply of electricity by generator or solar energy or biogas Sprinkle lime powder to prevent ammonia accumulation due to dampness	Sanitation of poultry house Treatment of affected birds Disposal of dead birds by burning / burying with line powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against RD
Cyclone			
Shortage of feed ingredients	In case of EFW, shift the birds to safer place Storing of house hold grain like maize, broken rice, bajra etc, Culling of weak birds	Use stored feed as supplement Don't allow for scavenging Protect from thunder storms	Routine practices are followed
Drinking water		Use water sanitizers or offer cool drinking water	
Health and disease management	In case of EFW, add antibiotic powder in drinking water to prevent any disease outbreak	Sanitation of poultry house Treatment of affected birds Prevent water logging surrounding the sheds Assure supply of electricity Sprinkle lime powder (5-10g per square feet) to prevent ammonia accumulation due to dampness	Disposal of dead birds by burning / deep burying with lime powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against Ranikhet Disease (0.5ml S/c)

2.5.3 Fisheries/ Aquaculture:

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Inland			
(i) Shallow water depth due to insufficient rains/inflow	Stocking of advnced fingerlings in half or even less than the normal stocking density or stocking of common carp seed	Immediate harvesting or decreasing the density commensurate with the water quantity.	De weeding and deepening of tank to ensure retention of water for a longer period and provision of employment under MGNREGP
(ii) Changes in water quality	Regular monitoring of water quality parameters and application of geolites, soil probiotics, etc to maintain water qaulity	Immediate harvesting or changing the water quality by application of sanitisers.	Removal of top layer, deep ploughing of tank and application of lime
(iii) Any other			
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	Crop holiday or going for stocking of yearlings by reducing the density according to availability of water	Harvesting of fish and leaving the pond fallow till next season	Removal of top layer, deep ploughing of tank and application of lime
(ii) Impact of salt load build up in ponds / change in water quality	Stocking of salinity tolerant fish / shrimp, application of geolites and other buffers	Frenquent change of water with fresh water	Frequent draining of the pond with fresh water, removal of top layers
(iii) Any other			
2) Floods			
A. Capture			
Marine	No intervention	No intervention	No intervention
Inland			

(iv) Loss of stock	Avoidance of surface species like catla, silver carp since they are vulnerable in tanks prone to floods, erection of nets across the spill way or just beyond it	Erection of nets at spill ways	Taking up compensatory stocking
(v) Changes in water quality		When dissolved oxygen levels go down, aerators, recirculation of water, etc are to be attempted to maintain DO levels, going for partial harvest, etc	
(vi) Health and diseases	Sometimes there may be heavy accumulation of nutrients and organic matter.	There may be break out of Heamorrhagic septicimea. Addition of antibiotics like Chloro Tetra Cycline or Oxy Tetra Cycline to the feed to constrol the disease	Removal of weeds, top layer of soil, deep ploughing of tank and application of lime, exposing to sun light
B. Aquaculture			
(i) Inundation with flood water	Raising and rivetting the bunds, construction of spill way to release excess water, erection of nets to avoid escape of fish	Continuous pumping of excess water, erection of nets low lying areas	Strengthening of bunds, excavating channels along the sides of the ponds for free escape of water
(ii) Water continuation and changes in water quality		When dissolved oxygen levels go down, aerators, recirculation of water, etc are to be attempted to maintain DO levels, going for partial harvest, etc	
(iii) Health and diseases	Sometimes there may be heavy accumulation of nutrients and organic matter.	There may be break out of Heamorrhagic septicimea. Addition of antibiotics like Chloro Tetra Cycline or Oxy Tetra Cycline to the feed to constrol the disease	Removal of weeds, top layer of soil, deep ploughing of tank and application of lime, exposing to sun light
(iv) Loss of stock and inputs (feed, chemicals etc)	Advance erection of nets, strengthening of bunds where they are prone to breaches, harvesting or	Suspension of feeding, application of organic manures	Compensatory stocking, assessment of values and payment of subsidy on inputs

	reducing the density		
(v) Infrastructure damage (pumps, aerators, huts etc)	Insuring pond, accessories, etc., Shifting of aerators, pumps soon after warnigs are issued	Relocating pumps, aerators to elevated places	Assessment of damages and provision of them on subsidy
(vi) Any other			
3. Cyclone / Tsunami			
A. Capture			
(i) Compensation due to loss of fishermen lives	Avoidance of fishing, preventing fishermen from venturing into sea, carrying of safety equipment and VHF sets, shifting fishermen from vulnerable areas to relief camps, etc	To ensure the return of fishing boats on long voyages, provision of information on such boats to coast Guard	Payment sufficient ex-gratia to the families
(ii) Damage to boats / nets/damaged	Avoidance of fishing when warnings are issued, shifting of boats and nets to safe places	Shifting and relocating boats and nets to safer places	Assessment of damages to boats and nets and provision of boats and nets for restoration of livelihoods
(iii) Damage to houses/huts	Avoidance of houses in Coastal Regulation Zone, designing of houses to withstand impact of turbulent wind and water	Shifting of people by relief boats to the relief camps	Assessment of damages to houses and provision of compensation in case of partial damage and sanction house under existing schemes
Inland	Erection of protective nets acroos the surplus weir to prevent fish loss due to overflows	Continuous monitoring to prevent or minimise escape of fish along with surplus water	Compensatory stocking of seed
B. Aquaculture			
(i) Overflow / flooding of ponds	The design of the pond must be in such a manner as to bail out surplus water and to prevent loss of stanidng crop	Continuous monitoring to prevent or minimise escape of fish along with surplus water	Compensatory stocking of seed
(ii) Changes in water quality (fresh water / brackish water ratio)	Recircualtion water to repleish and ensure sufficient dissolved oxygen levels in the pond. Maintenance of salinity levels by pumping in water	Continuation of the same process.	Restoration of physical and chemical parameters

	from creecks.		
(iii) Health and diseases	Removal of stress causing factors to maintain the health of the animal	Removal of stress causing factors to maintain the health of the animal	Restoration of physical and chemical parameters
(iv) Loss of stock and inputs (feed, chemicals etc)	Preventive nets must be erected to minimise loss of stock	Continuation of the same process.	Compensatory stocking of seed
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	Pumps, aerators, etc must be protected by moving them to safe locations	To avoid use of aerators, pumps and other appliances	Overhauling of the eqipment to prevent from being damaged
(vi) Any other			
4. Heat wave and cold wave			
A. Capture			
Inland	Monitoring dissolved oxygen levels	Monitoring dissolved oxygen levels	No intervention
B. Aquaculture			
(i) Changes in pond environment (water quality)	Reduction of biomass by partial harvest in the event of heat as the DO levels will be very low.	Avoidance of fishing	Compensatory stocking of seed and restoration of all physical and chemical parameters
(ii) Health and Disease management	Removal of stress causing factors to maintain the health of the animal	Removal of stress causing factors to maintain the health of the animal	Compensatory stocking of seed and restoration of all physical and chemical parameters
(iii) Any other			