State: MEGHALAYA

Agriculture Contingency Plan for District: East Khasi Hills

1.0 District Agriculture profile*				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	North-Eastern Hills (Purvachal), Warm Perhumid Eco-sub region (17.1)		
	Agro-Climatic Zone (Planning Commission)	Eastern Himalayan Region (II)		
	Agro Climatic Zone (NARP)	Sub Topical Hill Zone (NEH-5)		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	East Khasi hills, West Khasi Hills, Jaintia hills ,East Garo Hills, West Garo Hills, South Garo Hills, Ri Bhoi		
	Geographic coordinates of district headquarters	**Latitude**	**Longitude**	**Altitude**
		25°07" & 25°41" N	91°21" & 92°09" E	1496m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	ICAR Research Complex for NEH region ,Umiam Road,Umiam-793103 (Meghalaya)		
	Mention the KVK located in the district with full address	State Biological Control Laboratory,5th Mile, Upper Shillong- 793009		
	Name and address of the nearest Agro met Field Unit (AMFU, IMD) for agro-advisories in the Zone	Indian Metereorological Department, 3rd Mile, Upper Shillong-793005		

1.2	**Rainfall**	**Normal RF(mm)**	**Normal Rainy days (number)**	**Normal Onset**	**Normal Cessation**
	SW monsoon (June-Sep):	1189.5	110	1st week of May	Last week of September
	NE Monsoon(Oct-Dec):	124	12	Last week of September	Last week of October
	Winter (Jan- February)	0.00	0.00	-	-
	Summer (March-May)	237.7	41	Last week of February-	1st week of May-
	Annual	1551.2	163	Last week of February	Last week of October

Source: IMD, 3rd Mile, Upper Shillong

1.3	**Land use pattern of the district** (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	274.8	-	-	-	NA	-	-	-	-	-

Note:-* Recent data not available

* mention colour, depth and texture (heavy, light, sandy, loamy, clayey etc) and give vernacular name, if any, in brackets (data source: Soil Resource Maps of NBSS

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area (ha)**	**Percent (%) of total geographical area**	**PH**
	Clay Loam	60367.44	20.9	5.12 – 5.68
	Sandy Loam	10646.91	3.7	5.85 – 5.95
	Sandy Clay	47313.85	16.4	5.21 – 5.23
	Sandy Clay Loam	156749.4	54.2	5.285 – 5.91
	Clay	11229.51	3.9	4.41 – 5.465
	Town	2725.72	-	
	Total	289032.84		

1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	31.5	124.9
	Area sown more than once	7.8	
	Gross cropped area	39.3	

1.6	**Irrigation**	Area (ha)		
	Net irrigated area	4010.04		
	Gross irrigated area	5312.85		
	Rain fed area	-		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area(Area may be indicated)
	Canals	38	1723.29	32.90%
	Tanks	-	-	-

	Open wells	-	-	-
	Bore wells	-	-	-
	Lift irrigation schemes	-	-	-
	Micro-irrigation	-	-	-
	Other sources (please specify)	37	2286.752	43.66%
	Total Irrigated Area	75	4010.042	76.56%
	Power tiller under State Plan Scheme	37	-	-
	Power tiller under Centrally Sponsored Scheme	25	-	-
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Semi- critical	-	-	-
	Safe	8	-	Sporadic occurrence of high concentration of Fe
	Wastewater availability and use	-	-	-
	Ground water quality	Good fit for drinking		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: **Central Ground Water Board North Eastern Region**

1.7 Area under major field crops & horticulture (as per latest figures)

1.7	**Major field crops cultivated**	**Area (ha)**							
		Kharif			***Rabi***				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Rice	-	5422	5422	-	279	-	114	5815
	Maize	-	2091	2091	-	-	-	-	2091
	Soybean	-	405	405	-	-	-	-	405
	Millets	-	246	246	-	-	-	-	246
	Rabi pulses	-	645	645	-	-	-	-	645
	Sesame	-	78	78	-	-	-	-	78
	Rape & Mustard	-	91	91	-	-	-	-	91

Sl. No.	**Horticulture crops - Fruits**	**Area (ha)**		
		Total	**Irrigated**	**Rainfed**
	Pineapple	887	-	887
	Citrus fruits	4263	-	4263
	Banana	760	-	760
	Papaya	95	-	95
Others (specify)			-	
	Horticulture crops - Vegetables	**Total**	**Irrigated**	**Rainfed**
	Potato	11273	-	11273
	Sweet potato	664	-	664
	Ginger	476	-	476
	Tapioca	428	-	428
	Black Pepper	172	-	172
	Chillies	116	-	116
	Turmeric	90	-	90
	Arecanut	4521	-	4521
	Rubber	-	-	-
	Coffee	-	-	-
	Total fodder crop area			
	Grazing land, reserve areas etc			
	Availability of unconventional feeds/by products eg., breweries waste, food processing, fermented feeds bamboo shoots, fish etc			
	Sericulture etc **Other agro enterprises (mushroom cultivation etc specify)**			
	Others (specify)			

Source: (2011-12) Directorate of Agriculture, Meghalaya, Shillong

Live Stock

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Indigenous cattle	26.645	73.274	99.919
	Improved / Crossbred cattle	0.479	8789	9.268
	Buffaloes (local low yielding)	0.213	413	0.626
	Improved Buffaloes	-	-	-
	Goat	20.944	35.688	56.632
	Sheep	3.451	5.506	8.957
	Pig	67.318	52.039	119.357
	Yak	-	-	-
	Others (Horse, mule, donkey etc., specify)	-	-	-
	Commercial dairy farms (Number)	-	-	-
1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**	
	Government Poultry Farm	2	**475.253** Including#	
	Private Farms, Individual rearers #	-		

Source: (2007) Directorate of Animal Husbandry & Veterinary, Meghalaya.

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)	
	-	-	-	-	-	-

ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**
	1070	1	40

B. Culture

	Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)	-	-	-
ii) **Fresh water** (Data Source: Fisheries Department)	25494	1.5 t/ha	0.382
Others	-	-	-

(2012-13) Directorate of Fisheries, Meghalaya

1.11 Production and Productivity of major crops

1.11	Name of crop	**Kharif**		**Rabi**		**Summer**		**Total**		**Crop residue as fodder** (‘000 tons)
		Production (tonnes)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production (tonnes)	Productivity (kg/ha)	
Major Field crops (Crops to be identified based on total acreage)										
	Rice	99092	18348	5402	20682	1954	16892	106448	186407	
	Maize	45746	2288.8	-	-	-	-	45746	22888	
	Rabi pulses	-	-	7424	26412	-	-	7424	26412	
	Millets	2858	1075	-	-	-	-	2858	1075	
	Soybean	2366	1058	-	-	-	-	2366	1058	
	Sesame	41	834.6	-	-	-	-	41	8346	
	Rapeseed	368	563	-	-	-	-	368	563	
Major Horticultural crops (Crops to be identified based on total acreage)										
	Potato							109756	9746	
	Citrus fruits							20031	4650	
	Banana							8013	10578	
	Pineapple							6251	7183	
	Papaya							642	6946	
	Arecanut							4767	1056	
	Ginger							3645	7712	
	Sweet potato							2602	3943	
	Tapioca							2261	5264	

	Turmeric							473	5130	
	Chillies							241	2028	
	Black pepper							106	631	
	Tea							6	76	

Source: (2012-13) Directorate of Agriculture, Meghalaya, Shillong.

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	**Rice**	**Maize**	**Rabi pulses**	**Millets**	**Soybean**
	Kharif- Rainfed	2nd week of May – 1st week of June	1st week of April – 3rd week of May		1st week of April - 3rd week of May	
	Kharif-Irrigated					
	Rabi- Rainfed	1st week of January	1st week October - 1st week of November	2st week October – 1st week of November	1st week October- 1st week of November	
	Rabi-Irrigated	-				
	Summer-irrigated	-				
	Summer-rainfed	-				1st week of June- 1st week of July

1.13	**What is the major contingency the district is prone to?** (Tick mark)	**Regular***	**Occasional**	**None**
	Drought			√
	Flood			√
	Cyclone			√
	Hail storm		√	
	Heat wave			√
	Cold wave			√
	Frost		√	
	Sea water intrusion			√
	Snowfall			√

	Landslides		√	
	Earthquake		√	
	Pests and disease outbreak (specify)		√	
	Others (like fog, cloud bursting etc.)		√	

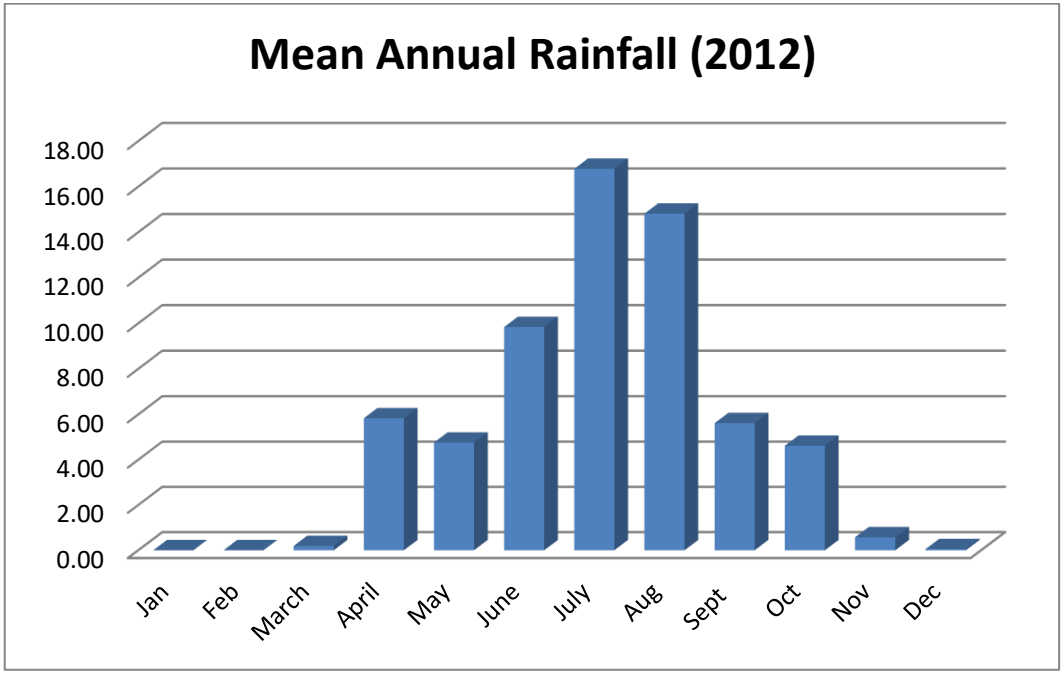
*When contingency occurs in six out of 10 years

1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Enclosed: Yes
		Mean annual rainfall as Annexure 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes

Annexure 1

Fig: Map of East Khasi Hills

Annexure- II


Mean Annual Rainfall (2012)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec

Annexure-III

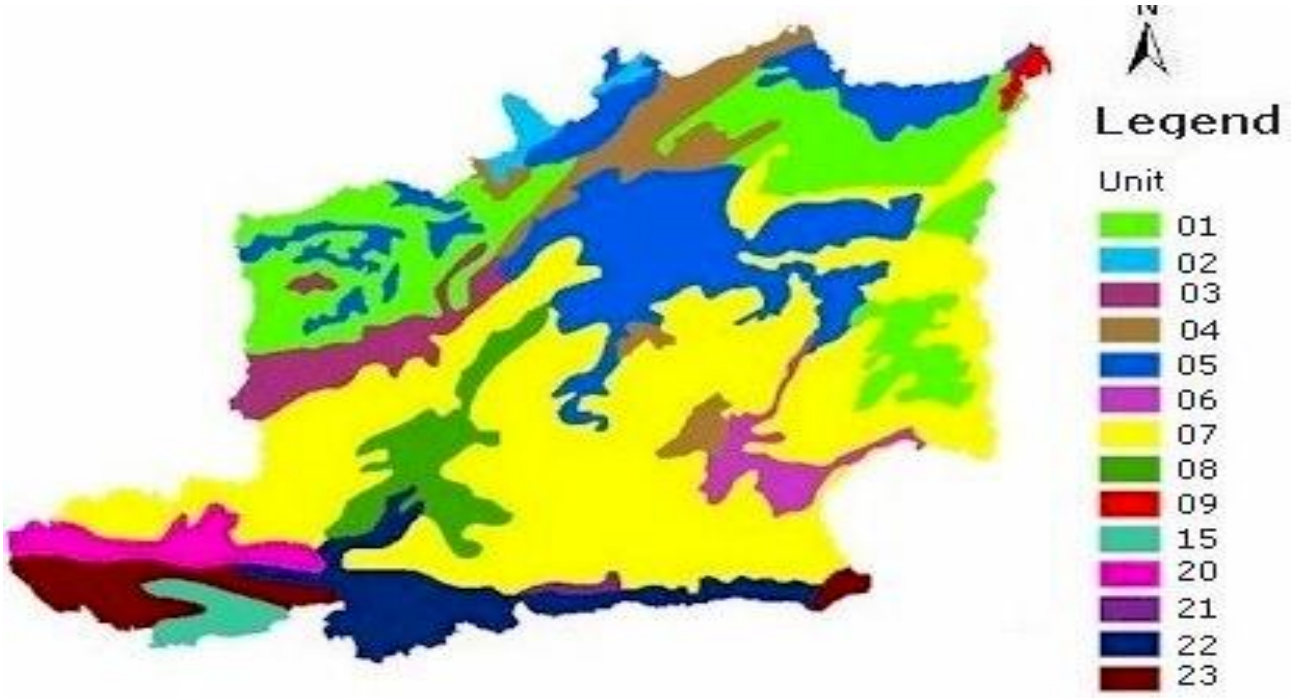


Fig. Soil type of East Khasi Hills

Sl. No	Unit	Description
1	01	Deep, excessively drained, fine soils on moderately sloping side-slopes of hills having loamy surface with moderate erosion hazard associated with: Moderately deep, excessively drained, coarse-loamy soils on gently sloping hill tops with very severe erosion hazard and strong stoniness.
2	02	Deep, excessively drained, fine soils on gently sloping side-slopes of hills having loamy surface with moderate erosion hazard associated with: Deep, poorly drained, fine-loamy soils on very gently sloping valleys with very slight erosion hazard and ground water table below one metre depth of the surface.
3	03	Deep, excessively drained, fine soils on moderately sloping side slopes of hills having loamy surface with moderate erosion hazard & slight stoniness associated with: Moderately deep, excessively drained, loamy-skeletal soils on gently sloping hill tops with very severe erosion hazard and strong stoniness.
4	04	Deep, excessively drained, fine soils on moderately steep side-slopes of hills having loamy surface with moderate erosion hazard and strong stoniness associated with: Moderately deep, excessively drained, loamy-skeletal soils on very gently sloping hill tops with severe erosion hazard and strong stoniness
5	05	Deep, excessively drained, fine soils on moderately sloping side-slopes of hills having loamy surface with moderate erosion hazard associated with: Moderately deep, excessively drained ,fine-loamy soils on gently sloping hill tops with very severe erosion hazard and strong stoniness
6	06	Moderately shallow, excessively drained, fine-loamy soils on moderately steep side slopes of hills having loamy surface with severe erosion hazard and strong stoniness associated with: Moderately Shallow, excessively drained, loamy-skeletal soils on gently sloping hill tops with very severe erosion hazard and slight stoniness.
7	07	Moderately deep, excessively drained, coarse-loamy soils on very steeply sloping hill escarpment having sandy surface with very severe erosion hazard and strong stoniness associated with: Deep, excessively drained, coarse-loamy soils on steeply sloping hill tops with severe erosion hazard and strong stoniness
8	08	Moderately deep, excessively drained, loamy-skeletal soils on moderately steep side-slopes of hills having sandy surface with very severe erosion hazard and strong stoniness associated with: Shallow, excessively drained, loamy-skeletal soils on moderately steep side-slopes of hills with very severe erosion hazard and strong stoniness
9	09	Deep, excessively drained, fine-loamy soils on moderately sloping side-slopes of hills having loamy surface with moderate erosion hazard associated with: deep excessively drained, fine soils on moderately sloping side-slopes of hills with moderate erosion hazard.
10	15	Deep, moderately well drained, fine soils on very gently sloping upland having loamy surface with slight erosion and slight flood hazards associated with: Deep, well drained, fine soils on moderately sloping side slopes of hills with moderate erosion hazard.
11	20	Deep, excessively drained, loamy-skeletal soils on steeply sloping side-slopes of hills having loamy surface with severe erosion hazard and strong stoniness associated with: Deep, excessively drained, coarse-loamy, soils on steeply sloping side-slopes of hills with severe erosion hazard and moderate stoniness.
12	21	Moderately deep, excessively drained, fine-loamy soils on steeply sloping side-slopes of hills having loamy surface with severe erosion hazard and moderate stoniness associated with: Deep, excessively drained fine soils on steeply sloping side-slopes of hills with severe erosion hazard and strong stoniness.
13	22	Moderately deep, excessively drained coarse loamy soils on moderately steep side-slopes of hills having loamy surface with moderate erosion hazard and slight stoniness associated with: Moderately deep, excessively drained, fine soils on moderately, sloping side-slopes of hills with severe erosion hazard and slight stoniness.

14	23	Moderately deep, excessively drained loamy-skeletal soils on moderately steep side-slopes of hills having loamy surface with very severe erosion hazard and strong stoniness associated with: Moderately shallow, excessively drained, coarse loamy soils on moderately steep side-slopes of hills with very severe erosion hazard and strong stoniness.

2.0 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 including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks	Coarse-loamy soil	1.Potato 2. Maize var. 3.Maize legume intercropping		Preventive irrigation. Mulching in maize and maze based cropping system. Construction of Jhalkund (water harvesting structure). Insurance of all crops should be done by the farmers.	Construction materials for Jhalkund may be procured from concerned KVKs. National Agriculture Insurance Scheme, available in all nationalized banks.
Delay by 4 weeks	Coarse-loamy soil	1.Potato 2. Maize var. Vijay comp. 3.Maize legume intercropping 4. Rice nursery 5. Cabbage nursery	Replace maize var. Vijay comp. with var. Navjot.	Earthening up of potato. Insurance of all crops should be done by the farmers.	Maize var. Navjot seeds may be procured from Department of Agriculture, Govt. of Meghalaya and neighboring KVKs. National Agriculture Insurance Scheme, available in all nationalized banks.
Delay by 6 weeks	Fine to coarse-loamy soil	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice nursery		SRI method should be adopted. Life saving irrigation for cabbage nursery,	Leaflets and guide on SRI method may be collected from KVKs. National Agriculture Insurance

		4. Cabbage nursery 5. Cauliflower, pumpkin, cucumber, brinjal, French bean nurseries.		maize and maize based cropping system. Insurance of all crops should be done by the farmers.	Scheme, available in all nationalized banks.
Delay by 8 weeks	Fine to coarse-loamy soil	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice 4. Cabbage nursery cauliflower, pumpkin, cucumber, brinjal, French bean bittergourd, bottlegourd nusery		Arrangements for Irrigation for all crops should be done. Insurance of all crops should be done by the farmers.	National Agriculture Insurance Scheme, available in all nationalized banks.

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Fine to coarse-loamy soil.	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice nursery 4. Cabbage nursery 5. Cauliflower, pumpkin, cucumber, brinjal, French bean nurseries.	If dry spell in between is forecasted, plant population for crops may be increased in case of direct sown crops.	Mulching in all crops. Construction of Jhalkund (water harvesting structure). Protrays should be used for vegetable nurseries.	Leaflets and guide on mulching may be collected from KVKs. Construction materials for Jhalkund may be procured from concerned KVKs.
At vegetative stage	Fine to coarse-loamy soil.	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice nursery 4. Cabbage nursery 5. Cauliflower, pumpkin, cucumber, brinjal, French bean nurseries.		SRI method should be followed.	Leaflets and guide on SRI method may be collected from KVKs.

At flowering/ fruiting stage	Fine to coarse-loamy soil.	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice nursery 4. Cabbage nursery 5. Cauliflower, pumpkin, cucumber, brinjal, French bean nurseries.		Irrigation should be given at an interval of 5-7 days interval for proper flowering and fruiting.	
Terminal drought (Early withdrawal of monsoon)	Fine to coarse-loamy soil.	1. Maize var. Navjot. 2. Maize legume intercropping 3. Rice nursery 4. Cabbage nursery 5. Cauliflower, pumpkin, cucumber, brinjal, French bean nurseries.		Irrigation from Jhalkund.	

2.1.2 Drought - Irrigated situation-not applicable

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed release of water in canals due to low rainfall					
Limited release of water in canals due to low rainfall					
Non release of water in canals under delayed onset of monsoon in catchment					
Lack of inflows into tanks due to insufficient /delayed onset of monsoon					

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficiency of surface water for irrigation					

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient groundwater recharge due to low rainfall					

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

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Rice	Drain out excessive water	Drain out excessive water	Drain out, Harvesting at physiological maturity stage	Dry and store in air tight condition
Maize	Ridge planting, proper drainage	Proper drainage		
Horticulture				
Vegetables	Proper drainage	Proper drainage	Drain out, Harvesting at physiological maturity stage	Store at optimum temperature and packed properly
Heavy rainfall with high speed winds in a short span[2]				

Rice	Drain out excessive water	Drain out excessive water	Drain out, Harvesting at physiological maturity stage	Dry and store in air tight condition
Maize	Ridge planting, proper drainage	Proper drainage		
Horticulture				
Vegetables	Ridge planting, proper drainage	Proper drainage	Drain out and harvest the crop at optimum stage.	Store at optimum temperature and packed properly
Citrus Fruits	Proper drainage	Application of PGRs, (Auxin) and boron to enhance fruit set	Drain out and harvest the crop at maturity.	
Outbreak of pests and diseases due to unseasonal rains				
Rice	Disease resistant varieties, Root dip treatment with Bavistin @1g/lit of water	During this phase, appearance of Blast disease maybe observed. As soon as one or two blast spots are seen, Carbendazim @ 1 g/lit of water is to be sprayed. There may be occurrence of Brown spot disease also. Spraying of Mancozeb @ 2.5 g/lit maybe done at initial symptom development.		Safe storage against storage pest and diseases
Maize		During this drought season, the occurrence of Aphids in Maize crop at its vegetative stage is quite high. Long dry spells increase the incidence of this insect. This can be controlled by spraying Monocrotophos (0.05%) at 80-90 DAS.		Safe storage against storage pest and diseases
Rabi pulses	Wilt in low lying patches in field or field border: Drench Carbendazim 1-2 g/l at the base of plants after the event			Safe storage against storage pest and diseases
Horticulture				
Vegetables	Disease resistant varieties, Need based plant protection	Bio control agents, Need based plant protection IPDM	Harvest the crops at physiological maturity	Safe storage against storage pest and

	IPDM, Crop rotation		stage	diseases

2.3 Floods-not applicable

Condition	**Suggested contingency measure[o]**			
Transient water logging/ partial inundation[1]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Continuous submergence for more than 2 days[2]				
Sea water intrusion[3]				

2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone

Extreme event type	**Suggested contingency measure[r]**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave				
Cold wave				
Frost				
Horticulture				
Cole crops	Provide shade	Irrigation before and just after the occurrence of frost		
Fruits trees	Mulching	Mulching	Mulching	Mulching
Hailstorm				
Rice	Replanting of seedlings	ITK & Top dressing	Availing Insurance.	Availing Insurance
Maize	Introduction of short duration late sowing varieties. Resowing may be advised. Crop/weather insurance.	Cultural operations-Earthing up, Top dressing Crop can be used as fodder. Availing Insurance	Crop can be used as fodder. Availing Insurance.	Availing Insurance.

Rabi Pulses	-	-	-	-
Millets	-	Cultural operations-Earthing up	-	-
Horticulture				
Potato	Resowing with short duration varieties	Cultural operations-Earthing up	Availing insurance	dehalming
Vegetables	Replanting of seedlings, Introduction of short duration late sowing variety Crop/weather insurance	Gap filling	Availing Insurance.	Availing Insurance.
Ginger	-	Adequate mulching. Availing Insurance.	-	-
Cyclone	Not applicable			
Sand deposition or heavy siltation	Not applicable			

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event [s]	**During the event**	**After the event**
Drought			
Feed and fodder availability	i. Creation of permanent fodder, feed and seed banks ii. Raising drought tolerant perennial grasses and fodders like congosignal, guinea, oat etc. as permanent source of fodder. Iii. Preservation and conservation of legume trees, bushes, brooms, grasses and legumes through silage and hay making Iv. Burning of jungles of hills and paddy straw should not be allowed.	i. Feeding of locally available jungle tree leaves like Artocarpus hetrophyllus, Fircus hookerii, Symingtonia populnea, Schefflera wallichiana for ruminant. Ii. Feeding of non conventional feed and forage resources like broom, stylosanthes, Job's tears etc. Iii. Feeding of crop residues (rice straw) and agro industrial byproduct after chemical or biological treatment and processing.	i. Cultivation of high yielding and drought tolerant varieties of grasses and fodder like oat, congosignal,guinea, para and napier grasses. Ii. Introduction of fodder trees, bushes and grasses as rehabilitation option on all kinds of wasted and abandoned lands.

	V. Development of fodder varieties of cultivated crops having tolerance for varying degree of drought	Iv. The maintenance ration should be reduced to half.	
Drinking water	i. Creation of alternate drinking water bodies ii. Livestock based water management strategy which focuses as recycling of water iii. Searching of natural stream of water	i. Use of water from water reservoir/natural stream ii. Animal should be forced to drink saline water	i. Development of watershed based livestock farming. Ii. Harvesting of rain water through Jalkund.
Health and Disease management	i. Precautionary measures like vaccination and deworming of animals should be done. Ii. Life saving approaches such as drenching/watering, guard against heat stress, drips of normal saline and dextrose, therapeutic care and drugs should be available.	i. Health checkup of animal particularly for dehydration which may cause death of animals. Ii. There should be safe provisions for disposal of dead animals. Iii. Additional supplementation of concentrates and fodders for productive, lactating and pregnant animals should be provided.	I . Deworming and vaccination against common diseases should be done. ii. Supplementation of minerals and vitamins in feed for few days to restore the normal fertility of animals. Iii. Organization of animal health
Floods			
Feed and fodder availability			
Drinking water			
Health and Disease management			
Cyclone			
Feed and fodder availability			
Drinking water			
Health and Disease management			
Heat wave and cold wave			
Shelter/ environment management			
Health and Disease management			

[s] based on forewarning wherever available

2.5.2 Poultry

	Suggested contingency measures		
	Before the event [s]	**During the event**	**After the event**
Drought			
Shortage of food ingredients	i. Establishment of permanent storage	Feeding of non conventional feed and	Cultivation of non conventional grasses,

	facilities for feed ingredients. ii. Raising drought tolerant non conventional grasses, crops, bushes like Job tears, Buck wheat, Jack beans, Stylosanthens etc as permanent feed ingredients for poultry.	forage resources	crops, bushes like Job tears, Buck wheat, Jack beans, Stylosanthens etc as permanent feed ingredients for poultry.
Drinking water	Creation of alternate drinking water bodies	Use of water from water reservoir/stream	i. Development of watershed based poultry farming. Ii. Harvesting of rain water through Jalkund.
Health and Disease management	Precautionary measures like vaccination and deworming of animals should be done.	Health checkup of bird particularly for dehydration which may cause death of birds	i. Deworming and vaccination against common diseases should be done. ii. Supplementation of minerals and vitamins in feed for few days .
Floods			
Shortage of food ingredients			
Drinking water			
Health and Disease management			
Cyclone			
Shortage of food ingredients			
Drinking water			
Health and Disease management			
Heat wave and cold wave			
Shelter/ environment management			
Health and Disease management			

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event [a]	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	NA	NA	NA

Inland	NA	NA	NA
(i) Shallow water depth due to insufficient rains/ inflow	NA	NA	NA
(ii) Changes in water quality	NA	NA	NA
(iii) Any other	NA	NA	NA
B. Aquaculture	NA	NA	NA
(i) Shallow water depth due to insufficient rains/ inflow	1. Water supply from other sources	1. Water supply from other sources/Reduce stock	1. Partial harvesting & lime/fertilizer application
(ii) Impact of salt load build up in ponds/ change in water quality	1. Aeration of water surface to increase the dissolved Oxygen 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc.)	1. Partial dewatering, refilling with fresh water 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc.)	1. Partial harvesting & lime/fertilizer application 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc.)
2) Floods			
A. Capture	NA	NA	NA
Marine	NA	NA	NA
Inland	NA	NA	NA
(i) Average compensation paid due to loss of human life	NA	NA	NA
(ii) No. of boats/ nets damaged	NA	NA	NA
(iii) No. of houses damaged	NA	NA	NA
(iv) Loss of stock	NA	NA	NA
(v) Changes in water quality	NA	NA	NA
(vi) Health and Diseases	NA	NA	NA
B. Aquaculture	NA	NA	NA
(i) Inundation with flood water	1. Provision of overflow drainage system 2. Drainage system on the sides of the pond to prevent the surface runoff water from entering the pond	1. Siphon excess water from the pond 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 3. Lime, fertilizer application based on the water quality	1. Maintaining desired water level 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc. 3. Liming, fertilizer application based on the water quality
(ii) Water continuation and changes in water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** Lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality
(iii) Health and diseases	Maintaining proper hygiene/water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on

		the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.	the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.
(iv) Loss of stock and inputs (feed, chemicals, etc)			
(v) infrastructure damage (pumps, aerators, huts etc)			
(vi) Any other			
3) Cyclone/ Tsunami			
A. Capture	NA	NA	NA
Marine	NA	NA	NA
(i) Average compensation paid due to loss of fishermen lives	NA	NA	NA
(ii) Average no. of boats/ nets damaged	NA	NA	NA
(iii) Average mo. of houses damaged	NA	NA	NA
Inland	NA	NA	NA
B. Aquaculture			
(i) Overflow/ flooding of ponds	1. Provision of overflow drainage system 2. Drainage system on the sides of the pond to prevent the surface runoff water from entering the pond	1. Siphon excess water from the pond 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 3. Lime, fertilizer application based on the water quality	1. Maintaining desired water level 2. Analysis of water quality (pH, alkalinity, salinity, temperature etc. 3. Liming, fertilizer application based on the water quality
(ii) Changes in water quality (fresh water/ brackish water ratio)	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality
(iii) Health and diseases	Maintaining proper hygiene/water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.
(iv) Loss of stock and inputs (feed,			

chemicals etc)			
(v) Infrastructure damage (pumps. Aerators, shelters/huts etc)			
(vi) Any other			
4. Heat wave and cold wave			
A. Capture			
Marine	NA	NA	NA
Inland	NA	NA	NA
B. Aquaculture			
(i) Changes in pond in pond environment (water quality)	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) **2.** lime, fertilizer application based on the water quality
(ii) Health and Disease management	Maintaining proper hygiene/water quality	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.	1. Analysis of water quality (pH, alkalinity, salinity, temperature etc.) 2. Lime, fertilizer application based on the water quality **3.** Separation of infected fishes in quarantine ponds/identification of the causing agent/proper treatment procedure to be followed.
(iii) Any other			

[a] based on forewarning wherever available