State: ORISSA

Agriculture Contingency Plan for District: MAYURBHANJ

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	Eastern Plateau (chhotanagpur) And Easter Ghats, Hot subhumid eco-region (12.1)		
	Agro-Climatic Zone (Planning Commission)	Eastern Plateau and Hills region (VII)		
	Agro Climatic Zone (NARP)	North Central Plateau zone (OR-2)		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Mayurbhanj, Major parts of Keonjhar district except Anandapur and Ghasipura block		
	Geographic coordinates of district headquarters	**Latitude**	**Longitude**	**Altitude**
		22º01'07.84"N	86º24'52.66"E	712 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Regional Research and Technology Transfer Station, Judia Farm PO, Keonjhar Orissa- 758 002		
	Mention the KVK located in the district with address	Krishi Vigyan Kendra, Judia Farm, P.O. Keonjhar, Orissa, Pin-758 002		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	Krishi Vignan Kendra, Mayurbhanj, Shamakhunta/ RRTTS, Keonjhar, Judia Farm, Orissa Pin-758 002		

1.2	Rainfall	Normal RF(mm)	Normal Rainy days (number)	Normal Onset	Normal Cessation
	SW monsoon (June - September):	1225	56.1	June 2nd week	September last week
	NE Monsoon (October - December):	143	7.1	-	-
	Winter (January - February)	78.5	5.2		
	Summer (March - May)	153.7	8.9		
	Annual	1600.2	77.3		

1.3	Land use pattern of the district (latest statistics)	Geographical area	Cultivated area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wastel and	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	1042	389	439	58	28	10	41	16	39	13

Source: Odisha Agriculture statistics 2008-09

1. 4	Major Soils (common names like red sandy loam deep soils (etc.,)	Area ('000 ha)	Percent (%) of total
	Lateritic soils	226.6	51.9
	Red Sandy loam soils	210.4	48.2

(Data source: Soil Resource Maps of NBSS & LUP)

1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	389	133
	Area sown more than once	121	
	Gross cropped area	519	

Source: Odisha Agriculture statistics 2008-09

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	108.5		
	Gross irrigated area	153.0		
	Rainfed area	280.5		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals		66.8	61.5
	Tanks	-	-	-
	Open wells	6985	2.0	1.8
	Bore wells	5428	14.3	13.2
	Lift irrigation schemes	68	11.9	11.0
	Micro-irrigation	-	0.1	0.1
	Other sources (please specify)	-	13.4	12.4
	Total Irrigated Area	-	108.5	-
	Pump sets	5248	-	-
	No. of Tractors	625	-	-
	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	26	100	
	Wastewater availability and use			
	Ground water quality	Suitable for irrigation		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: Agriculture statistics Book 2008-09 and DDA office, Baripada.

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

S.No.	Major field crops cultivated	Area ('000 ha)							
		Kharif			*Rabi*				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Paddy	97.2	242.1	339.4	5.8	-	5.8	-	345.1
	Blackgram	0.2	11.3	11.5	0.8	2.3	3.1	-	14.6
	Maize	0.2	13.3	13.5	0.3	-	0.3	-	13.7
	Horsegram	-	-	-	-	10.9	10.9	-	10.9
	Arhar	-	8.4	8.4	-	-	-	-	8.4
	Groundnut	-	1.5	1.5	6.2	0.04	6.2	-	7.8
	Greengram	0.2	3.70	3.9	0.9	2.8	3.7	-	7.6
	Niger	-	6.3	6.3	-	-	-	-	6.3

Source: Odisha Agriculture statistics 2008-09

Horticulture crops - Fruits			**Area ('000 ha)**
			Total
	1	Mango	7.6
	2	Lime	3.7
	3	Guava	0.4
	4	Sapota	0.03
	5	Litchi	0.02
Horticulture crops - Vegetables			**Total**
	1	Brinjal	14.1
	2	Chilli	7.1
	3	Okra	6.6
	4	Tomato	6.2
	5	Cowpea	5.7
	6	Turmeric	3.8
	7	Cauliflower	3.6
	8	Cabbage	3.6
	9	Ginger	3.2
	10	Sweet potato	2.1
	11	Onion	1.8
	12	Potato	1.1
Medicinal and Aromatic crops			**Total**

	1	Aomla	0.03
	2	Aloevera	0.01
	3	Sarpagandha	0.01
	4	Aswagandha	0.01
	5	Pipalli (long pepper)	0.01
Plantation crops			**Total**
	1	Banana	0.9
	2	Papaya	0.02

Source: Directorate of Horticulture, Govt. of Orissa, Year: 2008-09

Fodder crops			**Total**
	1	Oat	0.008
	2	Cowpea	0.006
	3	Berseem	0.005
	4	MP Cherry	0.003
	5	Sudex Cherry	0.003
	Others (Specify)	Perennial	0.04
		Total fodder crop	0.06
		Grazing land	27

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	577.7	310.6	888.4
	Improved cattle	2.1	1.2	3.3
	Crossbred cattle	13.6	30.7	44.4
	Non descriptive Buffaloes (local low yielding)	15.4	10.8	26.3
	Descriptive Buffaloes	0.01	0.01	0.02
	Goat	249.5	437.2	686.8
	Sheep	68.8	97.8	166.6
	Pig	37.7	43.2	80.9
	Commercial dairy farms (Number)			06
1.9	Poultry	No. of farms		Total No. of birds ('000)
	Commercial	789		147.1
	Backyard	-		2617.5
Source: Directorate of Animal Husbandry, Govt. of Orissa, 2008-09				

1.10	**Fisheries**						
	A. Capture						
	i) Marine	**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	**No. Farmer owned ponds**		**No. of Reservoirs**		**No. of village tanks**	
		19455		12		6948	
	B. Culture						
		Water Spread Area (ha)		**Yield (t/ha)**		**Production ('000 tons)**	
	i) **Brackish water**	0		0		0	
	ii) **Fresh water**	11402.4		1.0		11.5	
	Others	3844.9		0.04		0.2	

Source: Dept. of Fisheries, Govt. of Orissa, 2008-09

1.11 Production and Productivity of major crops (Average of last 5 years: 2004, 05, 06, 07, 08; specify years)

	Crops	**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)**
1	Paddy	793.9	2339	15.9	2732	-	-	809.8	2346
2	Maize	15.8	1175	0.4	1607	-	-	16.3	1184
3	Greengram	1.8	470	1.7	478	-	-	3.6	474
4	Blackgram	4.7	408	1.3	440	-	-	6.1	415
5	Arhar	7.7	912	-	-	-	-	7.6	912
6	Groundnut	2.3	1475	7.8	1260	-	-	10.1	1303
Major Horticultural crops									
1	Mango	-	-	-	-	41.0	4000	41.0	4000

2	Lime	22.4	5600	-	-	-	-	22.4	5600
3	Cashew	-	-	-	-	24.1	6000	24.1	6000
4	Banana	24.2	20000	-	-	-	-	24.2	20000
5	Guava	21.0	4125	-	-	-	-	21.0	4125
Others	Jackfruit	0.9	400	-	-	-	-	0.9	400

Source: Odisha Agriculture statistics 2008-09

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	**Paddy**	**Maize**	**Arhar**	**Blackgram**	**Greengram**
	Kharif- Rainfed	June –July	June	June-July	June-July	June-July
	Kharif-Irrigated	August	-	-	-	-
	Rabi- Rainfed	-	-	-	September-October	September-October
	Rabi-Irrigated	December – January	October – November	-	-	January - February

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			√
	Pests and disease outbreak – (Stem Borer, Leaf folder, Blast and BLB)	√		

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: No
		Soil map as Annexure 3	Enclosed: No

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 (June 4th week)	Low Elevation and Medium Rainfall Red soils	Paddy-fallow/ Paddy-Greengram / Paddy-Blackgram	No change	-	-

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 2nd week)	Low Elevation and Medium Rainfall Red soils	Paddy-fallow/ Paddy-Greengram / Paddy-Blackgram	• Grow Paddy varieties such as: Swarna, Pratikshya, Ranidhan & Puja. • Direct sowing should be avoided • Transplanting may be done from previously raised nurseries • Sprouted seeds may be sown by using drum seeder	• Strengthen field bunds; manage weeds by application of herbicides • In-situ rain water conservation Measures to be adopted Withheld nitrogen fertilizer application till receipt of rainfall	• For seed contact CRRI/OUAT/ OSSC Bhubaneswar. • Linkage with ATMA, NFSM, RKVY,MNREGS • Seed drill under RKVY. • Supply of seeds through ATMA, OSSC and NFSM

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks (July 4th week)	Low Elevation and Medium Rainfall Red soils	Paddy-Fallow/ Paddy-Greengram / Paddy-Blackgram	• Medium long duration varieties such as Swarna, Pratikshya, Ranidhan, Puja can be substituted by relatively shorter duration varieties such as Lalat, Manaswini, Naveen, MTU 1010, Konark & Surendra in low and medium rainfall red and lateritic soils • Direct sowing should be avoided • Transplanting may be done	• Devote 10% of the cultivable area for storing excess rain water • Apply full P, K and 20% N of recommended dose along with well decomposed organic matter for early seedling vigor, • In-situ rain water conservation.	• For seed contact OUAT, OSSC Bhubaneswar • Make linkage with ATMA, NFSM, RKVY, MNREGS.

			from previously raised nurseries • Sprouted seeds may be sown by using drum seeder		

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 2nd week)	Low Elevation and Medium Rainfall Red soils	Paddy-fallow/ Paddy-Greengram / Paddy-Blackgram	• In place of medium duration varieties grow relatively short duration varieties such as: Lalat, Manaswini, Naveen, Kharvela, MTU 1010 and Khandagiri. • Direct sowing is not recommended. • Transplanting may be done from previously raised nurseries • Spouted seeds may be sown by using drum seeder • In slopping topography in place of Paddy grow crops such as: Niger (Deomali, Alasi-1) Sweet potato (Gouri, Shankar, Samrat, Shree Nandini, Shree Bhadra), Rice bean (RBL-6, KRB-1), Sesamum (Uma, Usha, Nirmala, Prachi), Blackgram (Sarala, Prasad, Ujala), Greengram (K-851, Sujata, Durga, PDM-54, Kamadeva) can be grown. • Maize (Navjyot) and cowpea (Utkal Manik, SEB-2, Pusa Barsati) may be grown as fodder crop. • Vegetables like Tomato (Utkal Shravani,Baisali, Jyoti), Cauliflower	• Plant 5-6 nos. of seedlings per hill and follow closer spacing in case of aged seedlings (>45 days) and apply full P, K & 50 % N of the recommended dose as basal. • Take in-situ rain water conservation measures. • Manage the weeds by application of herbicides such as: butachlor, oxadiargyl etc. • Maintain optimum plant population by clonal propagation.	• Seed drill under RKVY. • Supply of seeds through ATMA, OSSC and NFSM

			(Tushar, Sweta, kartik), Knol-khol (Purple Viena, White Viena), Raddish (Pusa Chetki, Pusa desi)), Brinjal (Blue Star, Green Star, Mukta keshi), Runner bean (Raikia Local, Kentucky Wonder) can be grown.		

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.	Low Elevation and Medium Rainfall Red soils	Paddy-Fallow/ Paddy-Greengram / Paddy-Blackgram	• If Rice population is less than 50% resow the crop with medium duration varieties (Naveen, lalat, surendra, manaswini, MTU-1010. • Raise community nursery for transplanting to save time. • Sowing of sprouted seeds with the help of seed drill can be done. • If the Rice population is more than 50% carryout weeding and adjust the plant population by Khelua (removing and redistributing the hills) and clonal propagation.	• Raise height of the bund • Close the mouse holes to check seepage loss. • Take measures to conserve rainwater in farm ponds for use as life saving irrigation. • Use the stored rain water for live saving irrigation	Convergence with MNREGS, RKVY

Condition			Suggested Contingency measures		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At vegetative stage	Low Elevation and Medium Rainfall Red soils	Paddy-Fallow/ Paddy-Greengram / Paddy-Blackgram	• Do not practice beushaning (blind cultivation) in Rice, if the crop is more than 45 days old. • Weed out the field without waiting for rainfall. • Go for gap filling using seedling of same age or clonal tillers to have a uniform distribution of plant. • Withhold N fertilizer application up to receipt of rainfall. Close up drainage lines and reduce run off losses to recharge ground water table. • Provide protective irrigation through recycling of harvested rain water. • Remove the weeds and follow plant protection measures against blast in the nursery if existing. • Withhold N fertilizer application up to receipt of rainfall/ Foliar spray of 2% area. • Apply Potassic fertilizers wherever soil moisture allows or wait up to receipt of rainfall. • Spray 2% KCl + 0.1 ppm boron to	• Strengthen the field bonds and close the mouse holes. • Take measures to conserve rainwater in farm ponds. • Store rain water to use as life saving irrigation.	Convergence with NREGS, RKVY

			Blackgram to overcome drought situations. • Foliar application of 2% urea at pre-flowering and flowering stage of Greengram is helpful to mitigate drought. • Top dress the crops after receipt of rain.		

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At flowering/ fruiting stage	Low Elevation and Medium Rainfall Red soils	Paddy-fallow/ Paddy-Greengram / Paddy-Blackgram	• Check surface run off in the low lying areas. • Provide protective irrigation through recycling of harvested rain water. • Provide irrigation at critical stages such as flowering, grain filling, etc. in alternate furrows in wide spaced crops. • Under situation of complete failure of kharif crop dismantle it. In such situation or where land is remaining fallow, sow (dibble) the pre-rabi crops.	• Close the drainage holes and check the seepage loss • Inter-cultivation (Soil mulching) • Conservation furrow • Organic mulching with previous crop residues • Store rain water to use as life saving irrigation. • Strengthen the field bunds and close the holes to check seepage loss.	Convergence with NREGS, RKVY

Condition			**Suggested Contingency measures**		
Terminal drought (Early withdrawal of monsoon)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Rabi Crop planning**	**Remarks on Implementation**
At maturity	Low Elevation and Medium Rainfall Red soils	Paddy-fallow/ Paddy-Greengram / Paddy-Blackgram	• Provide protective irrigation through recycling of harvested rain water at critical stages such as flowering, grain filling stage of Paddy. • Crops like cowpea, Maize, Greengram may be harvested for fodder purpose to avoid their failure as grain crops. • Paira crop of Blackgram can be taken. • Sprinkle water from water harvesting structures / nallahs to soften the soil in groundnut and uproot it. • Make judicious use of irrigation water forming Panipanchayat. • Cleaning & repairing of field channels, strengthening of field bunds to check seepage loss. • Provide irrigation at critical stages such as flowering, grain filling, etc. • Apply potassic fertilizer and withheld nitrogenous fertilizer.	• In case of complete failure of Kharif crop dismantle it and where land is remaining fallow, sow the pre-rabi crops such as: Horsegram (Urmi), Blackgram (Ujala), Greengram (TARM-1, TARM-2) and Sesamum. • Vegetable crops such as Tomato (Utkal Raja, Utkal Kumari, Utkal Urbasi). Cabbage (Pride of India, Golden Acre, Konark, Sujata, Vijay, Cauliflower (Snow ball, Improved Japanese, Himani), Okra (Utkal Gourab, Arka Anamika), and leafy vegetables to be sown to conserve soil moisture. And provide life saving irrigation as and when necessary	For seed contact OUAT, OSSC Bhubaneswar.

2.1.2 Drought - Irrigated situation

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	Canal irrigated Red soils	Paddy-Paddy/ Paddy-Greengram / Paddy-Blackgram/ Paddy-Groundnut	• Instead of varieties of 140 – 145 days duration, grow varieties such as Lalat, Manaswini, Kharbela, Konark, Surendra(120-130 days)	• Raise community nursery of rice for transplanting to save time. • Use polythene sheets on irrigation channels to save conveyance loss • Follow SRI method of cultivation, where drainage is not a problem	For seed contact OUAT, OSSC Bhubaneswar

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Limited release of water in canals due to low rainfall	Canal irrigated Red soils	Paddy-Paddy/ Paddy-Greengram / Paddy-Blackgram/ Paddy-Groundnut	• Instead of varieties of 140 – 145 days duration, grow varieties such as Lalat, Manaswini, Neveen, Konark, Surendra (120-130 days) • Reduce the paddy area in Rabi season and instead take non-paddy crops like Groundnut/Greengram.	• Use polythene sheets on irrigation channels to save conveyance loss. • Use irrigation water judiciously only at critical stages such as flowering and grain-filling. • Follow SRI method of cultivation, where drainage is not a problem	• For seed contact OUAT, OSSC Bhubaneswar • Make linkage with ATMA/NFSM/MG NREGS

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Non release of water in canals under delayed onset of monsoon in catchment	Canal irrigated Red soils	Paddy-Paddy/ Paddy-Greengram / Paddy-Blackgram/ Paddy-Groundnut	• Grow varieties such as Lalat, Manaswini, Naveen, MTU 1010, Konark & Surendra • Paira cropping of Blackgram can be taken up. • Instead of paddy in rabi season, Greengram, Blackgram can be taken in residual moisture.	• Irrigate the field only at critical stages such as flowering and grain filling from alternative water sources like pond and water harvesting structure etc. • Harvest paddy at physiological maturity stage if required and take up rabi crops like Greengram, Blackgram and Toria • Manage weeds in paddy by application of herbicides such as Butachlor @ 1lit/acre, Oxadiargyl 80 % WP @ 30g/acre	• For seed contact OUAT, OSSC Bhubaneswar • Make linkage with ATMA/NFSM/MG NREGS

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures[i]**	**Remarks on Implementation**
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	NOT APPLICABLE				

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	Borewell irrigated Red soils	Paddy-Paddy/ Paddy-Greengram / Paddy-Blackgram/ Paddy-Groundnut	• Grow varieties such as Lalat, Manaswini, Naveen, MTU 1010, Konark & Surendra • Paira cropping of Blackgram can be taken up. • Instead of paddy in rabi season, Greengram, Blackgram can be taken in residual moisture. • Paira cropping of Blackgram can be taken up.Instead of paddy in rabi season, Greengram, Blackgram can be taken in residual moisture.	• Irrigate the field only at critical stages such as flowering and grain filling from alternative water sources like pond and water harvesting structure etc. • Harvest paddy at physiological maturity stage if required and take up rabi crops like Greengram, Blackgram and toria.	• For seed contact OUAT, OSSC Bhubaneswar • Make linkage with ATMA/NFSM/MGNREGS

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**
Paddy	If damage is more that 50% re-transplant Rice crop of medium duration group. In partially damaged fields, allow the Rice plants to stand upright. Do not go for beushaning as it may further reduce the plant	Arrange for drainage	Harvest as soon as the water recedes	Protect the seeds from rain, go for sun drying for two to three days

	population. Weed out the Rice field, make gap filling and top dress N and K to boost the growth if situation permits.			
Maize	Provide drainage	-do-	-do-	-do-
Arhar	-do-	-do-	-do-	-do-
Blackgram	-do-	-do-	-do-	-do-
Greengram	-do-	-do-	-do-	-do-
Horticulture				
Mango	Digging of drainage channel	Drainage of excess water	Drainage of excess water	Spraying of fungicide and bactercide
Banana	Digging of drainage channel ,Staking to prevent lodging of plants	Drainage of excess water and Staking to prevent lodging of plants	Drainage of excess water and Staking to prevent lodging of plants	Removal of plants from which bunches have been harvested, spraying of fungicides to ratoon crop.
Cashew	Digging of drainage channel.			-
Tomato	Digging of drainage channel, Spraying of fungicide and bactericide			-
Heavy rainfall with high speed winds in a short span				
Paddy	If damage is more that 50% re-transplant Rice crop of medium duration group. In partially damaged fields, allow the Rice plants to stand upright. Do not go for beushaning as it may further reduce the plant population. Weed out the Rice field, make gap filling and top dress N and K to boost the growth if situation permits.	Arrange for drainage	Harvest as soon as the water recedes	Protect the seeds from rain, go for sun drying for two to three days

Maize	Provide drainage	Provide drainage	Provide drainage	Protect the seeds from rain, go for sun drying for two to three days
Arhar	-do-	-do-	-do-	-do-
Blackgram	-do-	-do-	-do-	-do-
Greengram	-do-	-do-	-do-	-do-

	Vegetative stage	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Horticulture				
Mango	Digging of drainage channel, Staking to plants	Digging of drainage channel, Staking to plants	Digging of drainage channel, Staking to plants	Spraying of fungicide and bactercide
Banana	Digging of drainage channel. Staking to plants, spraying with fungicides	-do-	-do-	Cutting of fallen plants, cleaning of orchards.
Cashew	-do-	-do-	-do-	Removal of broken branches. Spray of fungicides
Tomato	-do-	-do-	-do-	-
Brinjal	Digging of drainage channel, washing of plants with cleaning water, spraying of fungicides	-do-	-do-	-

	Vegetative stage	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Outbreak of pests and diseases due to unseasonal rains				
Paddy	In partially inundated areas, Rice caseworm and in general leaf folder attack is expected. If 1-2 cases of folded leaves / hill is seen spray the crop with Monocrotophos / Chlorpyriphos @ 2 ml/lit of water or with Cartap hydrochloride 50 SP / Fipronil 5 SP @ 2 g/lit of water. Rain storms during Kharif may result in severe occurrence of bacterial leaf streak and Bacterial blight in Rice. It is advised to spray the crop immediately after each rain storm with Streptocycline		When swarming caterpillar cross the ETL i.e. one larva / hill then spray the crop with Chlorpyriphos / Triazophos / Profenophos / Endosulfan @ 2	

	(0.02%) or Plantomycin (0.1%) or Bacterinol (0.15%)		ml/lit of water or dust the crop with Quinalphos @ 1.5% D @ 25 kg/ha.	
Maize	For stem-borer attack apply Thimet granules @ 2-3 granules per plant.	For stem borer attack apply Thimet granules @ 2-3 granules per plant.	-	
Arhar Blackgram Greengram	To Control black aphid, spray Neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with Dimethoate @ 2 ml/lit or Imidacloprid @ 1 ml/4 lit of water if population is high. A protective spray with mancozeb @ 0.3% may be given to pulse crops (Greengram and Blackgram) against Cercosporella Blight disease.	-	-	
	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
Horticulture				
Mango	To control black aphid spray neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with dimethoate @ 2 ml/lit or imidacloprid @ 1 ml/4 lit of water if population is high.	To control black aphid spray neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with dimethoate @ 2 ml/lit or imidacloprid @ 1 ml/4 lit of water if population is high.	-	-
Banana	Spraying with fungicides and bactericides to save the crop from rotting.	Spraying of fungicide and micro nutrient	Spraying of fungicide and micro nutrient	-
Cashew	To control black aphid spray Neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with Dimethoate @ 2 ml/lit or Imidacloprid @ 1 ml/4 lit of water if population is high.	To control black aphid spray Neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with Dimethoate @ 2 ml/lit or Imidacloprid @ 1 ml/4 lit of water if population is high.	-	-
Tomato	To control black aphid spray Neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with Dimethoate @ 2 ml/lit or Imidacloprid @ 1 ml/4 lit of water if	Spraying of fungicide & insecticide and NAA	Spraying of fungicide	

	population is high.			
Brinjal	To control black aphid spray Neem formulations (1500 ppm) @ 5 mil/lit of water when the population is low or spraying with Dimethoate @ 2 ml/lit or Imidacloprid @ 1 ml/4 lit of water if population is high.	-do-	-do-	

2.3 Floods

Condition	**Suggested contingency measure**			
Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Paddy	Select the Rice varieties like Kanchan, Ramachandi, Durga, Uphar, Sarala, Varshadhan for semi-deep low lands. If damage is more than 50% re-transplant Rice crop of medium duration group. In partially damaged fields, allow the Rice plants to stand upright. Raise nursery by Dapog method to transplant wherever possible. Maintain a buffer nursery in the backyard/highland area to ensure adequate plant population in the field after flood damage.	Transplant 40-65 days old seedlings after flood water recedes. Make up plant population by transplanting clonal tillers detaching from the old clumps, wherever possible. Broadcasting / line sowing of sprouted seeds of relatively short duration Rice varieties in soft puddle after flood water recedes. Apply moderate dose of fertilizer (40:20:20 N: P_2O_5: K_2O kg/ha.). Do not go for beushaning as it may further reduce the plant population. Weed out the Rice field, make gap filling and top dress N and K to boost the growth if situation permits.	Provide drainage facility In up-medium land where there is no scope for revival of Rice, go for pulses like Blackgram, Greengram, Horsegram.	Harvest the crop as soon as the water recedes. Shift the produce to half covered threshing floor and other safer places for post harvest operations and cover the crops to protect from moisture absorption
Maize	Go for gap filling if necessary.	Provide drainage	Provide drainage	Harvest the crop as soon as the water recedes. Shift the produce to half covered threshing floor and other safer places for post harvest operations and cover the crops to protect from moisture absorption

Arhar	-do-	-do-	-do-	-do-
Blackgram				
Greengram				
Horticulture				
Mango	Spraying with fungicide and 4% urea solution	Interculture	Drainage	Drainage
Cashew				
Vegetables				
Condition	**Continuous submergence for more than 2 days**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Paddy	Select the Rice varieties like Kanchan, Ramachandi, Durga, Uphar, Sarala, Varshadhan for semi-deep low lands. If damage is more than 50% re-transplant Rice crop of medium duration group. In partially damaged fields, allow the Rice plants to stand upright. Raise nursery by Dapog method to transplant wherever possible. Maintain a buffer nursery in the backyard/highland area to ensure adequate plant population in the field after flood damage.	Transplant 40-65 days old seedlings after flood water recedes. Make up plant population by transplanting clonal tillers detaching from the old clumps, wherever possible. Broadcasting / line sowing of sprouted seeds of relatively short duration Rice varieties in soft puddle after flood water recedes. Apply moderate dose of fertilizer (40:20:20 N: P_2O_5: K_2O kg/ha.). Do not go for beushaning as it may further reduce the plant population. Weed out the Rice field; make gap filling and top dress N and K to boost the growth if situation permits.	Provide drainage facility In up-medium land where there is no scope for revival of Rice, go for pulses like Blackgram, Greengram, Horsegram.	Harvest the crop as soon as the water recedes.
Maize	Resow the crop		-	-
Arhar			-	-
Blackgram			-	-
Greengram			-	-
Horticulture				
Mango	Spraying with fungicide and 4% urea solution	Interculture	Drainage	Drainage
Cashew	-do-	-do-	-do-	-do-
Vegetables	Spraying with fungicide and insecticide	-do-	-do-	-do-

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

Extreme event type	**Suggested contingency measure**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave				
Paddy	Provide irrigation	Provide irrigation	Provide irrigation	-
Maize				
Arhar				
Blackgram				
Greengram				
Horticulture				
Mango	Spraying of clean water and continuous irrigation.		Spraying of clean water to plants and air in orchard.	Spraying of clean water to plants and air in orchard.
Banana	Provide irrigation			
Vegetables	-do-			

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Feed and fodder availability	• Encourage perennial fodder production on river beds and tank bed on community Basis • Village gauchar (grazing) lands should be developed for fodder production. • Trees or shrubs like Sesbania, Subabul, Neem etc should be planted on boundaries of agricultural fields • Establish fodder bank near forest areas • Preserve Excess fodder as hay/silage • Explore the possibilities of availability of unconventional / alternative feed resources during draught. • Organizing training programme of persons connected with A.H. on feeding and management of animals during drought.	• Utilizing fodder from perennial trees and fodder bank reserves. • Transporting excess fodder from adjoining districts. • Utilizing the existing crops which fail to grow adequately due to failure of monsoon for feeding of animals. • Use of unconventional livestock feed such as sugar cane top, sugar cane bagasse, Banana plant Crop residues such as cassiatora water hyacinth and other like tree pods and seeds etc. Improving poor quality roughages by ammonia treatment, urea treatment, urea molasses mineral block etc and feeding them.	Supplementary feeding of remaining livestock and the replacement stock.
Drinking water	• Preserve water in community tanks and ponds etc for drinking purpose by excavation and sanitization of these resources. In addition, wells (bore wells or dug wells) may be constructed ahead of possible event of draught.	Water sources of Temples, Churches, Gurdwaras, Jain temples and Maszids are generally ideal sources during draught	
Health and disease management	Preparedness with storage of vaccine and medicines.	• Conducting animal health camps and treating the affected animals • Supplementation of mineral and vitamin mixtures	• Availing insurance • Culling of unproductive livestock • Proper disposal of dead animals
Floods			

Feed and fodder availability	Store grains required for feed	• Stored/Procured feeds and fodders should be fed to all animals on the order of priority of animals. • Straws and stoves that got soaked during floods need not be thrown away out right. They can be fed to animals as long as rotting or fungal growth has not set in. Partial drying choffing and sprinkling concentrate mixture can improve intake and utility.	• Provision of supplementary feeding (concentrate / Roughage) with vitamin & minerals.
Drinking water	Dig bore wells	• Drinking water be made available to the animals in any kind of clean container available with the farmer.	• Provision of clean drinking water.
Health and disease management	• Keep the emergency service kit (first Aid Requisites) ready always containing Cotton wool, Bandages, Surgical gauze, old cotton sheets, Rubber tubing (for torniquet), Surgical scissors – Curved and made of stainless steel, Forceps, Splints or Split bamboos (for fractures), Clinical thermometers – two or three, Disinfectants – potassium permanganate, Acriflvin, Dettol, Savlon, Tannic acid powder (for poisons) and Jelly (for burns) Antibiotic eye drops, Epsom salts, copper sulphate, Treacle, oil of turpentine (for bloat), Obstetric ropes, chains and hooks, Tincture of iodine, tincture of Benzoin Co.(for wounds), Cotton rope, halters (for restraint), Trocar and canola (for bloat), Pocket Knife (for cutting, strangulating ropes etc.)	• There should be one veterinarian with 3 to 4 village to work with the help of local volunteers. • The team should be well equipped with contingent items like bandages, tourniquet ropes, controlling rope, splints, slings, poles and ropes to lift animals. Drugs including painkillers, antiseptics, antibiotics, anti-venom and anti-shock drugs etc. should be adequately available with them. • Keep the animals loose in paddock (sheltered or unsheltered) rather keeping them tethered. • Releasing animals from the unnatural and harmful position or situation, stopping bleeding, binding broken limbs, administering painkillers, anti-poison and anti-shock drugs, sedating difficult animals and even performing euthanasia on hopelessly injured and suffering animals with the consent of their owners.	• Prompt and appropriate attention to injuries by providing necessary medicines to the livestock owners. • Vaccination campaign against common endemic diseases of the areas (like H.S. B.Q, Anthrax etc.) must be taken up urgently. Necessary steps should be taken for the control of non-specific digestive and respiratory infections in consultation of local veterinary personals. • Improving shed hygiene especially in the farmers household through cleaning and disinfection • Provision of supplementary feeding (concentrate / Roughage) with vitamin & minerals.
Cyclone			

Feed and fodder availability	-	-	-
Drinking water	-	-	-
Health and disease management	-	-	-
Heat wave and cold wave			
Shelter/environment management	• Green cover (trees plantation, land scaping). • Proper sheltering / housing white painting outside the roof and black painting inside the roof.	• Use cooling devices : fans, wet curtains or panels, air cooler if possible.	• Protection of dry / milch cows/ buffaloes/ breeding bulls and teasers against thermal stress • Heat detection with young teasers • Close observation of all open cows
Health and disease management	• Washing / wallowing / sprinkling/ splashing / showering • Provision of cool drinking water (inearthen pitches)	• Feeding Green fodder/ silage/ hay. • Provision for night feeding. • Grazing only if green pastures/ grass lands available. • Graze early in the morning and late in the afternoon.	• Study of cervical mucous • Heat detection and AI during cooler parts of the day. • Insemination at optimal time with good quality semen.

2.5.2 Poultry

Drought	**Suggested contingency measures**			**Convergence/ linkages with ongoing programs, if any**
	Before the event	**During the event**	**After the event**	
Shortage of feed ingredients	Ensure procurement of feed ingredients sufficient ahead	Feed supplementation will be made to the farms	Attempt will be made for available of feed ingredient or compound feed to the farmers	
Drinking water	Check water source for ensuring sufficient portable water during draught	Attempt will be made to provide sanitized drinking water	Availability of water will be ensured by digging of bore well	
Health and disease management	Procurement of vaccines and medicines and antistress agent. Feeding antibiotics Procurement of litter materials	Continue feeding of antistress agent		
Floods				
Shortage of feed ingredients	Ensure procurement of feed ingredients / compound feed sufficient ahead as feed supply to the farm will hamper due to submergence of the connecting roads	Supply the compound feed to the poultry farm under submerged area	Supply will continued till the situation is under control	
Drinking water	Protect the water sources from submergence	Attempt will be made to provide sanitized drinking water	Water sources will sanitized with bleaching powder or any water sanitizer	
Health and disease management	Procurement of vaccines and medicines. Feeding antibiotics. Procurement of litter materials	Continue feeding antibiotics .Prevent entrance of flood water to the shed. Replace wet litter. Proper disposal of dead birds if any	Disinfection of the farm premises. Feeding antibiotics and deworming. Replace wet litter Disinfection of sheds. Proper disposal of dead birds if any	
Cyclone				
Shortage of feed	Ensure procurement of feed ingredients / compound feed	Supply the compound feed to the poultry farm under submerged	Supply will continued till the situation is under control	

ingredients	sufficient ahead as feed supply to the farm will hamper due to submergence of the connecting roads	area		
Drinking water	Protect the water sources from submergence	Attempt will be made to provide sanitized drinking water	Water sources will sanitized with bleaching powder or any water sanitizer	
Health and disease management	Procurement of vaccines and medicines. Feeding antibiotics Procurement of litter materials	Continue feeding antibiotics. Prevent entrance of flood water to the shed Replace wet litter Proper disposal of dead birds if any	Disinfection of the farm premises. Feeding antibiotics and deworming. Replace wet litter Disinfection of sheds. Proper disposal of dead birds if any	
Heat wave				
Shelter/environment management	Pruning of big trees in the farm. Putting curtains on open sides of the shed. Procurement of electrical accessories Providing shed to poultry houses. Providing proper ventilation.	Attempt will be made for cooling of poultry shed by adapting different cooling methods. Thickness of litter should be reduced .Ventilation to the house should be increased by providing ceiling fans and exhaust fan	Provision should be made to ensure proper ventilation to the house	
Health and disease management	Procurement of Antistress drugs	Supplementation of antistress drug	Vaccination of birds against RD	
Cold wave				
Shelter/environment management	Procurement of curtains to cover open sides of the shed. Heating arrangement kept ready	Close the open sides of the shed by curtain in such a way that ventilation should not be hampered. Provide heat if necessary depending on the temperature and age of the birds	Remove the curtains. Discontinue heating.	
Health and disease management	Procurement of Antistress drugs and vaccine	Feeding of antistress drugs in drinking water Vaccination with fowl pox	Vaccination against IBD and RD	

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	-	-	-
Inland			
(i) Shallow water depth due to insufficient rains/inflow	1. Restricted release of water from reservoir. 2. Supplementary water harvest structures like pond and tanks has to be developed. 3. Renovation and maintenance of existing water harvest structures.	-	-
(ii) Changes in water quality	1. Prepare to release water into the habitat.	1. Mixing of water from the water harvest structure like ponds and tanks into the fish habitat.	1. Monitoring the water quality and health of aquatic organisms.
(iii) Any other	-	-	-
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	1. Building deep ditches in culture ponds for shelter of the fish to overcome high temperature	1. Recharge the ponds with bore well water or water from other sources. 2. Partial harvesting of the stock to reduce stocking density. 3. Artificial shelter by putting aquatic floating weeds in 1/3rd area.	-
(ii) Impact of salt load build up in ponds / change in water quality	1. Application of organic manure in culture system	1. Recharge the ponds with bore well water or water from other sources	1. Application of organic manure in culture system
(iii) Any other	-	-	-

2) Floods			
A. Capture			
Marine			
Inland			
(i) No. of boats / nets/damaged	1. The boats has to be secured safely to river/ reservoir banks. 2. Non operation of fixed bag nets in streams and rivers. 3. Insurance coverage for nets and boats.	1. Checking of the safety of the boats / nets. 2. An inventory logbook with name of crewmembers should be maintained. 3. Number of crew and load should be much below the marked tonnage.	1. Maintenance of the boats and nets. 2. Assessment and settlement of insurance.
(ii) No.of houses damaged	1. Insurance coverage for houses.	-	1. Settlement of insurance.
(iii) Loss of stock	-	-	1. Assessment of stock (fish population) and replenishment if stock is depleted. 2. Habitat restoration for the stock remaining.
(iv) Changes in water quality	-	-	1. Application of lime in tanks. 2. Application of fertilizer.
(v) Health and diseases	-	-	1. Observation of the health status of fish and accordingly control measure should be taken. 2. Control on transport of brooders and seeds
B. Aquaculture			
(i) Inundation with flood water	1. Strengthening and increase in dyke height. 2. They should be constructed with inlet and out let facility.	1. Net enclosure should be provided over the dyke to prevent the escape of fish from pond.	1. Repairing and strengthening of dyke if required.
(ii) Water contamination and changes in water quality	Application of lime.	-	1. Application of lime and geolite. 2. Application of Alum. 3. Application of KmnO4
(iii) Health and diseases	Application of lime	-	1. Application of lime and KmnO4. 2. Assessment of the health status of fish and accordingly control measure should be taken. 3. Control on transport of brooders and seeds.
(iv) Loss of stock and inputs	1. Strengthening and increase in dyke	1.Net enclosure should be provided over the dyke to prevent the escape of fish	1. Stock assessment and restocking with advanced fingerlings or yearling if required.

(feed, chemicals etc)	height. 2. Before flood the stock should be harvested and sold in flood prone areas. 3. Transport of feed and chemicals to safer place. 4. Purchase of feeds and chemicals on weekly or fortnightly basis. 5. Insurance coverage for stock.	from pond. 2. Water should be diverted from the main stream. 3. Sand bags cam be used for protection of dykes. 4. Storing of feed and chemicals to safer place.	2. Repairing of dykes. 3. Assessment of quality of feed and fertilizer. 4. Assessment and settlement of insurance.
(v) Infrastructure damage (pumps, aerators, huts etc)	Construction of flood shelter for pumps, aerators etc.	-	1. Repairing of pumps, aerators if required. 2. Repairing of damaged hut.
(vi) Any other	-	-	-
3. Cyclone / Tsunami			
A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives	1. Repeated broadcast and telecast of warning. 2. Sea venture should be avoided 3. Insurance coverage for lives of fishermen.	1. Provision of relief. 2. Evacuation of people to safer areas.	Assessment and settlement of insurance.
(ii) Avg. no. of boats / nets/damaged	1. The boats has to be secured safely to river/ reservoir banks. 2. Insurance coverage for nets and boats.	1. Checking of the safety of the boats / nets. 2. An inventory logbook with name of crewmembers should be maintained.	1. Maintenance of the boats and nets. 2. Assessment and settlement of insurance.
(iii) Avg. no. of houses damaged	Insurance coverage for houses.	-	Settlement of insurance.
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds	1. Strengthening and increase in dyke height. 2.The should be constructed with inlet	Net enclosure should be provided over the dyke to prevent the escape of fish from pond.	Repairing and strengthening of dyke if required.

	and out let facility.		
(ii) Changes in water quality (fresh water / brackish water ratio)			
(iii) Health and diseases	-	-	1. Application of lime and KMnO4. 2. Assessment of the health status of fish and accordingly control measure should be taken. 3. Control on transport of brooders and seeds.
(iv) Loss of stock and inputs (feed, chemicals etc)	1. Strengthening and increase in dyke height. 2. Transport of feed and chemicals to safer place. 3. Insurance coverage for stock.	1. Net enclosure should be provided over the dyke to prevent the escape of fish from pond. 2. Storing of feed and chemicals to safer place.	1. Stock assessment and restocking with advanced fingerlings or yearling if required. 2. Repairing of dykes. 3. Assessment of quality of feed and chemicals. 4. Assessment and settlement of insurance.
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)	-	-	1. Repairing of pumps, aerators if required. 2. Repairing of damaged hut.
4. Heat wave and cold wave			
A. Capture			
Marine	-	1. During hot waves night fishing should be done. 2. During hot waves preservation by cold chain should be increased.	-
Inland	-	1. During hot waves night fishing should be done. 2. Preservation by cold chain should be increased during hot waves.	-
B. Aquaculture			
(i) Changes in pond environment (water quality)	During hot waves adequate water depth should be maintained.	1. During hot waves mixing of water with fresh water should be done. 2. The culture system should be provided with aeration to avoid oxygen depletion due to high temperature during hot	-

		waves. 3. Partial harvesting can be done to avoid loss of crop.	
(ii) Health and Disease management	Application of lime and turmeric.	1. Feeding should be stopped. 2. If cold waves persists EUS outbreak takes place	Application of CIFAXto contro EUS disease in fish.

Annexure I : Location map

ORISSA