

## State: Jharkhand

### Agriculture Contingency Plan for District: Bokaro

1.0 District Agriculture profile			
1.1	Agro-Climatic/Ecological Zone		
	Agro Ecological Sub Region (ICAR)	Eastern plateau (chhotanagpur) and Eastern Ghats, Hot Subhumid Eco sub region (12.3)	
	Agro-Climatic Zone (Planning Commission)	Eastern Plateau And Hills Region (VII)	
	Agro Climatic Zone (NARP)	Central and North Eastern Plateau Zone (BI-4)	
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Bokaro, Deoghar, Dhanbad, Dumka, Giridih, Godda, Hazaribagh, Jamtara, Khuti, Pakur, Ramgarh, Ranchi, Sahebganj	
	Geographic coordinates of district headquarters	Latitude	Longitude
		23.29 <sup>0</sup>	86.09 <sup>0</sup>
		Altitude	210 <sup>0</sup>
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Research Station (ZRS), Dumka, Birsa Agricultural University, Ranchi	
	Mention the KVK located in the district with address	Krishi Vigyan Kendra Bokaro, P.O- Petarwar, Dist- Bokaro, State- Jharkhand, Pin-829121	
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	Birsa Agricultural University, Ranchi	

1.2	Rainfall	Normal RF(mm)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
	SW monsoon (June-Sep):	912.7	2 <sup>nd</sup> week of June	4 <sup>th</sup> week of September
	NE Monsoon(Oct-Dec):	64.42		
	Winter (Jan- March)	21.47	-	-
	Summer (Apr-May)	75.16	-	-
	Annual	1073.8	-	-

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)	288.9	86.9	72.2	59.63	5.30	15.88			54.02	34.74

1.4	Major Soils (common names like red sandy loam deep soils (etc.,))*	Area ('000 ha)	Percent (%) of total
	Red lateritic soils (Ultic Paleustalfs)		18.35
	Loam soils (Haplustalfs)		4.79
	Fine Loam soils (Rhodustlafs)		3.84
	Fine mixed Loam soils (Paleustalfs)		6.99

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

<b>1.5</b>	<b>Agricultural land use</b>	Area ('000 ha)	Cropping intensity %
	Net sown area	46.6	116%
	Area sown more than once	6.7	
	Gross cropped area	53.9	

<b>1.6</b>	<b>Irrigation</b>	Area ('000 ha)		
	Net irrigated area	6.7		
	Gross irrigated area			
	Rainfed area	39.88		
	<b>Sources of Irrigation</b>	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals	2	1.765	
	Tanks	262	3.260	
	Open wells	2542	2.156	
	Bore wells			
	Lift irrigation schemes			
	Micro-irrigation	34	0.382	
	Other sources (Check Dam)	129	1.442	
	Total Irrigated Area			
	Pump sets			
	No. of Tractors			
	<b>Groundwater availability and use* (Data source: State/Central Ground water Department /Board)</b>	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			
	Wastewater availability and use			
	Ground water quality			
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

1.7 Area under major field crops & horticulture

1.7	Major field crops cultivated	Area ('000 ha)							Grand total
		<i>Kharif</i>			<i>Rabi</i>			Summer	
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total		
Rice	-	-	28.63					28.63	
Maize	-	-	6.8			0.17		6.97	
Pigeonpea	-	-	4.28					4.28	
Black gram	-	-	0.621					0.621	
Green gram	-	-	0.67					0.67	
Groundnut	-	-	0.34					0.34	
Wheat	-	-				1.92		1.92	
Chick pea	-	-				1.22		1.22	
Lentil	-	-				1.34		1.34	
Mustard						2.69		2.69	

	Horticulture crops - Fruits	Area ('000 ha)		
		Total	Irrigated	Rainfed
		-	-	-
	<b>Horticulture crops - Vegetables</b>			
	Cauliflower	1.30		
	Cabbage	1.09		
	Tomato	1.01		
	Brinjal	0.49		
	Chilli	0.06		
	L. Finger	0.36		
	Bottle gourd	0.48		
	Bitter gourd	0.60		
	Cucumber	0.12		
	Ridge gourd	0.28		
	Sponge gourd	0.48		
	Frenchbean	0.14		
	<b>Medicinal and Aromatic crops</b>			
	<b>Plantation crops</b>	-	-	-
	<b>Fodder crops</b>	-	-	-

		-	-	-
	<b>Total fodder crop area</b>	-	-	-
	<b>Grazing land</b>	-	-	-
	<b>Sericulture etc</b>	-	-	-
	<b>Others (specify)</b>	-	-	-

<b>1.8</b>	<b>Livestock</b>	<b>Male ('000)</b>	<b>Female ('000)</b>	<b>Total ('000)</b>			
	Non descriptive Cattle (local low yielding)			663.8			
	Improved cattle						
	Crossbred cattle						
	Non descriptive Buffaloes (local low yielding)						
	Descript Buffaloes			91.6			
	Goat			342.1			
	Sheep			48.23			
	Others (Camel, Pig, Yak etc.)			781.9			
	Duckery			20.03			
	Commercial dairy farms (Number)						
<b>1.9</b>	<b>Poultry</b>	<b>No. of farms</b>	<b>Total No. of birds ('000)</b>				
	Commercial						
	Backyard		578.873				
<b>1.10</b>	<b>Fisheries</b> (Data source: Chief Planning Officer)						
	<b>A. Capture</b>						
	<b>i) Marine</b> (Data Source: Fisheries Department)	<b>No. of fishermen</b>	<b>Boats</b>		<b>Nets</b>		<b>Storage facilities (Ice plants etc.)</b>
			Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
	<b>ii) Inland</b> (Data Source: Fisheries Department)	<b>No. Farmer owned ponds</b>		<b>No. of Reservoirs</b>		<b>No. of village tanks</b>	
	<b>B. Culture</b>						

		Water Spread Area (ha)	Yield (t/ha)	Production ('000 tons)
	i) <b>Brackish water</b> (Data Source: MPEDA/ Fisheries Department)			2000
	ii) <b>Fresh water</b> (Data Source: Fisheries Department)			3000
	<b>Others</b>			

### 1.11 Production and Productivity of major crops

1.11	Name of crop	Kharif		Rabi		Summer		Total		Crop residue as fodder ('000 tons)
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	
<b>Major Field crops (Crops to be identified based on total acreage)</b>										
	Rice	46.69	1542.3			-	-	46.6	1542.3	
	Maize	11.28	1644.4	0.534	1774.08	-	-	11.8	3418.5	
	Pigeonpea	1.61	508.6	-	-	-	-	1.6	508.6	
	Blackgram	0.23	374.8	-	-	-	-	0.2	374.8	
	Greengram	0.15	344.1	-	-	-	-	0.15	344.1	
	Groundnut	0.10	608.4	-	-	-	-	0.10	608.4	
	Wheat	-	-	1.9	1025.2	-	-	1.9	1025.2	
	Chickpea	-	-	2.5	889.8	-	-	2.5	889.8	
	Pea	-	-	0.9	1517.0	-	-	0.9	1517.09	
	Lentil	-	-	0.0	779.8	-	-	0.0	779.8	
	Mustard	-		0.3	242.7			0.3	242.7	
<b>Major Horticultural crops (Crops to be identified based on total acreage)</b>										
	Cauliflower	35.6	0.27							

	Cabbage	32.3	0.29							
	Tomato	28.3	0.28							
	Brinjal	12.8	0.25							
	Chilli	.52	0.08							
	Ladies Finger	6.00	0.16							
	Bottle gourd	80.0	0.16							
	Bitter gourd	99.68	0.16					99.6	0.1	
	Cucumber	22.80	0.19					22.8	0.19	
	Ridge gourd	46.12	0.162					46.1	0.16	
	Sponge gourd	8.00	0.166					8.00	0.166	
	Frenchbean	13.360	0.090					13.360	0.090	
Others										

1.12	Sowing window for 5 major field crops (start and end of normal sowing period)	Rice	Maize	Pigeon pea	Horsegram	Blackgram
	Kharif- Rainfed	4 <sup>th</sup> week of June - 4 <sup>th</sup> week of July	3 <sup>rd</sup> week of June - 2 <sup>nd</sup> week of July	3 <sup>rd</sup> week of June- 2 <sup>nd</sup> week of July	August	3 <sup>rd</sup> week of June – 4 <sup>th</sup> week of June
	Kharif-Irrigated	2 <sup>nd</sup> week of June - 3 <sup>rd</sup> week of June				
						<b>Wheat</b>
	Rabi- Rainfed					
	Rabi-Irrigated		November-December			November to December

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 (specify)		✓	
	Others (specify)			✓

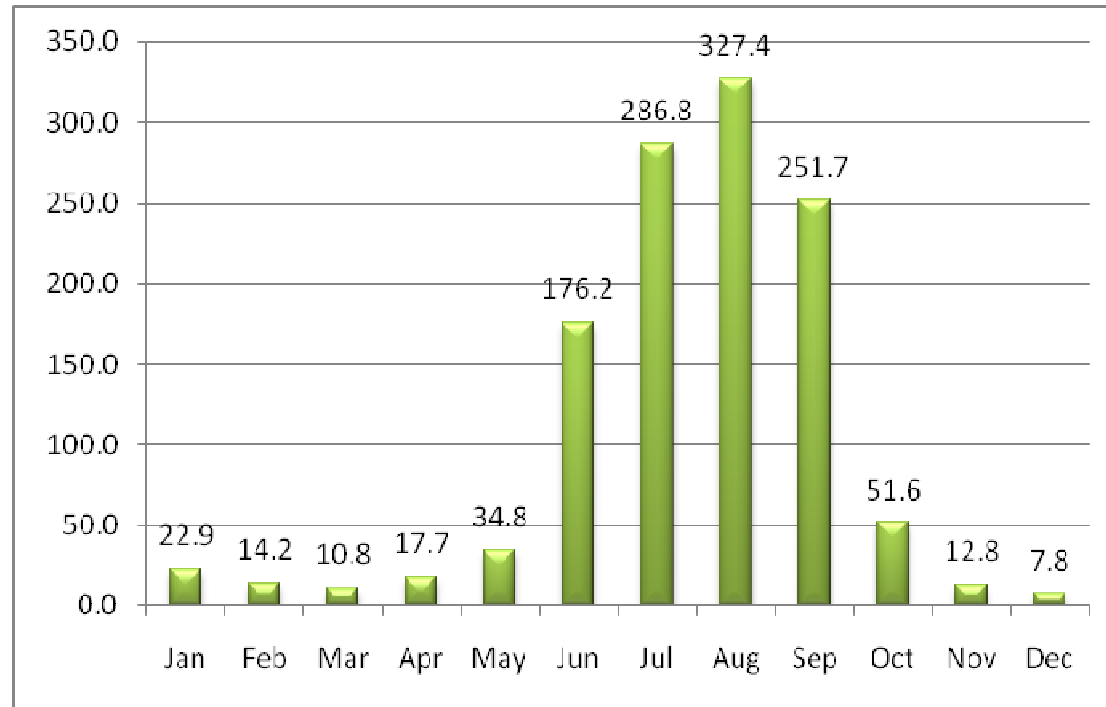
1.14	Include Digital maps of the district for	Location map of district within State as Annexure I	Enclosed: Yes
		Mean annual rainfall as Annexure 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes



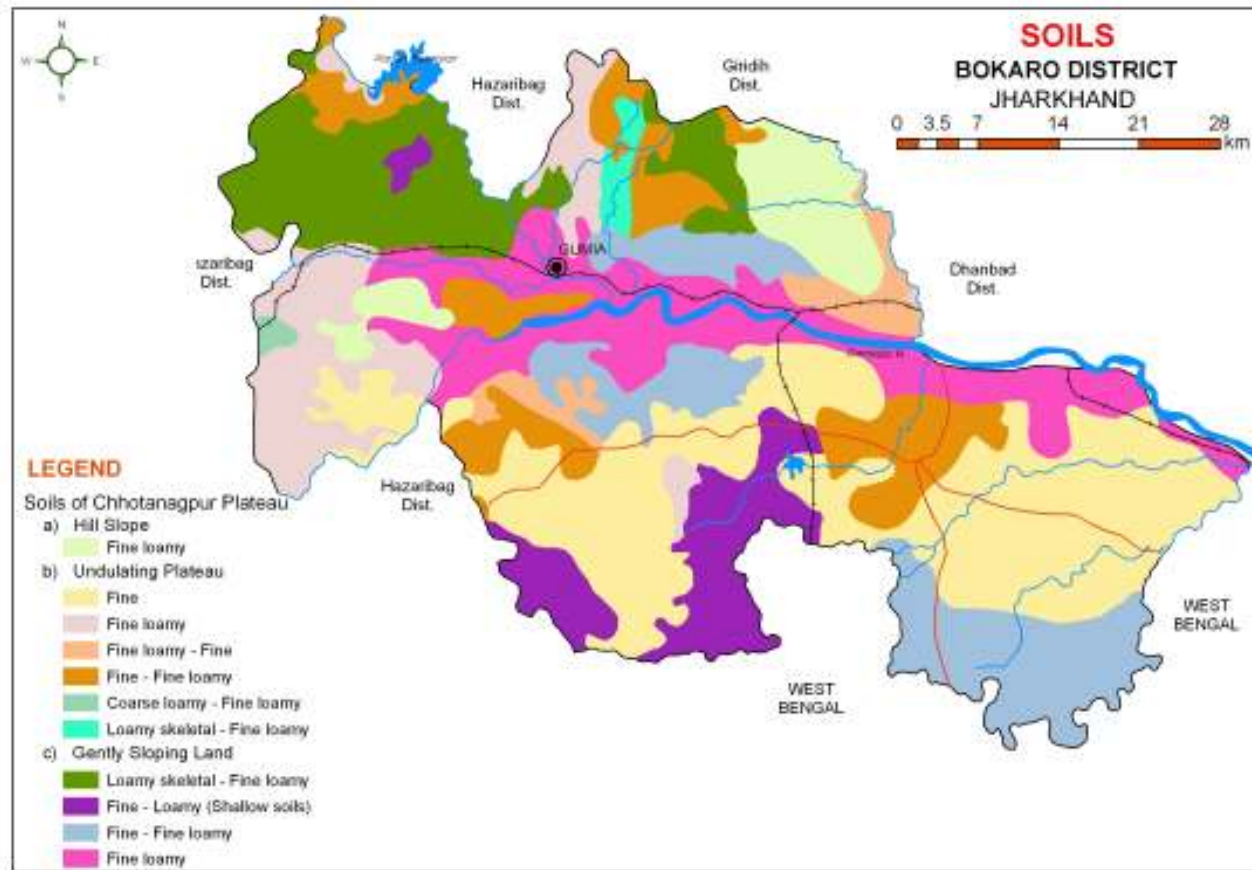
Annexure I



ANNEXTURE-II



### ANNEXTURE-III



SOURCE: NBSSLUP, Kolkata

## 2.0 Strategies for weather related contingencies

### 2.1 Drought

#### 2.1.1 Rainfed situation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset) Delay by 2 weeks June 4 <sup>th</sup> week	Upland sandy lateritic soils	Upland rice	No change	-	-
		Groundnut	No change	-	
		Maize	No change	-	
		Pigeon pea Pigeon pea+ groundnut  Pigeon pea + maize  Vegetables- Brinjal, tomato, sponge gourd	No change	<ul style="list-style-type: none"> <li>Follow wider spacing (90x25 cm) for pigeon pea</li> <li>Intercropping</li> </ul>	
	Midland sandy loam soils	Nursery raising of long duration Rice in dry method Var- MTU- 7029, 1001	Nursery raising with medium duration varieties / Prefer Hybrid rice - 6444	-	
	Lowland sandy loam soils	Rice (dry sowing of nursery with var- MTU- 7029)	Transplant seedlings in puddled condition after receipt of rains  If dry spell continues adopt dapog nursery method for raising seedlings (MTU- 7029, BPT- 5204, Rajendra mansuri)	-	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)					
Delay by 4 weeks  July 2 <sup>nd</sup> week	Upland Sandy lateritic soils	Upland rice, Groundnut,	Continued up to 15 <sup>th</sup> July  Upland rice: Birsa Dhan-108, Birsa vikas Dhan-109, 110, & 111, Vandana  Prefer Pigeon pea based intercropping  Pigeonpea +Groundnut/ Rice/Blackgram : Between the 2 rows of pigeonpea (75 cm between row & 20-25 cm between plant) 2 rows of Groundnut/upland rice/blackgram should be taken	<ul style="list-style-type: none"> <li>Intercropping in standing crop like maize, pigeon pea sown on ridge &amp; furrow method</li> </ul>	-
	Maize	Maize + Beans			
	Pigeonpea+ maize	<b>Pigeonpea + Maize</b> : 1 row pigeonpea and 1 row Maize (75 cm between row).			
		Pigeon pea	Prefer Pigeon pea based intercropping  Short duration varieties with Birsa A- 1, UPAS- 120, Asha (ICPL- 87119), ICPH- 2671  Pigeonpea + black gram Pigeonpea + upland rice Pigeonpea + Bhindi  Pigeonpea +Groundnut/ Rice/Urd : Between the 2 rows of Arhar (75 cm between row & 20-25 cm between plant) 2 rows of Groundnut/upland rice/blackgram		

		Vegetables- Brinjal, tomato, spongegourd	Sweet potato		
		Blackgram/ Greengram	No change		
	Midland sandy loam soils	Rice	Seedling raising with medium duration rice Var- IR- 64, Lalat, Navin, Hybrid- 6444	<ul style="list-style-type: none"> <li>Nursery raising by wet method with sprouted seed or prefer direct seeding with sprouted seed 50-60 kg seed/ha.</li> <li>Provide life saving irrigation to nursery</li> <li>Brown manuring with Dhaincha</li> </ul>	Promotion of SRI technique through RKVY
	Lowland sandy loam soils	Rice-Nursery raising of MTU- 7029	<p>If seedlings are available prefer transplanting</p> <p>Prefer seedlings of short duration varieties Lalat, Navin and Arize - 6444</p>	-	-

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)  Delay by 6 weeks  July 4 <sup>th</sup> week	Upland Sandy lateritic soils	Pigeon pea, Groundnut, Upland rice, Maize	Prefer Niger/ Horse gram/ Finger millet	Interculture	-
		Sweet potato- fallow	Finger millet: A- 404, Birsa Maruwa- 2/ Sweet potato		
	Vegetables- Brinjal, tomato, spongegourd	Vegetables like French bean, cow pea			
	Midland sandy loam soils	Rice-Nursery raising with dry method Var- IR-64, Lalat, IR-36	Direct sowing of Rice with Anjali, Bandana, Abhisekh, Birsa Vikas Dhan- 9 & 10	Prefer wet method of direct sowing with 50-60 kg/ha behind the plough	

	Lowland sandy loam soils	Rice	Transplanting with short duration varieties with MTU 7029, BPT 5204, Rajshree	-	
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Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset) Delay by 8 weeks 2 <sup>nd</sup> week of August	Upland Sandy lateritic soils	Upland rice/ Pigeon pea/ Groundnut/ Black gram/ Green gram  Vegetables- Brinjal, tomato, spongegourd	Prefer to sow Niger, Horse gram/ Toria in September	-	-
	Midland sandy loam soils	Rice	Direct seeded rice  Prefer Black gram Var- PU-19 & early Toria Var—T-9, PT- 303	<ul style="list-style-type: none"> <li>If transplanting of over aged seedlings (&gt; 30 days) is being done, plant 5-6 seedling/hill</li> </ul>	
	Lowland sandy loam soils	Rice	Transplanting with short duration varieties with MTU 7029, BPT 5204, Rajshree	<ul style="list-style-type: none"> <li>Reduce fertilizer dose by 20 %.</li> <li>Increase no.of seedling (5-6/hill), transplanting at closer spacing 15x10 cm</li> </ul>	

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Early season drought (Normal onset)					

Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.	Upland red lateritic soils	Upland rice/ Groundnut+ Pigeon pea Maize (Sathi, Kanchan)/ Maize + Pigeon pea/ Bhindi + Maize/ Upland rice- Brown Goda Pigeon pea- Aghani (local)  Vegetables- Brinjal, tomato, sponge gourd, cucurbits, cow pea, bean, bhendi, chilli	1. Interculture in standing crop. 2. Thinning & gap filling to maintain optimum plant population 3. Re-sowing incase of complete crop failure <b>Pigeon pea-</b> UPAS- 120, Asha, ICPL- 87109 <b>Maize-</b> Suwan- 1, HQPM-1 BVM- 2, Kanchan <b>Groundnut-</b> TG-22, Birsa GN-2 <b>Sesame-</b> Kanke safed, TC-25 Upland rice + Pigeon pea (1:3) Pigeon pea+ Black gram (1:2)	-	-
	Midland sandy loam soils	Rice Var- IR- 36, IR- 64, Lalat	Rice Var- Lalat, Navin, MTU- 1010, Abhishek  Direct sowing of rice	Weeding  Life saving irrigation	
	Lowland sandy loam soils	Rice MTU- 7029, 1001, Kanak	Rice BPT- 5204, Rajendra/ Hybrid: - Arize- 6444.	-	

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



<b>At vegetative stage</b>	Upland red lateritic soils	Upland rice/ Groundnut+ Pigeon pea Maize (Sathi, Kanchan)/ Maize + Pigeon pea/ Bhendi + Maize/ Upland rice- Brown Goda Pigeon pea- Aghani (local)  Vegetables- Brinjal, tomato, spongegourd, cucurbits, cow pea, bean, bhendi, chilli	Frequent interculture  Foliar application with 2 % urea and MOP	Mulching  Life saving irrigation at critical stage of the crop if possible	-
	Midland sandy loam soils	Rice IR- 64, IR – 36, Lalat	Foliar spray of Urea (2%)	<ul style="list-style-type: none"> <li>• Weeding</li> <li>• Life saving irrigation through well, ponds check dams</li> </ul>	
	Lowland sandy loam soils	Rice MTU- 7029, 1001, Kanak		<ul style="list-style-type: none"> <li>• Weeding</li> </ul>	

<b>Condition</b>			<b>Suggested Contingency measures</b>		
<b>Mid season drought (long dry spell)</b>	<b>Major Farming situation</b>	<b>Normal Crop/cropping system</b>	<b>Crop management</b>	<b>Soil nutrient &amp; moisture conservation measures</b>	<b>Remarks on Implementation</b>
<b>At flowering/ fruiting stage</b>	Upland red lateritic soils	Upland rice/ Groundnut+ Pigeon pea/ Maize/ Maize + Pigeon pea/ Bhindi + Maize/ Vegetable/ Cow pea/ Maize- Local (Sathi, Kanchan)/ Upland rice- Brown Goda/ Pigeon pea- Aghani (local)	Interculture	Provide life saving irrigation at critical stage of the crop	
	Midland sandy loam soils	Rice IR- 64, IR – 36, Lalat	Foliar spray of Urea (2%)	<ul style="list-style-type: none"> <li>• Weeding</li> <li>• Provide life saving irrigation at critical stage of the crop</li> </ul>	

	Lowland sandy loam soils	Rice MTU- 7029, 1001, Kanak		<ul style="list-style-type: none"> <li>Weeding and foliar spray of Urea (2%)</li> </ul>

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
	Upland red lateritic soils	Upland rice/ Groundnut+ Pigeon pea/ Maize/ Maize + Pigeon pea/ Bhindi + Maize/ Vegetable/ Cow pea/ Maize- Local (Sathi, Kanchan)/ Upland rice- Brown Goda/ Pigeon pea- Aghani (local)	1. Upland rice harvested for straw purpose 2. Harvest groundnut at physiological maturity stage	<ul style="list-style-type: none"> <li>Plan for early rabi sowing with Niger- BN-1, BN-2, JNC-06/</li> <li>Horse gram- Birsa Kulthi, Madhu/toria / potato</li> <li>Life saving irrigation for vegetables</li> </ul>	-
	Midland sandy loam soils	Rice IR- 64, IR – 36, Lalat	Harvest at physiological maturity use for fodder	<p><b>Sowing of Toria</b></p> <p>Field preparation for early rabi pulses like chick pea (P- 256,PL- 406), Lentil, Mustard (Shicani, Pusa Agrani), Linseed (Shubhra, T- 397)/ Niger- BN-1, BN-2, JNC-06/ Horse gram- Birsa Kulthi, Madhu/toria / potato</p> <p>Provide life saving irrigation</p>	-

	Lowland sandy loam soils	Rice MTU- 7029, 1001, Kanak	<ul style="list-style-type: none"> <li>• Crop harvested at physiological maturity</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Plan for early sowing of wheat, oilseed- mustard and pulses- chick pea</li> <li>• Intercropping of Wheat+ Mustard</li> <li>• Life saving irrigation</li> </ul>	
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### 2.1.2 Drought - Irrigated situation

Condition	Suggested Contingency measures				Remarks on Implementation
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	
Limited/ delayed release of water in canals due to low rainfall	Not applicable				
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					
Insufficient groundwater recharge due to low rainfall					

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

Condition	Suggested contingency measure			
	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
<b>Continuous high rainfall in a short span leading to water logging</b>				
Pigeon pea	Ridge making	Draining	-	-
Black gram	Ridge making	Draining	-	-
Rice	Bund making	Draining	Draining	
<b>Horticulture</b>				
Cucurbits	Staking	Draining	Draining	
Vegetables	Sowing on ridge			
<b>Outbreak of pests and diseases due</b>				

<b>to unseasonal rains</b>				
Pulses	Control Leaf hoper/Caterpillar			
Maize	Stem borer Control- Phorate 10G@ 20 kg/ha	Sheath blight Control- Hexaconazole 1.0 lit in 500 lit water/ha		
Rice		Blast diseases Control- Tricyclazole (0.05 %)	False Smut Control- Propiconazole 0.1 % or Copper oxy chloride - 50 (2 kg/ha)	
<b>Horticulture</b>				
French bean	Rust disease Control- Mancozeb 2.5 kg/ ha			

### 2.3 Floods –Not applicable

Condition	Suggested contingency measure <sup>o</sup>			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation				
Continuous submergence for more than 2 days <sup>2</sup>	Not applicable			
Sea water intrusion <sup>3</sup>				

### 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
<b>Hailstorm</b>	Not applicable			
<b>Heat Wave</b>				
Wheat	Life saving irrigation	Life saving irrigation	Life saving irrigation (Terminal heat)	
<b>Cold wave</b>				
Wheat	Irrigation Balanced fertilizer	Light irrigation Mulching with crop residue \	Irrigation, fertilizer application	

	application Foliar spray of nutrients	weeds Fertilizer application		
Vegetables	Raising of seedling in Poly house, re sowing if damaged	Light irrigation Mulching with crop residue \ weeds Disease and pest control, care for chilling injury or replanting	Quick harvesting	Grading, quick disposal for marketing
Pigeonpea		Light irrigation Mulching with crop residue \ weeds		
<b>Frost</b>				
Wheat		Light irrigation Mulching with crop residue \ weeds		
Pigeonpea	Exposure of crop to smoke by burning waste material during night time	Exposure of crop to smoke by burning waste material during night time, Light sprinkler irrigation	Exposure of crop to smoke by burning waste material during night time, Light sprinkler irrigation	Exposure of crop to smoke by burning waste material during night time
Tomato & Potato		Earthing up, Irrigation,		Harvest in dry weather
Horticultural crops (fruit crops)	Light frequent irrigation may be practiced wherever irrigation facilities are available, mulching, thatching and creating smoke screens and lighting of fire is also practiced where irrigation facilities are not available			
<b>Cyclone</b>	Not applicable			

## 2.5 Contingent strategies for Livestock, Poultry & Fisheries

### 2.5.1 Livestock

	Suggested contingency measures		
	Before the event	During the event	After the event
<b>Drought</b>			
Feed and Fodder availability	<p><b>1. Reserve feed/ fodder bank at community level</b></p> <p>Each district should have reserves (feeding 5000 ACU maintenance ration for about 1-3 weeks period) of the following at any point of the year for mobilization to the needy areas. Checking of feed availability may be made at 3 months interval, particularly before onset of summer.</p> <p>Rice/ wheat straw: 250 t</p> <p>Urea molasses mineral bricks (UMMB): and complete feed block (CFB) 50-100 t</p> <p>Dried grass collected from forest: 20-25 t</p> <p>Concentrates: 20-50 t</p> <p>Minerals and vitamin supplements mixture: 1-5 t</p> <p><b>2. Preparation and storage of straw and dried grass/ grass hay/ fallen leaves at household level</b></p> <p>Preserve the fodder in the form of hay from Berseem, cowpea, oat &amp; other grasses. Large farmers may prepare silage from</p> <p>(a) Maize- harvesting at dough stage.</p> <p>(b) Jowar - at flowering stage.</p> <p>(c) Oat</p> <p>(d) Hybrid Napier – 40-45 day old.</p> <p>(e) Water hyacinth mixing with Rice straw in ratio of 4:1 with 70 kg molasses /ton of clean water hyacinth.</p>	<p>Harvest and use all the failed crop (Maize, Rice, Wheat, Horse gram etc) material as fodder.</p> <p>Harvest the top fodder (Neem, Subabul, Acasia, Pipol, Gular, Sessame, Sal, Jamun, Mango, Jackfruit, Bamboo etc) and unconventional feeds resources like banana plants, babool pods, Mahua seed cake etc for use as feed/ fodder for livestock (LS). Fallen leaves from forest may also be used as fodder.</p> <p>Aquatic plants like lotus, water hyacinth, duckweed may be fed to livestock mixing with straw.</p> <p>During drought, sorghum may accumulate HCN, which is toxic to livestock. Care may be taken in feeding of stunted grown Sorghum fodder.</p> <p>Available feed and fodder should be collected from CPRs/ forest and stall fed in order to reduce the energy requirements of the animals</p> <p><b>Mild drought :</b> Hay/straw should be transported to the needy areas</p> <p><b>Moderate drought:</b> Hay/ straw and vitamin &amp; minerals mixture should be transported to the needy areas</p> <p><b>Severe drought:</b> UMMB, hay, concentrates and vitamin &amp; mineral mixture should be transported to the needy areas. All the hay should be enriched with 2% Urea molasses solution or 1% common salt solution and fed to LS. In acute drought affected areas, animal camp may be organized along nearby canals or water sources. Farmers along with canal may be persuaded to cultivate fodder crops (where canal exists).</p> <p>Herd should be split and supplementation should be given only to the highly productive and breeding animals (pregnant and lactating animals). Due to prolonged under-feeding, there is a chance of abortion in pregnant animals and lactating cows may show the symptoms of</p>	<p>Short duration fodder crops of Sorghum / Bajra / Maize (UP Chari, Pusa Chari, HC-136, HD-2/Rajkoo, Gaint Bajra, L-74, K-6677, Ananand / African tall, Kissan composite, Moti, Manjari, BI-7) and cowpea should be sown in unsown and crop failed areas. Cultivation of Jowar/Cowpea/ Maize in September-October.</p> <p>Rapeseed, mustard, Chinese cabbage etc and maize may be grown as fodder where feasible. These crops will be harvested in November to facilitate the sowing of wheat, pulses etc. Under irrigated conditions sowing of barseem with Chinese cabbage in last week of September may be taken up for early availability of green fodder. Oats may be grown in October as multi cut fodder to ensure the fodder availability for longer period.</p> <p>Concentrates supplementation should be provided to all lactating indigenous, crossbred and buffaloes</p> <p>In highly affected areas, where animals have died, soft loan or subsidy may be given for purchase of dairy animals. Backyard poultry, pig, goat may be distributed among</p>

	<p>Bales of hay and other dry fodder should be stored and covered with asbestos sheet or polythene sheet.</p> <p><b>3, Creation of permanent fodder seed banks in all drought prone areas.</b></p> <p><b>2. Establishment of silvi-pastoral system and cultivation of fodder tress</b></p> <p>Establishment of silvi-pastoral system in CPRs with <i>Stylosanthus hamata</i> and <i>Cenchrus ciliaris</i> as grass with <i>Leucaena leucocephala</i> as tree component. Fodder trees may be planted around the house, wasteland etc. Recently, Chaya tree (<i>Cnidoaculus aconitifolius</i>) has been introduced in IGFRI, Jhansi which has high protein value, may be introduced in drought prone regions.</p> <p><b>3. Management of CPRs</b></p> <p>Top dressing of N in 2-3 split doses @ 20-25 kg N/ha in CPRs with the monsoon pattern for higher biomass production</p> <p><b>4. Short duration and low water requiring fodder cultivation</b></p> <p>Increase area under short duration fodder crops of sorghum/bajra/maize(UP chari, MP chari, HC-136, HD-2, GAIN T BAJRA, L-74, K-677, Ananad/African Tall, Kisan composite, Moti) and cowpea.</p> <p><b>5. Feeing management</b></p> <p>Chopping of fodder should be made as mandatory in every village through supply and establishment of good quality crop cutters.</p>	<p>hypoglycemia. Comparatively good quality feed may be offered to milch and pregnant animals. Dry and non-productive animals may be reared on dry roughages sprayed with 10% molasses or crude jaggery solution and 2% urea for maintenance of animals.</p> <p>Available kitchen waste should be mixed with dry fodder while feeding.</p> <p>Livestock should be kept in shelter or under shed during daytime. In case of hot weather condition, grazing may be done in morning and afternoon. Livestock should not be traveled long distance for grazing to save energy and drinking water intake. Animals should not be watered immediately after return from grazing.</p> <p>Washing of animals may be done at least twice a day.</p> <p>40-50 g of salt and 30-40 g mineral mixture per adult animal and 10-20 g for small ruminants and calves to be provided daily through feed to reduce the imbalances of minerals.</p> <p>Livestock may be provided with drinking water from wells, hand pumps or from pond. In case of bad water quality, bleaching powder or chlorine or lime may be applied to water.</p> <p>Arrangements should be made for mobilization of small ruminants across the districts where no drought exits</p> <p>Unproductive livestock should to be culled during severe drought</p> <p>Create transportation and marketing facilities for the culled and unproductive animals (10000-20000 animals)</p> <p>Subsidized loans (5-10 crores) should be provided to the livestock keepers.</p>	<p>resource poor farmers for immediate income generation.</p>
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	<p>Establishment of backyard production of Azolla for feeding dairy animals.</p> <p>Establishment of back yard cultivation of para grass/ hybrid Napier with drain water from bath room/washing area</p> <p>Avoid feed wastage by offering chaffed fodder and less quantity feed for 4 times a day.</p> <p>Avoid wastage of maize stover.</p> <p>Harvesting and collection of perennial vegetation particularly grasses which grow during monsoon. If excess grasses are collected, dried grass may be stored.</p> <p>Proper drying, baling and densification of harvested grass.</p>		
<b>Cyclone</b>	<p>Harvest all the possible wetted grain (rice/ wheat/maize etc) and use as animal feed after drying.</p> <p>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.</p> <p>Don't allow the animals for grazing in case of early fore warning (EFW)</p> <p>In case of EFW, shift the animals to safer places.</p> <p>Identification of animals may be done.</p> <p>Keep animals untied in the shed in case of EFW.</p>	<p>Treatment of the sick, injured and affected animals through arrangement of mobile emergency veterinary hospitals / rescue animal health workers.</p> <p>Diarrhea out break may happen, arrangement should be made to mitigate the problem</p> <p>Protect the animals from heavy rains and thunder storms</p> <p>In severe cases un-tether <b>or</b> let loose the animals</p> <p>Arrange transportation of highly productive animals to safer place</p> <p>Spraying of fly repellants in animal sheds</p>	<p>Repair of animal shed</p> <p>Deworm the animals through mass camps</p> <p>Vaccinate against possible out breaks</p> <p>Proper disposal of the dead animals / carcasses by burning / burying with lime/ bleaching powder in pit</p> <p>Bleach / chlorinate (0.1%) drinking water or water resources</p> <p>Collect drowned crop material, dry it and store for future use</p> <p>Sowing of above mention short duration fodder crops in unsown and water logged areas</p> <p>Application of urea (20-25kg/ha) in the CPR's to enhance the bio mass production.</p> <p>After cyclone, for livelihood improvement of highly affected</p>



			areas, backyard poultry, pig, goat etc may be distributed for immediate income generation.
<b>Floods</b>	NA	NA	NA
<b>Heat &amp; Cold wave</b>	<p>Arrangement for protection from <b>heat wave</b></p> <ul style="list-style-type: none"> <li>i) Plantation around the shed</li> <li>ii) Water sprinklers / foggers in the shed or frequent washing of animals.</li> <li>iii) Application of white reflector paint on the roof or putting rice straw on the roof of the shed.</li> </ul> <p><b>Cold wave :</b> Covering all the wire meshed walls / open area with gunny bags/ polyethylene sheets (with a mechanism for lifting during the day time and putting down during night time)</p>	<p>Allow the animals early in the morning or late in the evening for grazing during heat waves</p> <p>Allow for grazing between 10AM to 3PM during cold waves</p> <p>Feed green fodder/silage / concentrates during day time and roughages / hay during night time in case of heat waves</p> <p>Add 25-50 ml of edible oil in concentrates and fed to the animal during cold waves. Molasses may be added in the concentrate feed during heat waves.</p> <p>Put on the foggers / sprinklers and frequent washing of animals during heat waves and heaters during cold waves</p> <p>In severe cases, vitamin 'C' and electrolytes should be added in H<sub>2</sub>O during heat waves.</p> <p>Apply / sprinkle lime powder in the animal shed during cold waves to neutralize ammonia accumulation</p>	<p>Feed the animals as per routine schedule</p> <p>Allow the animals for grazing (normal timings)</p>

<b>Health and Disease management</b>	Specify the endemic diseases (species wise) in that region. Identification of veterinary staff and animal health workers. Constitution of Rapid Action Veterinary Force Storage of emergency medicines and medical kits Timely vaccination (as per enclosed vaccination schedule) against all endemic diseases Surveillance and disease monitoring network establishment Provision for mobile ambulatory van.	Rescue of sick and injured animals and their treatment Conducting mass animal health camps  Animals may be checked for any external injury and illness, Pregnant animals may be checked for any discomfort and uneasiness.  Animals may be dewormed with suitable anti-parasitic drug and be checked and treated for ecto-parasites, if any. Deworming will improve fodder and feed absorption.  During flood do not leave halter or headstalls on animals.  Do not tie animals together when releasing.  Report the location, identification and disposition of livestock and poultry to authorities handling the disaster.	Conducting psahu sibir, mass animal health camps, fertility camps and deworming camps.  Conducting fertility camps.  Disposal of carcass by above means.  Pregnancy toxemia may occur due to prolonged under-feeding. Hypoglycemia is also observed. Treatment may be provided to affected animals.  Adequate attention is to be paid to disinfect the premises of temporary sheds with the help of bleaching powder, phenol, carbolic acid etc. In no case the carcass/ cadaver should come in contact with healthy animals rehabilitated in sheds.
<b>Insurance</b>	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	Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals)  Identification of water resources	Restrict wallowing of animals in water bodies/resources	Specify the options (place and area) for establishment of drinking water reserves.

#### Vaccination schedule in small ruminants (Sheep & Goat)

Disease	Season
Foot and mouth disease (FMD)	Before rainy season and in winter / autumn
PPR	All seasons, preferably in June-July
Black quarter (BQ)	May / June

Enterotoxaemia (ET)	May
Haemorrhagic septicaemia (HS)	March / June
Sheep pox (SP)	December / March

**Vaccination programme for cattle and buffalo:**

<b>Disease</b>	<b>Age and season at vaccination</b>
Anthrax	In endemic areas only, Feb to May
HS	May to June
BQ	May to June
FMD	November to December

**2.5.2 Poultry**

	<b>Suggested contingency measures</b>		
	<b>Before the event<sup>a</sup></b>	<b>During the event</b>	<b>After the event</b>
<b>Drought</b>			
Shortage of feed ingredients	Storing of house hold grain like maize, broken rice, wheat etc, Culling of weak birds	Supplementation only for productive birds with house hold grain Supplementation of shell grit (calcium) for laying birds	Supplementation to all
Drinking water	Rain water harvesting	Sanitation of drinking water	Give sufficient water as per the bird's requirement

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	Hygienic and sanitation of poultry house Disposal of dead birds by burning / burying with lime powder in pit
<b>Floods</b>	NA	NA	NA
Drinking water	Provide clean drinking water	Sanitation of drinking water	Sanitation of 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 with bleaching powder/ lime etc. Treatment of affected birds Prevent water logging surrounding the sheds Assure supply of electricity Sprinkle lime powder to prevent ammonia accumulation due to dampness	Disposal of dead birds by burning / burying with lime powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against RD
<b>Cyclone</b>			
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	Provide clean drinking water	Sanitation of drinking water	Sanitation of 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 to prevent ammonia accumulation due to dampness	Disposal of dead birds by burning / burying with lime powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against RD
<b>Heat wave and cold wave</b>			
<b>Heat wave</b>			
Shelter/environment management	Provision of proper shelter with good ventilation	In severe cases, foggers/water sprinklers/wetting of hanged gunny bags should be arranged Don't allow for scavenging during mid day	Routine practices are followed
Health and disease management	Deworming and vaccination against RD and fowl pox	Supplementation of house hold grain Provide cool and clean drinking water with electrolytes and vit. C In hot summer, add anti-stress probiotics in drinking water or feed. Increase energy and vitamin concentration in feed (supplementation with grain).	Routine practices are followed
<b>Cold wave</b>			
Shelter/environment management	Provision of proper shelter Arrangement for brooding Assure supply of continuous electricity	Close all openings with polythene sheets In severe cases, arrange heaters Don't allow for scavenging during early morning and late evening	Routine practices are followed

Health and disease management	Arrangement for protection from chilled air	Supplementation of grains Antibiotics in drinking water to protect birds from pneumonia	Routine practices are followed
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<sup>a</sup> based on forewarning wherever available

### 2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event <sup>a</sup>	During the event	After the event
<b>1) Drought</b>			
<b>A. Capture</b>			
Marine			
Inland			
(i) Shallow water depth due to insufficient rains/inflow			
(ii) Changes in water quality			
(iii) Any other			
<b>B. Aquaculture</b>			
(i) Shallow water in ponds due to insufficient rains/inflow	(i) Thinning of fish density (ii) Arrangement of water supply from external resource (iii) Deepening of ponds to accommodate more water	(i) Partial harvesting (ii) Addition of water in ponds (iii) Stocking of air breathing fishes (Singhi, Magur or Murrel)	(i) Maintenances of remaining stock till onset of favorable conditions or otherwise. (ii) Harvesting or transfer of fish stock to other place. (ii) Preparation of ponds for next crop.
(ii) Impact of salt load build up in ponds / change in water quality	(i) Regular monitoring of water quality parameters. (ii) Arrangement for water from external source. (iii) Arrangement for aeration.	(i) Addition of required water. (ii) Arrangement of aeration. (iii) Continuous monitoring of water quality parameters. (iv) Reduction in manuring.	(i) Exchange and addition of water. (ii) Manuring if required.
(iii) Any other	Laying of Polythene lining in ponds having water seepage problem.		

<b>2) Floods</b>			
<b>A. Capture</b>			
Marine			
Inland			
(i) No. of boats / nets/damaged			
(ii) No.of houses damaged			
(iii) Loss of stock			
(iv) Changes in water quality			
(v) Health and diseases			
<b>B. Aquaculture</b>			
(i) Inundation with flood water	(i) Elevation and renovation dykes of ponds. (ii) Construction of ponds in upland areas (ii) Arrangement for shifting of inputs, crafts and gears.	(i) Collection of naturally bred fish seed from flood water. (ii) Stocking of seed in nursery ponds constructed in upland area. (iii) Further raising of dykes by putting sand bags/fencing dykes with nylon nets.	(i) Repairing of damaged pond dykes. (ii) Removal of unwanted fishes from ponds. (iii) Sale large sized fishes.
(ii) Water contamination and changes in water quality	(i) Arrangement for monitoring of water quality parameters.		(I) Use of lime/Pott. Permanganate.
(iii) Health and diseases	(i) Arrangement of Pott. Permanganate and lime. (ii) (ii) Arrangement for CIFAX/ or other medicines.	Use of Pott. Permanganate and lime.	(i) Sampling of water and diseased fish for pathological analyses. (ii) Use of Pott. Permanganate and lime. (iii) Treatment with medicines/ CIFAX.
(iv) Loss of stock and inputs (feed, chemicals etc)	(i) Shifting of inputs to safer place. (ii) Raising height of pond dykes by fencing with nylonnet/bamboo mats.	(i) Arrangement of fish seed/inputs	(i) Fertilization of ponds, stocking with fish fingerlings and restoring supplementary feeding. (ii) Harvesting and sale of produce.

(v) Infrastructure damage (pumps, aerators, huts etc)	Arrangement, repairing and shifting of equipments, crafts and gears to safer place.		Restoration of infrastructural facility to its original.
(vi) Any other			
<b>3. Cyclone / Tsunami</b>			
A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives			
(ii) Avg. no. of boats / nets/damaged			
(iii) Avg. no. of houses damaged			
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds			
(ii) Changes in water quality (fresh water / brackish water ratio)			
(iii) Health and diseases			
(iv) Loss of stock and inputs (feed, chemicals etc)			
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)			
(vi) Any other			
<b>4. Heat wave and cold wave</b>			
A. Capture			
Marine			
Inland			
B. Aquaculture			



(i) Changes in pond environment (water quality)			
(ii) Health and Disease management			
(iii) Any other			
	<b>Suggested contingency measures</b>		
	<b>Before the event<sup>a</sup></b>	<b>During the event</b>	<b>After the event</b>
<b>1) Drought</b>			
<b>A. Capture</b>			
Marine			
Inland			
(i) Shallow water depth due to insufficient rains/inflow			
(ii) Changes in water quality			
(iii) Any other			
<b>B. Aquaculture</b>			
(i) Shallow water in ponds due to insufficient rains/inflow			
(ii) Impact of salt load build up in ponds / change in water quality			
(iii) Any other			
<b>2) Floods</b>			
<b>A. Capture</b>			
Marine			
Inland			
(i) No. of boats / nets/damaged			
(ii) No.of houses damaged			
(iii) Loss of stock			
(iv) Changes in water quality			

(v) Health and diseases			
<b>B. Aquaculture</b>			
(i) Inundation with flood water			
(ii) Water contamination and changes in water quality			
(iii) Health and diseases			
(iv) Loss of stock and inputs (feed, chemicals etc)			
(v) Infrastructure damage (pumps, aerators, huts etc)			
(vi) Any other			
<b>3. Cyclone / Tsunami</b>			
A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives			
(ii) Avg. no. of boats / nets/damaged			
(iii) Avg. no. of houses damaged			
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds			
(ii) Changes in water quality (fresh water / brackish water ratio)			
(iii) Health and diseases			
(iv) Loss of stock and inputs (feed, chemicals etc)			
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)			

(vi) Any other			
<b>4. Heat wave and cold wave</b>			
<b>A. Capture</b>			
Marine			
Inland			
<b>B. Aquaculture</b>			
(i) Changes in pond environment (water quality)			
(ii) Health and Disease management			
(iii) Any other			

<sup>a</sup> based on forewarning wherever available