

**State: Bihar**

**Agriculture Contingency Plan for District: Kishanganj**

**KRISHI VIGYAN KENDRA, KISHANGANJ**

<b>1.0 District Agriculture profile</b>				
<b>1.1</b>	<b>Agro-Climatic/Ecological Zone</b>			
	Agro Ecological Sub Region (ICAR)	Eastern Plain, Hot Subhumid (moist) Eco-sub region (13.1)		
	Agro-Climatic Zone (Planning Commission)	Middle Gangetic Plain Region (IV)		
	Agro Climatic Zone (NARP)	North East Alluvial Plain Zone (BI-2)		
	List all the districts falling under the NARP Zone*(*>50% area falling in the zone)	Begusarai, Saharsa, Supaul, Madhepura, Purnea , Kishanganj, Araria, Katihar		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		25 <sup>0</sup> 20' to 26 <sup>0</sup> 30' N	87 <sup>0</sup> 7' to 88 <sup>0</sup> 19' E	46.10 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	ARI, Mithapur , Patna		
	Mention the KVK located in the district with address	PC, Krishi Vigyan Kendra, Near Sub Development Farm, Kishanganj-855107		
Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	M.B. Agriculture College, Agwanpur, Saharsa			

<b>1.2</b>	<b>Rainfall</b>	<b>Normal RF(mm)</b>	<b>Normal Rainy days (number)</b>	<b>Normal Onset</b>	<b>Normal Cessation</b>
	SW monsoon (June-Sep)	1776	38	2 <sup>nd</sup> week of June	3 <sup>rd</sup> week of October
	NE Monsoon(Oct-Dec)	94	16		
	Winter (Jan- Feb)	21	4		

	Summer (Mar-May)	250	6		
	Annual	2141	64		

<b>1.3</b>	<b>Land use pattern of the district</b> (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable waste land	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	193.8	132.8	1.5	3.4					2.3	

<b>1.4</b>	<b>Major Soils</b>	<b>Area ('000 ha)</b>	<b>Percent (%) of total</b>
	Very deep, coarse loamy soils	63	33.3
	Very deep, sandy soils	2.2	1.2
	Very deep, calcareous, coarse loamy soils	8.6	4.6
	Very deep fine soils	21.9	11.6
	Very deep, fine-loamy soils	85.5	45.3

<b>1.5</b>	<b>Agricultural land use</b>	<b>Area ('000 ha)</b>	<b>Cropping intensity %</b>
	Net sown area	132.8	133.8%
	Area sown more than once	44.8	
	Gross cropped area	177.6	

<b>1.6</b>	<b>Irrigation</b>	<b>Area ('000 ha)</b>
	Net irrigated area	89.5
	Gross irrigated area	130

	Rainfed area	43.3		
	<b>Sources of Irrigation</b>	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals	2586		
	Tanks	42231		
	Open wells	3625		
	Bore wells	359		
	Lift irrigation schemes			
	Micro-irrigation			
	Other sources	1,20453		
	Total Irrigated Area		130	
	Pump sets	93226		
	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
	Over exploited	6		
	Critical	6	80-100	
	Semi- critical	6	70-95	
	Safe	6	65	
	Wastewater availability and use	6		
	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 (as per latest figures)**

1.7	Major field crops cultivated	Area ('000 ha)						
		<i>Kharif</i>			<i>Rabi</i>			
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Summer

Rice	72.3	2.2	74.5	25.2	1.2	26.4	0.4	101.3
Wheat				31.5	0.5	32		32
Maize	0.24	0.4	0.6	14.0	1.0	15		15.6
Pulses	0.5	0.5	1	10.0	1.3	11.3		12.3
Oilseeds				1.6	3.0	4.6		4.6

Horticulture crops - Fruits	Area ('000 ha)		
	Total	Irrigated	Rainfed
Mango	2.2		
Guava	1.2		
Banana	0.2		
Litchi	1.5		
Pine apple	3.0		
<b>Horticulture crops - Vegetables</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>
Potato	1.0		
Cucumber	0.06		
Tomato	0.14		

	Brinjal	1.8		
	Onion	0.6		
	<b>Medicinal and Aromatic crops</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>
	Lemon grass	0.01		
	Java citronella	0.005		
	Palm Rosa	0.005		
	Mentha aruvehsis	0.15		
	Sarpgandha	0.01		
	Mulethe	0.004		
	<b>Plantation crops</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>
	<b>Fodder crops</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>
	<b>Total fodder crop area</b>			
	<b>Grazing land</b>			
	<b>Sericulture etc</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)	125.2	133.6	258.8
	Improved cattle			
	Crossbred cattle	12	98	110
	Non descriptive Buffaloes (local low yielding)	22	22.9	45
	Descript Buffaloes			

	Goat	107	175.2	282.304
	Sheep	0.12	0.126	0.2
	Others (Camel, Pig, Yak etc.)			

<b>1.9</b>	<b>Poultry</b>	<b>No. of farms</b>	<b>Total No. of birds ('000)</b>	
	Commercial		977.7	
	Backyard			

<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>						
			<b>Water Spread Area (ha)</b>		<b>Yield (t/ha)</b>	<b>Production ('000 tons)</b>	
		<b>i) Brackish water</b> (Data Source: MPEDA/ Fisheries Department)					
	<b>ii) Fresh water</b> (Data Source: Fisheries Department)	358.8		3.2	353.8		

### 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 identified based on total acreage)</b>										
	Rice	193.7	2600	97.8	3700			291.5	2876	
	Wheat			60.8	1900			60.8	1900	
	Maize							48.7	3250	
	Pulses	39.3	8700					10.7	870	
	Oilseeds	15.8	8540					3.9	854	

1.12	Sowing window for 5 major field crops (start and end of normal sowing period)	Rice	Wheat	Maize	Potato	Jute
	Kharif- Rainfed	4 <sup>th</sup> week of May - 2 <sup>nd</sup> week of July	-	3 <sup>rd</sup> week of May- 2 <sup>nd</sup> week of June	-	2 <sup>nd</sup> week of March to 2 <sup>nd</sup> week of April
	Kharif-Irrigated	3 <sup>rd</sup> week of June – 2 <sup>nd</sup> week of July	-	4 <sup>th</sup> week of June – 1 <sup>st</sup> week of July	-	3 <sup>rd</sup> week of March – 3 <sup>rd</sup> week of April
	Rabi- Rainfed	-	1 <sup>st</sup> week of November – 3 <sup>rd</sup> week of November	3 <sup>rd</sup> week of October- 3 <sup>rd</sup> week of November	-	-
	Rabi-Irrigated	-	2 <sup>nd</sup> week of November – 2 <sup>nd</sup> week of December	4 <sup>th</sup> week of October - 2 <sup>nd</sup> week of November	3 <sup>rd</sup> week of October - 2 <sup>nd</sup> week of November	-

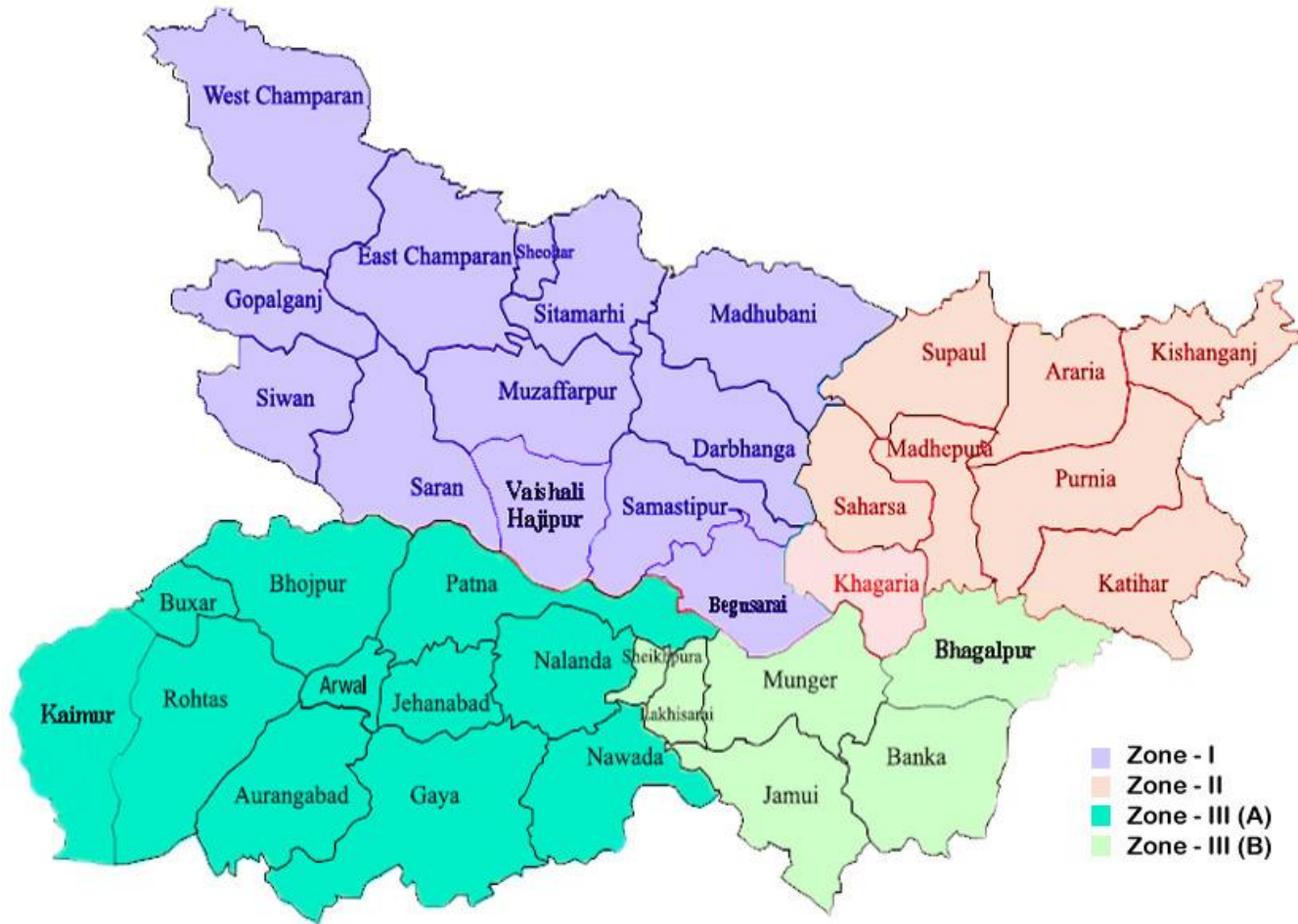
1.13	What is the major contingency the district is prone to? (Tick mark)	Regular	Occasional	None
	Drought		√	
	Flood	√		
	Cyclone			√
	Hail storm			√
	Heat wave		√	
	Cold wave		√	
	Frost		√	
	Sea water intrusion			√
	Pests and disease outbreak	√		

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



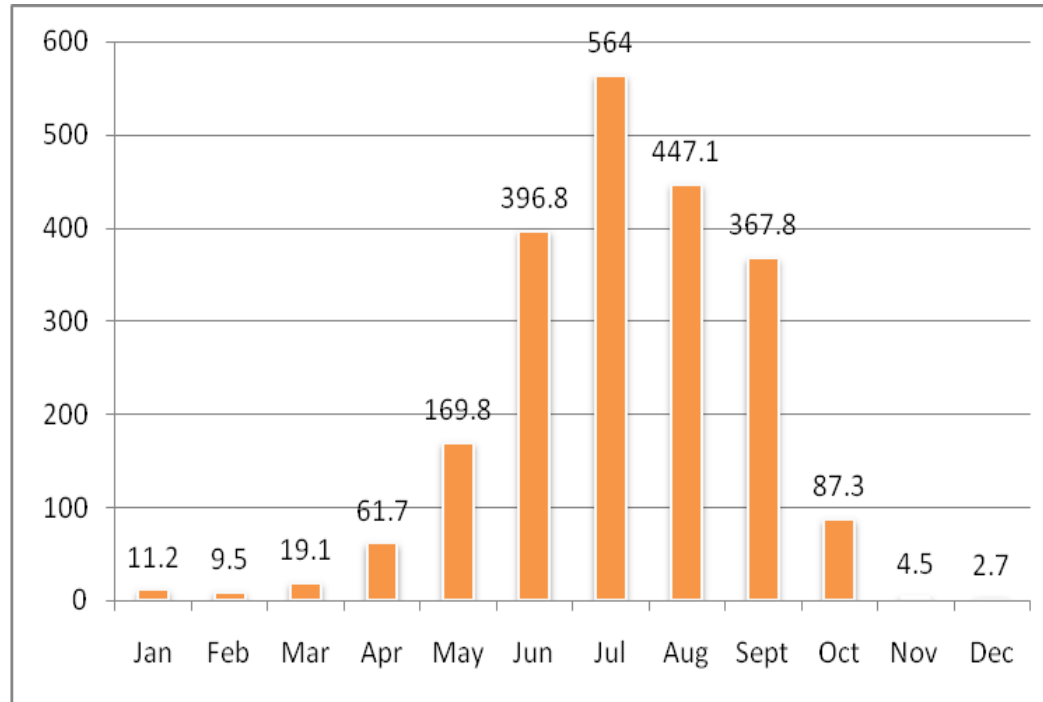
## Annexure I

### Agro climatic Zones of Bihar

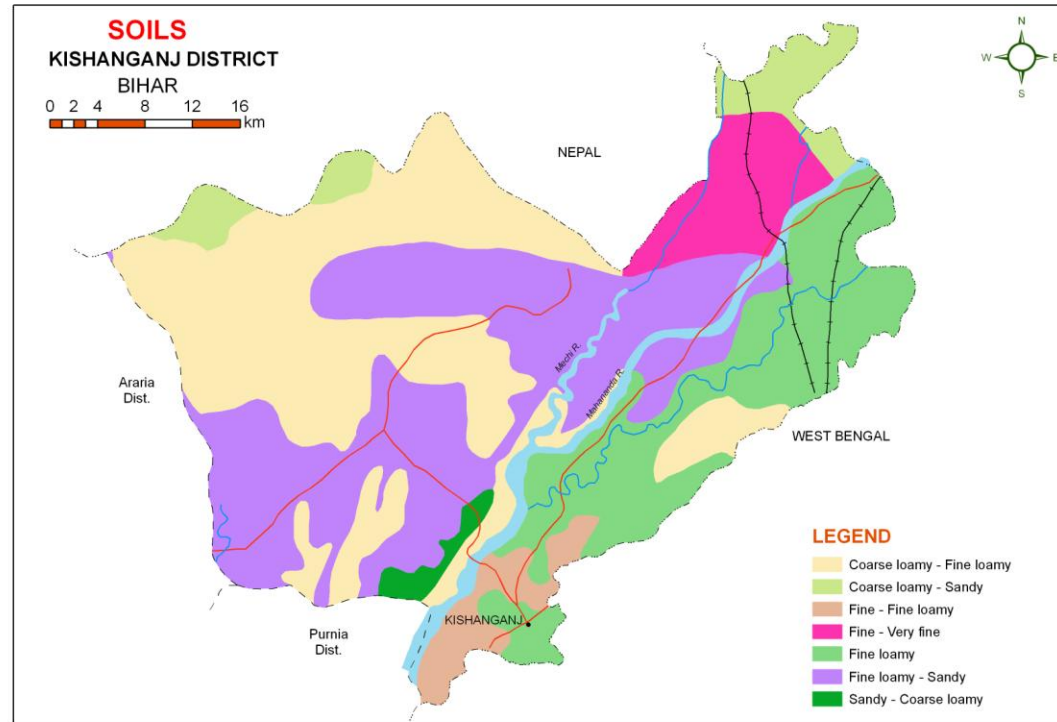


Source: [krishi.bih.nic.in](http://krishi.bih.nic.in)

**Annexure-II**



### Annexure-III



Source : NBSS& LUP, Regional Centre, 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 including variety	Agronomic measures	Remarks on Implementation
Delay by 2 weeks	Upland (Light tex. soil)	Rice-Wheat Rice-Maize	Rice – Wheat Prefer long to medium duration varieties	<ul style="list-style-type: none"> <li>• Normal package of Practices</li> <li>• Direct seeding of rice can be done</li> </ul>	-
	Medium land (Med. Tex. soil)	Rice- Wheat	Rice-Wheat  Prefer long to medium duration varieties		
	Lowland (Heavy tex. soil)	Rice- Wheat	Rice – Wheat  Prefer long to medium duration varieties		
		Jute – Maize	Jute – Maize <b>Jute-JRO-128</b> Maize- Devki		

Condition	Major Farming situation <sup>a</sup>	Normal Crop/cropping system <sup>b</sup>	Suggested Contingency measures		
			Change in crop/cropping system <sup>c</sup>	Agronomic measures <sup>d</sup>	Remarks on Implementation <sup>e</sup>
Delay by 4 weeks	Upland (Light tex. soil)	Rice- Wheat Rice-Maize	Rice-Wheat Rice- Prefer Medium to short duration varieties like Saroj (100-110d), Birsa Dhan-	<ul style="list-style-type: none"> <li>• Direct seeding of rice with medium duration drought tolerant varieties with pre emergence herbicide</li> </ul>	Seeds from BRBN, BAU, Sabour, NSC, TDC

	Upland (Med. tex. soil)	Rice- Wheat Rice-Maize	201 (100-115d)	<p>application under sufficient soil moisture conditions followed up with a post-emergence weedicide application 20-25 days later for effective weed management.</p> <ul style="list-style-type: none"> <li>▪ Normal sowing of rice can be used with enhanced NPK to boost the early vegetative growth in late plantings under sufficient moisture</li> <li>• Interculture for timely weed control in direct seeded rice</li> </ul>	
	Medium land (Med. Tex. soil)	Rice – Wheat	Rice-Wheat  <b>Rice</b> - Direct sowing / 20d old dapog seedlings with medium to short duration varieties – BR34, Rajendra Dhan-201(130-135d), Rajendra Bhagwati, Rajendra Suwasni, Rajshree, Prabhat	<ul style="list-style-type: none"> <li>• Where field is moist, direct seeding of medium duration varieties (125 days) can be done during second fortnight of July in midlands. Post-emergence herbicide application use is essential</li> </ul>	
	Lowland (heavy tex. soil)	Rice – Wheat	Rice – Wheat  Rice- Direct/ dapog seedlings with Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta, Swarna sub-1	<ul style="list-style-type: none"> <li>• Use mat nursery/ dapog nursery , mat nursery (dapog method) can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August in mid and Lowlands</li> <li>• Raise staggered community nursery preferably with Medium duration varieties in mid and lowlands</li> </ul>	

				<ul style="list-style-type: none"> <li>• Transplant with 30-35 days old seedling may be used with 3-4 seedling per hill with close spacing.</li> <li>• Para grass cultivation for fodder in Lowland</li> <li>• Normal package of practices</li> <li>• Timely interculture for weed control in direct seeded rice</li> <li>• Life saving irrigation</li> </ul>	
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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
Delay by 6 weeks	Upland (Light tex. soil)	Rice-Wheat Rice-Maize	Rice – Wheat/Maize	<ul style="list-style-type: none"> <li>• Direct seeding of Rice</li> <li>• Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions</li> <li>• Life saving irrigation</li> </ul>	Seeds from BRBN, BAU, Sabour, NSC, TDC
			Finger millet- Wheat/Maize Finger millet- RAU 7&8 Rice- Rajendra Bhagavathi (early-upland and midland), Dhanlaxmi , Richharia(<100d), Saroj (100-110d), Birsa Dhan-201 (100-115d)Prabhat, Sahbhagi.		
	Medium land (Med. Tex. soil)	Rice – Wheat	Finger millet-Wheat Finger millet- RAU 7&8	<ul style="list-style-type: none"> <li>• Mat nursery (dapog method)/ Community nursery can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August</li> <li>• Direct seedling of Rice</li> </ul>	
		Rice -Wheat <b>Rice</b> - Rajendra Bhagawati, Rajendra Suwasni Rajshree, Prabhat			

	Lowland (Heavy tex. soil)	Rice-wheat	Rice -Wheat <b>Rice-</b> Rajshree, Santosh , Sita,Rajendra Suwasni, Rajendra Sweta, Prabhat, Dhanlaxmi	<ul style="list-style-type: none"> <li>• Raise staggered community nursery preferably with medium duration varieties in mid and lowlands</li> <li>• Enhanced basal dose of NPK to boost the early vegetative growth</li> <li>• Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions</li> <li>• Life saving irrigation</li> </ul>	
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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	Upland (Light tex. soil)	Rice-Wheat Maize-Wheat	Early Rice – Late wheat  <b>Rice-</b> Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	<ul style="list-style-type: none"> <li>• Direct seeding of rice</li> <li>• Inter cultivation</li> <li>• Sowing of <i>rabi</i> crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables</li> <li>• Fodder varieties of Jowar, Maize, Bajra in combination with legumes (cowpea and horsegram) can be taken up wherever feasible to meet the fodder requirements in deficit rainfall districts</li> </ul>	Seeds from BRBN, BAU, Sabour, NSC, TDC

	Medium land (Med.tex. soil)	Maize-Wheat	Sesame-Late wheat <b>Sesame</b> – Krishna, Pragati	-
		Rice-Wheat	Early Rice/Sesame –Rabi maize <b>Early Rice</b> -Prabhat, Dhanlaxmi, Richharia, Turanta	<ul style="list-style-type: none"> <li>• Direct seeding of rice /re-transplanting of rice .Mat nursery (dapog method)/ Community nursery can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August</li> <li>• Use of 20 days old dapog seedling in rice.</li> <li>• Supply of contingency crop seeds of Toria, Maize (QPM varieties, Swann composite-65-70 days; HM-4 hybrid baby corn), Arhar (Bahar, NDA1, Pusa 9), Urd (Navin and T9), Cowpea and Horsegram need to be ensured for taking up of sowing in September in midlands Fodder varieties of Jowar, Maize, Bajra in combination with legumes (cowpea and horsegram) can be taken up wherever feasible to meet the fodder requirements in deficit rainfall districts</li> </ul>
	Lowland (Heavy tex. soil)	Rice- BoroRice	Rice-Boro Deep water cultivars.	<ul style="list-style-type: none"> <li>• Double transplanting of rice (karuhan) can be done with 30 + 45 days old seedlings of long duration or photosensitive varieties up to 30<sup>th</sup> August with close planting (40-45 hills per square meter)</li> </ul>



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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 (Light tex. soil)	Rice-Wheat	<ul style="list-style-type: none"> <li>• Gap filling of existing crop</li> <li>• Thinning</li> </ul>	<ul style="list-style-type: none"> <li>• Inter culture operation.</li> <li>• Foliar application of 2% MOP</li> <li>• Mulching for moisture conservation</li> <li>• Conservation tillage</li> <li>• Life saving irrigation</li> </ul>	Seeds from BRBN, BAU, Sabour, NSC, TDC
	Upland (Med. tex. soil)	Rice-Wheat			
	Medium land: (Med. Tex. soil)	Maize-wheat  <b>Maize -</b> Shaktiman-1,2,3,4,5, Suwan, Ganga-11, Deoki, Pusa early hybrid Maka-3	<ul style="list-style-type: none"> <li>• Gap filling</li> </ul>		
	Lowland (Heavy tex. soil)	Rice-wheat-Green gram  <b>Rice-</b> Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta	<ul style="list-style-type: none"> <li>• Gap filling through Dapog nursery</li> </ul>		

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)					

<b>spell, consecutive 2 weeks rainless (&gt;2.5 mm)</b>					
At vegetative stage	Upland (Light tex. soil)	Rice-Potato	<ul style="list-style-type: none"> <li>• Gap filling of existing crop</li> <li>• Postponement of top dressing</li> <li>• Spray (1%) Urea on the crops</li> </ul>	<ul style="list-style-type: none"> <li>• Inter cultivation</li> <li>• Mulching</li> <li>• Conservation tillage</li> <li>• Foliar application of 2% MOP</li> <li>• Life saving irrigation</li> </ul>	
	Upland (Med. tex. soil)	Rice –Wheat			
	Medium land (Med. Tex. soil)	Rice-wheat-Green gram			

<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>
At flowering/ fruiting stage	Upland (Light tex. soil)	Vegetables – Wheat	Postpone the top dressing	<ul style="list-style-type: none"> <li>• Inter cultivation</li> <li>• Mulching</li> <li>• Conservation tillage</li> <li>• Life saving irrigation</li> </ul>	
	Upland (Med. tex. soil)	Rice-Wheat	Clipping of maize leaves		
	Medium land (Med. Tex. soil)	Maize-wheat			
	Lowland (Heavy tex. soil)	Rice-wheat-green gram			

<b>Condition</b>			<b>Suggested Contingency measures</b>		
<b>Terminal drought (Early withdrawal of monsoon)</b>	<b>Major Farming situation</b>	<b>Normal Crop/cropping system</b>	<b>Crop management</b>	<b>Rabi Crop planning</b>	<b>Remarks on Implementation</b>
	Upland (Light tex. Soil and Med. tex. soil)	Rice-Wheat	<ul style="list-style-type: none"> <li>• Thinning</li> <li>• Foliar application</li> </ul>	Open the furrow during evening and left furrow open overnight and plank in the next morning before	Seeds from BRBN, BAU, Sabour, NSC,

	Medium land: (Med. Tex. soil)	Maize-wheat	of 2% MOP • Mulching • Life saving irrigation	sunrise for growing of early rabi crops like wheat, Rabi Maize/Pulses /Oilseeds/ Vegetables	TDC
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### 2.1.2 Drought - Irrigated situation

Condition	Suggested Contingency measures				
	Major Farming situation <sup>f</sup>	Normal Crop/cropping system <sup>g</sup>	Change in crop/cropping system <sup>h</sup>	Agronomic measures <sup>i</sup>	Remarks on Implementation <sup>j</sup>
Delayed release of water in canals due to low rainfall	Not Applicable				
Limited release of water in canals due to low rainfall	Not Applicable				
Non release of water in canals under delayed onset of monsoon in catchment	Not Applicable				
Lack of inflows into tanks due to insufficient /delayed onset of monsoon	Not Applicable				
Insufficient groundwater recharge due to low rainfall	Not Applicable				

**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>				
Rice	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Re transplanting through Dapog nursery seedlings</li> <li>• Gap filling</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Gap filling with 40-45 days old seedlings</li> <li>• Kharuhan (double transplanting)</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Harvest at physiological maturity</li> <li>• Lentil as paira crop can be taken</li> </ul>	Storage at safer place
Maize	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Re sowing</li> <li>• Gap filling</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Harvest at physiological maturity</li> </ul>	Storage at safer place
Vegetables	<ul style="list-style-type: none"> <li>• Re sowing</li> <li>• Re planting</li> </ul>	<ul style="list-style-type: none"> <li>• Provide management</li> </ul>	<ul style="list-style-type: none"> <li>• Provide management</li> </ul>	Storage at safer place
<b>Horticulture</b>				
Mango	<ul style="list-style-type: none"> <li>• Replanting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>	Provide drainage	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	
Banana	<ul style="list-style-type: none"> <li>• Replanting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>	Provide drainage	Provide drainage	
<b>Heavy rainfall with high speed winds in a short span<sup>2</sup></b>				
Rice	<ul style="list-style-type: none"> <li>• Gap filling</li> <li>• Re sowing</li> </ul>	<ul style="list-style-type: none"> <li>• Replanting through Kharuhan method (double transplanting) by 3-4 seedlings per hill</li> <li>• Short duration rice variety</li> </ul>	<ul style="list-style-type: none"> <li>• Toria/Late wheat if completely damaged</li> </ul>	Storage at safer place
Maize	<ul style="list-style-type: none"> <li>• Re-sowing</li> </ul>		<ul style="list-style-type: none"> <li>• Toria/Late wheat if completely damaged</li> </ul>	Storage at safer place

vegetables	Gap filling Provide drainage	• Provide drainage	• Provide drainage	
<b>Horticulture</b>				
Mango	Provide drainage	Provide drainage	• Harvest at proper time • Provide drainage	
Banana				
<b>Outbreak of pests and diseases due to unseasonal rains</b>				
Rice	❖ Seedling treatment with granular insecticide – Cartap hydrochloride or phorate 10G or carbofuran 3G. ❖ Maintain shallow water in nursery beds ❖ Providing good drainage.	❖ Use copper fungicides against Bacterial leaf blight. ❖ Split application of N fertilizer (3-4 times)	❖ Harvest at physiological maturity	Proper drying and safe storage
Maize	❖ Drainage, and yellowing mainly due to nitrogen deficiency apply N split doses ❖ Application of granular insecticides viz. Thimet 10g, or Carbofuran 3g. in whorl of maize	❖ Foliar blight control through Mancozeb @ 2.5g/l or Zineb/ Maneb @ 2.5-4 g/lit of water (2-4 applications at 8-10 days interval)	❖ Cob harvesting from standing crop ❖ Harvest at physiological maturity	❖ Storage in safe places like farmer warehouse/tent covering of produce ❖ Ensure 10-12% moisture in grains before storage ❖ Proper drying
<b>Horticulture</b>				
Vegetables	• Drainage management	• Drainage management	• Drainage management	

Mango	<p><b>Anthracnose:-</b> The foliar infection can be controlled by spraying of copper oxychloride (0.3%)</p> <p>Use bio control agent viz <i>Streptosporangium pseudovulgare</i></p> <p><b>Bacterial canker:</b> Regular inspection of orchards, sanitation and seedling certification are recommended as preventive measures. Mango stones for raising seedlings (root stock) should always be taken from healthy fruits. Use of wind-breaks helps in reducing brushing/ wounding and thus reduces the chance of infection.</p>	<p><b>Anthracnose:-</b> Apply Carbendazim/ Thiophanate methyl (1g/lit) to control of Anthracnose. Blossom infection can be controlled effectively by spraying of Bavistin (0.1%) at 15 days interval.</p> <p><b>Mango powdery mildew:</b> Spray wettable sulphur(0.2%) &amp; calixin or karathane (0.1% ) during second week of December</p>	<p><b>Mango powdery mildew:</b> Prune diseased leaves and malformed panicles harbouring the pathogen to reduce primary inoculum load.</p> <p>Spray wettable sulphur (0.2%) when panicles are 3-4" in size</p> <p>Spray dinocap (0.1%) 15-20 days after first spray. Spray tridemorph (0.1%) 15-20 days after second spray.</p> <p>Spraying at full bloom needs to be avoided.</p> <p><b>Mango bacterial canker:</b> Three sprays of Streptocycline (200 ppm) at 10 days intervals reduce fruit infection.</p> <p>In severe infection, spraying of Streptocycline (300 ppm) or copper oxychloride (0.3%) is more effective.</p>	<p>Harvest at proper time</p> <p><b>Anthracnose:-</b> Pre-harvest sprays of hexaconazole (0.01%) or Carbendazim (0.1%) at 15 days interval should be done in such a way that the last spray falls 15 days prior to harvest.</p> <p>Diseased leaves, twigs, and fruits, should be collected and burnt to avoid the spread for next season</p>
Banana	Provide drainage	Provide drainage	Harvest at proper time	

### 2.3 Floods

Condition	Suggested contingency measure <sup>o</sup>			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation <sup>1</sup>				
Water logging/Partial inundation				
Rice	• Provide drainage	• Provide drainage	• Provide drainage	Storage at safer place

	<ul style="list-style-type: none"> <li>• Re transplanting through Dapog nursery seedlings</li> <li>• Gap filling</li> </ul>	<ul style="list-style-type: none"> <li>• Gap filling</li> <li>• 40-45 days old seedlings may be used</li> <li>• Kharuhan (double transplanting) mehod</li> </ul>	<ul style="list-style-type: none"> <li>• Harvest at physiological maturity</li> <li>• Lentil as paira crop can be taken</li> </ul>	
Maize	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Re sowing</li> <li>• Gap filling</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Harvest at physiological maturity</li> </ul>	Storage at safer place
<b>Horticulture</b>				
Mango	<ul style="list-style-type: none"> <li>• Re planting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>
anana	<ul style="list-style-type: none"> <li>• Replanting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Replanting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>
<b>Continuous submergence for more than 2 days<sup>2</sup></b>				
Rice	<ul style="list-style-type: none"> <li>• Gap filling,</li> <li>• Re sowing</li> </ul>	<ul style="list-style-type: none"> <li>• Replanting through Kharuhan (double transplanting) method by 3-4 seedlings per hill</li> <li>• Short duration rice variety</li> </ul>	<ul style="list-style-type: none"> <li>• Toria/Late wheat if completely damaged</li> </ul>	Storage at safer place
Maize	<ul style="list-style-type: none"> <li>• Re sowing</li> </ul>	<ul style="list-style-type: none"> <li>• Re sowing or gap filling</li> </ul>	<ul style="list-style-type: none"> <li>• Toria/Late wheat if completely damaged</li> </ul>	Storage at safer place
<b>Horticulture</b>				
Mango	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>			
Banana	<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>			
<b>Sea water intrusion<sup>3</sup></b>	Not Applicable			

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

Extreme event type	Suggested contingency measure <sup>r</sup>			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Heat Wave <sup>p</sup>				

Maize	Provide irrigation	Provide irrigation	Provide irrigation	
Pigeonpea	Provide irrigation	Provide irrigation	Provide irrigation	
Wheat			Provide irrigation (Terminal heat)	
<b>Horticulture</b>				
Mango	Provide irrigation	Provide irrigation	Provide irrigation	
Litchi	Provide irrigation	Provide irrigation	Provide irrigation	
Papaya	Provide irrigation	Provide irrigation	Provide irrigation	
<b>Cold wave<sup>a</sup></b>				
Wheat		Provide irrigation , Mulching		
Maize		Provide irrigation , Mulching		
Mustard		Provide irrigation , Mulching		
Potato		Provide irrigation , Mulching		
Pulses		Provide irrigation , Mulching		
<b>Horticulture</b>				
Bhendi		Provide irrigation, Mulching		
Brinjal		Provide irrigation, Mulching		
Chili		Provide irrigation , Mulching		
Tomato		Provide irrigation ,Mulching		



Lauki		Provide irrigation , Mulching		
<b>Frost</b>		Provide irrigation, Mulching		
Wheat		Provide irrigation, Mulching		
Chickpea		Provide irrigation , Mulching		
Pigeonpea		Provide irrigation , Mulching		
Lentil		Provide irrigation , Mulching		
<b>Horticulture</b>				
Bhendi		Provide irrigation , Mulching		
Brinjal		Provide irrigation , Mulching		
Chilli		Provide irrigation , Mulching		
Tomato & Potato		Earthing up Provide irrigation , Mulching		Harvest in dry weather
<b>Hailstorm</b>		Not Applicable		

## 2.5 Contingent strategies for Livestock, Poultry & Fisheries

	Suggested contingency measures		
	Before the event <sup>s</sup>	During the event	After the event
<b>Drought</b>			
Feed and fodder availability			
Drinking water			
Health and disease management			

Floods			
Feed and fodder availability	<ol style="list-style-type: none"> <li>1. Cultivation of fodder tree</li> <li>2. Storage of Improved Quality Fodder</li> <li>3. Conservation &amp; Storage of <ul style="list-style-type: none"> <li>• Feed &amp; Fodder</li> <li>• Hay &amp; Silage: — Preserve the fodder in the form of hay from Berseem &amp; other grasses as well as silage from</li> </ul> <ol style="list-style-type: none"> <li>(a) Maize- harvesting at well developed cob.</li> <li>(b) Jowar - at flowering stage.</li> <li>(c) Oat</li> <li>(d) Hybrid Napier – 40-45 day old.</li> <li>(e) Water hycianth mixing with Rice straw in ratio of 4:1 with 70 kg molasses /ton of clean water hycianth.</li> <li>(f) Potato leaves mixing with wheat straw in ratio of 7:1 and should be supplemented with 3% molasses.</li> </ol> <p><b>Hay: –</b></p> <ul style="list-style-type: none"> <li>• Berseem/Lucerne and other grasses.</li> <li>• Bales of hay and other dry fodder should be stored in dry places at a height of last flood level and covered with asbestos sheet or polythene sheet.</li> </ul> </li> <li>4. <b>Development &amp; storage of: –</b> <ol style="list-style-type: none"> <li>(a) Complete Feed Block (CFB)</li> <li>(b) Urea-Molasses-Mineral-Block (U.M.M.B)</li> </ol> </li> <li>5. Development of Fodder Bank</li> </ol>	<ol style="list-style-type: none"> <li>1. Feeding of Complete Feed Block</li> <li>2. Feeding of Urea-Molasses-Mineral-Block &amp; Fodder</li> <li>3. Feeding of stored Hay/Silage/Improved Quality Fodder</li> <li>4. Feeding of Tree leaves some of which are as follows: <ol style="list-style-type: none"> <li>1. Bamboo leaves</li> <li>2. Neem</li> <li>3. Bargad</li> <li>4. Peepal</li> <li>5. Seesam</li> <li>6. Subabul</li> </ol> </li> </ol> <p><u>Use of unconventional feed stuff:</u></p> <ol style="list-style-type: none"> <li>(i) Aquatic Plants – water hycianth</li> <li>(i) Lotus</li> <li>(ii) Aquatic weeds</li> </ol>	Production of forage crops <ol style="list-style-type: none"> <li>1. Balanced feeding of Animal supported with little higher concentrate mixture</li> <li>2. Cultivation of fodder Rabi maize if water stagnated upto Nov/ December</li> <li>3. Jowar/Cowpea</li> <li>4. Maize in September</li> </ol>
Drinking water			

<p>Health and disease management</p>	<p><b>Veterinary Preparedness with Medicines, Vaccines and provision for mobile ambulatory van.</b></p> <ul style="list-style-type: none"> <li>• <b>Vaccination</b></li> </ul> <p>During flood stress becomes an incriminating factor for the precipitation of diseases in livestock and poultry.</p> <p>So, necessary vaccination of livestock and poultry should be done against economically important contagious disease.</p> <p>This will be helpful not only to check epidemic in animals, but also to reduce the probability of zoonoses in human beings.</p> <p>Care should be taken for mass vaccination of livestock and poultry with a view to covering 80% of livestock population in order to achieve herd immunity.</p> <p>Mass vaccination should be conducted by a team of Department staff with proper maintenance of detailed Inoculation Register.</p> <p>Pro-active steps should be taken to receive and stock the required doses of vaccines against different diseases for their use in face of Flood.</p>	<p><b>Animal safety, Health camp and Treatment</b></p> <p><b>Important Suggestions for animal and Poultry safety</b></p> <p>During flood, all efforts should be made to rescue most of the livestock and poultry as carefully as possible.</p> <p>The people should be made conscious through announcement with the help of mikes or other means of communication, so that they may escape with their livestock and poultry to safe area.</p> <p>The fisherman or the people who knows swimming should be deputed for the rescue of drowning and floating animals and birds.</p> <p>During flood do not leave halter or headstalls on animals.</p> <p>Do not tie animals together when releasing.</p> <p>Report the location, identification and disposition of livestock and poultry to authorities handling the disaster.</p> <p><b>Health camp and treatment</b></p> <p>Water borne diseases are one of the most common phenomena during the flood</p> <p>Diarrhoeal diseases outbreaks can</p> <p>Report the location, identification</p>	<p><b>Sanitation, deworming, treatment, health camps Culling of Sick animals and disposal of carcass</b></p> <p><b>Maintenance of Sanitation:</b></p> <p>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. Arrangements should be made accordingly.</p> <p><b>De-worming after the flood:</b></p> <p>Immediately after flood, the animals like cattle, buffalo. Sheep, goat, pig, dog and poultry need to be de-wormed with suitable broad spectrum anthelmintics. This will enable the animals to regain proper health.</p> <p>In water logged area, sucks can be introduced as biological control measures against snails to protect livestock from parasitec disease.</p> <p><b>Treatment of sick animals:</b></p>
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		<p>and disposition of livestock and poultry to authorities handling the disaster.</p> <p><b>Health camp and treatment</b></p> <p>Water borne diseases are one of the most common phenomena during the flood</p> <p>Diarrhoeal diseases outbreaks can occur after drinking contaminated water.</p> <p>Diseases that can occur during flood should be given special attention and accordingly medicines should be available in the health camp for the following mentioned diseases.</p> <p>Salmonella spp. Escherichia coli Giardiasis Amoebiasis Rotavirus Leptospirosis Scabies Black leg Malignant Edema Foot rot Anthrax Botulism Tetanus Red water Black disease Entertoxemia Liver fluke Amphistomiasis Brooders pneumonia</p>	<p>The <b>Disposal of Carcass:</b> the disposal of dead animals and birds are to be done by Animal Husbandry Department. Accordingly, necessary arrangement should be made for prompt and easy disposal of carcasses during the Flood and Post-Flood period.</p> <p>Carcasses of animals affected by the disease are the chief source of soil infection. They harbour the germs in large numbers and liberate them from both artificial and natural body openings into the surrounding soil.</p> <p><b>Methods of Carcass disposal to be adopted</b></p> <p><b>Burial</b> <b>Burning</b> <b>Composting</b> <b>Vulturing</b></p> <p><b>s. Health Camp after the flood:</b></p> <p>Protection of livestock from out breaking and communicable diseases be made. Health camps are to be organised in Flood affected areas to restore the normal breeding capability of breedable population as well as to restore the normal health of livestock and poultry.</p>
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<b>Cyclone</b>			
<b>Heat wave and cold wave</b>			

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

## 2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event <sup>a</sup>	During the event	After the event	
<b>Drought</b>				
<b>Floods</b>				
Shortage of feed ingredients				
Drinking water				
Health and disease management	<b>Vaccines to be used for different animals and Poultry</b>			

	<p><b>Cattle and Buffalo</b>  Hemorrhagic Septicemia Vaccine  Black Quarter Vaccine  FMD Vaccine  Anthrax Vaccine as per endemicity.</p> <p style="text-align: center;"><b>Sheep and Goat</b></p> Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity <p style="text-align: center;"><b>Pigs</b></p> Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity. <p style="text-align: center;"><b>Dogs</b></p> Rabies Vaccine <p style="text-align: center;"><b>Poultry</b></p> Mareks disease vaccine RDV (F <sub>1</sub> & R <sub>2</sub> B), FPV, IBRV & IBDV <p style="text-align: center;"><b>( Annexure-1)</b></p> <ul style="list-style-type: none"> <li>• <b>Medicines</b></li> </ul> All Districts should be earmarked for flood. <p>An inventory of required medicines to treat the affected livestock in case of eventualities should be made.</p>			
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	<p>The Govt. should take steps to procure sufficient quantity of essential life saving medicines.</p> <p><b>List of life saving Medicines</b></p> <p>Corticosteroids  Nikethamide  Antibloat  Adrenaline  Antihistaminic  Antidotes for common poisoning  Antisnake venom  Broad spectrum antibiotics  Anti-inflammatory  Antipyretic and Analgesics  Fluids and Electrolytes</p> <p style="text-align: center;">• <b>Mobile Veterinary Clinics</b></p> <p>Mobile Veterinary Clinics should be kept ready at Veterinary Hospital or Veterinary Camps so that immediate treatment of injured and affected animals may be done.</p> <p>For this MVC must have adequate drugs like antibiotic, analgesic, dewormer, ointment, antisnake venom and emergency health care facilities along with trained personnel.</p> <p>A good no. of mobile clinic teams should be planned consisting dedicated and experienced technical workers with allotment of area of operation.</p> <p>The teams should be kept in readiness <b>having required stock of medicines and equipment</b> to work in any adverse situation.</p> <p>A telephone directory should be maintained at the District level by collecting the telephone nos. of Vets, Para-Vets, NGOs / youth clubs / societies, volunteers etc. to collect feedback and plan the activities during the emergency.</p> <p>An emergency kit for poultry should be made ready well in advance. The Poultry kit should have Cage, mask, mash,</p>			
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	pellet feed trough, waterers, detergents, poultry vaccines, Veterinary drugs, workers protection uniform etc.			
<b>Cyclone</b>				
<b>Heat wave and cold wave</b>				

<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>			
<b>B. Aquaculture</b>			
(i) Shallow water in ponds due to insufficient rains/inflow	(i) Thinning of population (ii) Arrangement of water supply from external resource	(i) Partial harvesting (ii) Addition of water (iii) Stocking of air breathing fishes	(i) Maintenances of remaining stock till favorable condition achieved (ii) If not feasible, total harvesting or transfer of fishes may be done. (iii) Preparation of the pond for next crop.
(ii) Impact of salt load build up in ponds / change in water quality	(i) Regular monitoring of water quality parameter. (ii) Arrangement of aeration (iii) Addition of water from external resource	(i) Arrangement of aeration. (ii) Addition of water (iii) Monitoring of water quality (iv) Reduction of manuring according to water level.	
<b>2) Floods</b>			
<b>A. Capture</b>			
<b>B. Aquaculture</b>			
(i) Inundation with flood water	(i) Elevation/ Renovation of pond dyke. (ii) Sale of Table/marketable size fishes (iii) construction of earthen nursery ponds in upland areas	Collection of naturally bred seeds (Spawn /fry /fingerling) from flooded water Stocking in nursery ponds for rearing	-Retain the water in pond immediately after flood through repairing of damaged dyke etc. -Netting of pond -Removal of unwanted, predatory/weed fishes -Sell of large size fishes
(ii) Water contamination and changes in water quality	Arrangement of regular water quality monitoring		



(iii) Health and diseases	(a) Use lime/ potassium permanganate (b) Arrangement of CIFAX and medicines & chemical stock		-Sampling of fishes and water for disease analysis - Liming, use of drugs/ medicine if required in consultancy of fisheries experts
(iv) Loss of stock and inputs (feed, chemicals etc)	Raising the height of dyke by fencing with net and bamboo poles to prevent loss of stock	Arrangement of advance size fingerling/ yearlings for stocking	Stocking of large size fingerlings carp Fertilization of pond and regular feeding of fish Harvesting and sale of fish
(v) Infrastructure damage (pumps, aerators, huts etc)	Repairing/ arrangement of alternate safe place to keep pumps aerators etc.	A regular water on the flood and infrastructure facilities.	Re establishment of the infra structural facility.
<b>3. Cyclone / Tsunami</b>			
<b>4. Heat wave and cold wave</b>			

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