

**State: BIHAR**  
**Agriculture Contingency Plan for District: BHAGALPUR**

<b>1.0 District Agriculture profile</b>				
1.1	Agro-climatic/Ecological Zone	Eastern Plain, Hot Subhumid (moist) Eco-Region (13.1)		
	Agro-Climatic Zone (Planning Commission)	Middle Gangetic Plain Region (IV)		
	Agro Climatic Zone (NARP)	South Bihar Alluvial Plain Zone (BI-3)		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Zone-III (Bhagalpur, Kaimur, Banka, Shekhpura, Munger and Jamui)		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		25 <sup>0</sup> 7' to 25 <sup>0</sup> 30' N	86 <sup>0</sup> 37' to 87 <sup>0</sup> 30' E	42.9 m
	Name and address of the concerned ZRS/ZARS/RARS/RRS/RRTTS			
	Mention the KVK located in the district with address	Programme Co-ordinator, Krishi Vigyan Kendra, Sabour, Bhagalpur, Pin – 813 210		
Name and address of the nearest Agromet Field Unit (AMFI, IMD) for agro-advisories in the Zone	Bihar Agricultural College, Sabour, Bhagalpur			

1.2	Rainfall	Normal RF (mm)	Normal onset	Normal Cessation
	SW monsoon (July-Sept)	992	3 <sup>rd</sup> week June	3 <sup>rd</sup> week of October
	NE monsoon (Oct-Dec)	97		
	Winter (Jan-Feb)	26		
	Summer (Mar-May)	93		
	Annual	1208		

1.3	Land Use pattern of the district (latest statistics)	Geographic 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
	<b>Area ('000 ha)</b>	248.2	153.6	0.78	51.5	.63	2.3	6.57	22.6	7.2	3.2

Source : CDAP, Bhagalpur & Dist. Agril. Office, Bhagalpur

1.4	Major Soils	Area ('000 ha)	Percentage (%) of total
	Sandy Soils	20.594	13.78
	Coarse Sandy Loam Soils	28.719	19.22
	Fine Sandy Loam Soils	44.836	30.00
	Clayey Soils	34.980	23.41

	Saline/ Calcareous Soils	20.294	13.58
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1.5	<b>Agricultural land use</b>	<b>Area ('000 ha)</b>	<b>Cropping intensity %</b>
	Net sown area	153.6	125
	Area sown more than once	39.0	
	Gross cropped area	191.1	

1.7 Area under major field crops & horticulture

1.6	<b>Irrigation</b>	Area ('000 ha)		
	Net irrigated area			
	Gross irrigated area	54		
	Rainfed area			
	<b>Sources of Irrigation</b>	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals		6	
	Tanks		4	
	Open wells		35	
	Bore wells		26	
	Lift irrigation schemes			
	Micro-irrigation			
	Other sources		8	
	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	16		Safe	
Wastewater availability and use				
Ground water quality				

\*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%

1.7	Major Field Crops cultivated	Area ('000 ha)						Summer	Grand Total
		Kharif			Rabi				
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total		
Rice			55.1					55.1	
Wheat						49.8		49.8	
Maize			64.9			51.3		116.2	
Lentil						3.5		3.5	
Blackgram			1.3					1.3	
Mustard						2.8		2.8	
Barley						0.4		0.4	

	Horticultural crops – Fruits	Area ('000 ha)		
		Total	Irrigated	Rainfed
	Mango	7.2		
	Guava	0.6		
	Litchi	0.4		
	Lemon	0.9		
	Banana	1		
		Total	Irrigated	Rainfed
	Total fodder crops area			
	Grazing land	2221		
	Sericulture etc			

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (local low yielding)			301.2
	Improved cattle			10.5
	Crossbred cattle			44.3
	Non descriptive Buffaloes (local low yielding)			94.3
	Descript Buffaloes			1.2
	Goat			349.6
	Sheep			0.7
	Other (Camel, Pig, Yak etc.)			4.9
	Commercial dairy farms (Number)			

1.9	Poultry	No. of farms	Total No. of birds ('000)
	Commercial		454.7
	Backyard		

1.10	Fisheries (Data source : Chief Planning Officer)
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<b>A. Capture</b>						
i) Marine (Data Source Fisheries Department)	No. of fishermen	Boats		Nets		Storage facilities (Ice plants etc.)
ii) Inland (Data Source Fisheries Department)	No. Farmer owned ponds		No. of Reservoirs		No. of village tanks	
	652		1423		771	
<b>B. Culture</b>						
			Water Spread Area		Yield (t/ha)	Production ('000 tons)
i) Brackish water (Data Source : MPEDA/Fisheries Department)						
ii) Fresh water (Data Source : Fisheries Department)						
			805.4		3.2	1277.4

### 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 (Crop identified based on total acreage)</b>										
	Rice	129.2	2342					129.2	2342	
	Wheat			124.7	2500			124.7	2500	
	Maize	64.9	1950	51.4	3500			116.3	5450	
	Lentil			3.5	1000			3.5	1000	
	Mustard			1.9	700			1.9	700	
	Black gram	0.06	700					0.06	700	
<b>Major Horticultural crops (Crops identified based on total acreage)</b>										
	Mango							68.7		
	Banana							48.5		
	Guava							5.9		
	Lemon							7.0		

Source : Distt. Agriculture Office, Bhagalpur

1.12	Sowing window for 5 major field crops (start and end of normal sowing period)	Rice	Wheat	Maize	Lentil	Blackgram
	Kharif – Rainfed	June to July	-	June to July	-	-
	Kharif – Irrigated	June to July	-	May to June	-	-
	Rabi – Rainfed	-	3 <sup>rd</sup> week October – 2 <sup>nd</sup> week of November	3 <sup>rd</sup> week Oct. – 2 <sup>nd</sup> week of Nov	October to November	August - September
	Rabi – Irrigated	-	2 <sup>nd</sup> week of November –	October -	2 <sup>nd</sup> week of October -	-

			1 <sup>st</sup> week of January	November	2 <sup>nd</sup> week of December	
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1.13	What is the major contingency the district is prone to? (Tick mark)	Regular	Occasional	None
	Drought		√	
	Flood	√		
	Cyclone			√
	Heat wave	√		
	Cold wave	√		
	Hailstorm			√
	Frost	√		
	Sea water intrusion			√
	Pests and disease outbreak	√		

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

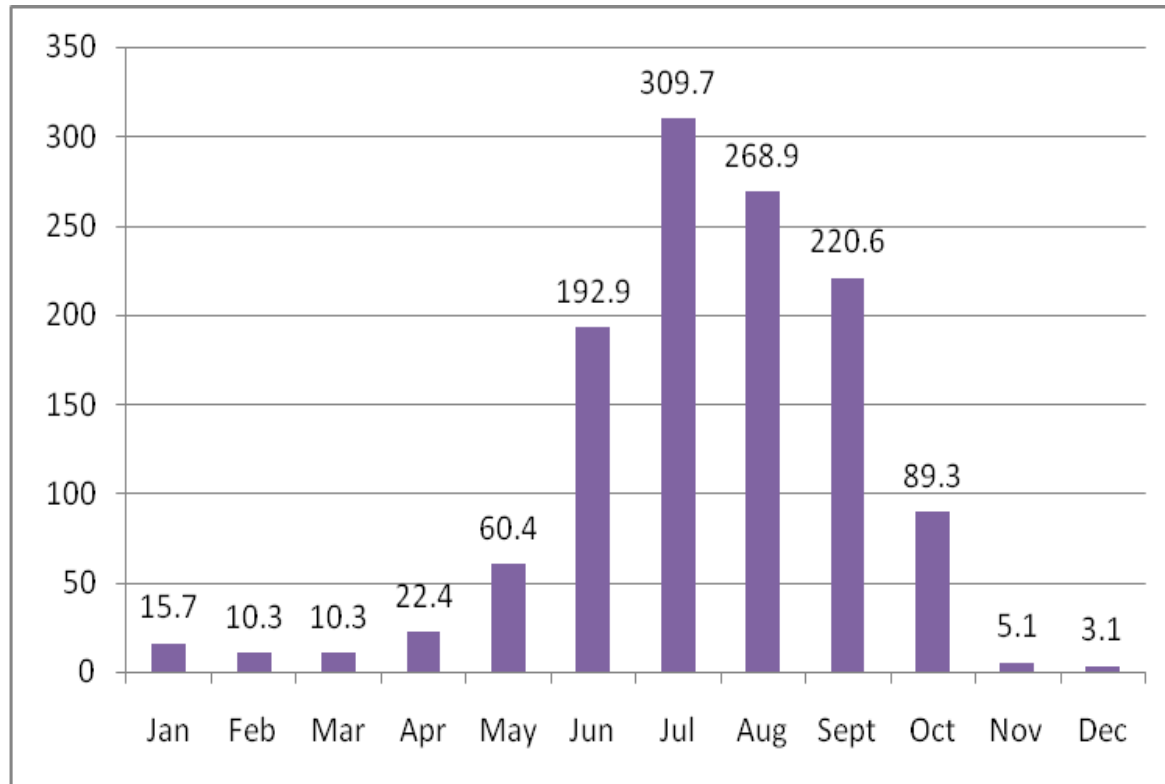
**Annexure I  
Agro climatic Zones of Bihar**



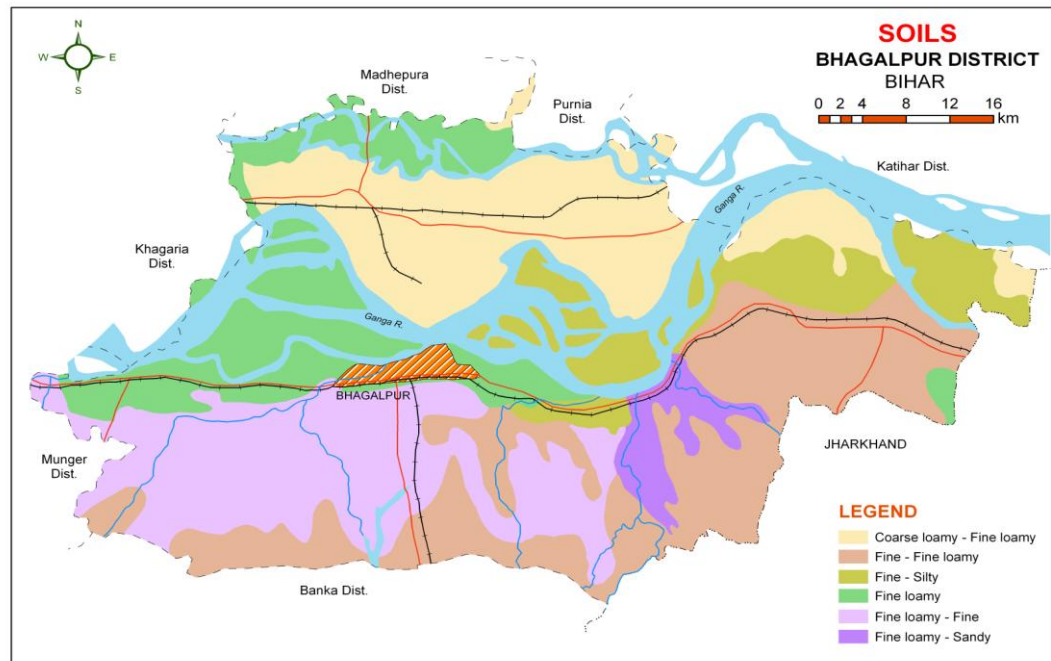
Source: krishi.bih.nic.in

**Annexure-II**

**Mean annual rainfall (mm)**



### 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 <sup>c</sup> including variety	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)  Delay by 2 weeks  1 <sup>st</sup> week of July	1. Upland	Rice – Wheat Kharif Maize – Wheat	Rice – Wheat Rice – Wheat – Summer blackgram Pigeonpea – Blackgram Kharif Maize – Wheat  Rice : Prefer medium to long duration varieties Pigeonpea : Malviya – 13, Narendra Arhar – 1, Bahar, P – 9 Kharif Maize : Saktiman – 1, 2, Suwan, Devki	<ul style="list-style-type: none"> <li>• Direct sowing of rice can be done</li> <li>• Normal package of practices should be followed</li> <li>• Seed treatment with Rhizobium culture for Pulse crops</li> <li>• Drum seeding may also be used</li> <li>• Life saving irrigation</li> </ul>	-
	2. Medium land	Rice- Wheat	Rice-Wheat Rice : Prefer medium to long duration varieties	<ul style="list-style-type: none"> <li>• Normal package of practices should be followed</li> <li>• Direct seeding of sprouted seed can be done</li> </ul>	
	3. Lowland	Rice – Wheat	Rice – Wheat Rice : Prefer medium to long duration varieties	<ul style="list-style-type: none"> <li>• Drum seeding may also be used</li> <li>• Life saving irrigation</li> </ul>	

Condition	Major Farming situation	Normal Crop / Cropping system	Suggested Contingency measures		
			Change in crop / cropping system <sup>c</sup> including variety	Agronomic measures	Remarks on Implementation
Early season drought					



Delay by 4 weeks  3 <sup>rd</sup> week of July	1.Upland	Rice- Wheat	Rice – Wheat Pigeonpea – Blackgram  Rice- Prefer Medium to short duration varieties like Saroj (100-110d), Birsa Dhan-201 (100-115d)  Pigeonpea– Malviya – 13,NDA – 1, Bahar, Pusa – 9	<ul style="list-style-type: none"> <li>• Direct seeding of rice with medium duration drought tolerant varieties with pre emergence herbicide application under sufficient soil moisture conditions followed up with a post-emergence weedicide application 20-25 days later for effective weed management.</li> <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> <li>▪ Drum seeding may also be used</li> </ul>	Seeds from RAU, Pusa, NSC, TDC , BRBN, BAC, Sabour etc.
	2. Medium land	Rice – Wheat	Rice-Wheat  Direct sowing / 20d old dapog seedlings with medium to short duration varieties – BR34, Rajendra Dhan-201(130-135d), Rajendra Bhagwati, Saroj, Rajendra Suwasni, Santosh, R. Kasturi, Sita	<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>	
	3. Low land	Rice – Wheat	Rice – Wheat  Rice- Direct/ dapog seedlings with Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta, Swarna sub-1  (130-140 days long duration variety should be selected)	<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 low lands</li> <li>• Raise staggered community nursery preferably with short duration varieties in mid and</li> </ul>	

				lowlands <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>• Enhanced dose of nitrogen with full basal dose of NPK at the time of transplanting to boost the early vegetative growth in late plantings under sufficient moisture</li> <li>• Timely interculture for weed control in direct seeded rice</li> <li>• Life saving irrigation</li> </ul>	
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Condition		Suggested Contingency measures			
Early season drought	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 6 weeks  1 <sup>st</sup> Week of August	1.Upland/Medium land	Rice- Wheat	Rice – Wheat Pigeonpea + Blackgram Pigeonpea +Kulthi Blackgram/Finger millet – Wheat  Rice – Prabhat, Richharia, Dhanlaxmi, Turanta Pigeonpea – Bahar Blackgram – Samrat, PDM – 54, Sona, SML 668, Finger millet – RAU-7&8	<ul style="list-style-type: none"> <li>• SRI &amp; Dapog seedlings can be used under moist soil conditions of midlands</li> <li>• Direct seeding of Rice               <ul style="list-style-type: none"> <li>▪ Direct Seeding of sprouted seed may be used.</li> <li>▪ Drum seeding may also be used</li> </ul> </li> <li>• Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions in severely affected districts               <ul style="list-style-type: none"> <li>▪ Inter cultivation</li> <li>▪ Mulching</li> </ul> </li> <li>• Life saving irrigation</li> </ul>	Seeds from NSC, TDC , BRBN, BAC, Sabour etc.
	2.Low land	Rice – Pulse crop	Rice – Pulse crop Rice – Sita, Rajendra, Swaswani, Rajshree, Santosh, Rajendra Sweta,	<ul style="list-style-type: none"> <li>• Mat nursery (dapog method)/ Community nursery can be raised for quick availability of young seedlings for</li> </ul>	

			Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj  If dry spell continues, direct seeding of Short duration rice varieties (100 days) can be done in midlands by first fortnight of August and extra Short duration (70-75 days) up to 25 <sup>th</sup> August	transplanting of medium duration varieties by first fortnight of August <ul style="list-style-type: none"> <li>• Direct seedling of Rice</li> <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 in severely affected districts</li> <li>• Life saving irrigation</li> </ul>	
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Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
Early season drought	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 8 weeks  3 <sup>rd</sup> week of August	1.Upland	Rice- Wheat	Rice – Late Wheat Sept. Pigeonpea – Blackgram  Rice – Turanta, Prabhat, Dhanlaxmi, Richharia  Pigeonpea – Sarad,, P – 9	<ul style="list-style-type: none"> <li>▪ Prefer extremely short duration rice should be selected</li> <li>▪ Application of organic manures &amp; vermi compost initially for Rice and others.</li> <li>▪ Direct seeding of sprouted seed.</li> <li>▪ Enhanced basal dose of NPK by 20-25% in rice to boost early vegetative growth.</li> <li>▪ Life saving irrigation</li> </ul>	Seeds from RAU, Pusa, NSC, TDC , BRBN, BAC, Sabour etc.
	2. Medium land	Rice – Wheat Maize – Pigeonpea	Sunflower – Rabi Maize Sunflower – Late Wheat Sept. Pigeonpea – Blackgram  Sunflower – cv. Morden, Paradevik, Surya Pigeonpea – P – 9, Sarad	<ul style="list-style-type: none"> <li>• Direct sowing of rice</li> <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> </ul>	

				<ul style="list-style-type: none"> <li>• Use of 20 days old dapog seedling in rice.</li> <li>• Enhanced basal dose of NP in rice to boost early vegetative growth after receipt of rainfall</li> <li>• Application of organic manures &amp; vermi compost initially for Rice &amp; other crops.</li> <li>• Life saving irrigation</li> </ul>	
	Lowland	Rice-Wheat Rice-Lentil Rice- Chickpea	Rice short duration (Direct seeded)- Wheat  Rice- Prabhat, Dhanlaxmi, Richharia, Turanta	<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> <li>• Application of organic manure and vermi compost initially for Rice and other crops.</li> <li>• Sowing of <i>rabi</i> crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables can be taken up on time for maximizing productivity from lowlands with support from the government for timely supply of inputs and in a way <i>rabi</i> production would compensate the production loss during <i>kharij</i>.</li> <li>• Fodder varieties of Jowar, Maize, Bajra in combination with legumes (cowpea and horsegram) can be taken up wherever feasible to meet the</li> </ul>	

				fodder requirements in deficit rainfall districts	
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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.	1. Upland Very deep, calcareous fine loamy soils	Rice-Wheat  Rice- Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	<ul style="list-style-type: none"> <li>Life saving irrigation</li> <li>Gap filling of existing crop</li> <li>Thinning the excess population</li> </ul>	<ul style="list-style-type: none"> <li>Inter cultivation</li> <li>Mulching</li> <li>Conservation tillage</li> </ul>	Seeds from RAU, Pusa, NSC, TDC , BRBN etc
	2. Medium land	Maize-Wheat Maize - Shaktiman-1,2,3,4, Suwan, Ganga-11, Deoki, Pusa early hybrid Maka-3	<ul style="list-style-type: none"> <li>Life saving irrigation</li> <li>Gap filling</li> </ul>		
		Pigeonpea-Blackgram Pigeonpea – Bahar, Pusa-9, Narendra Arhar-I	<ul style="list-style-type: none"> <li>Pre sowing irrigation</li> <li>Prefer to sow with 25% higher seed rate</li> <li>Gap filling</li> </ul>		
	3. Lowland	Rice-Wheat-Greengram  Rice- Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta	<ul style="list-style-type: none"> <li>Life saving irrigation</li> <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 spell, consecutive 2 weeks rainless (>2.5 mm) period)					

At vegetative stage	1.Upland  Very deep, calcareous fine loamy soils	Rice-Potato Rice –Wheat Pigeonpea- Blackgram  Rice- Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj Pigeonpea – Bahar, Pusa-9 Narendra Arhar-I	<ul style="list-style-type: none"> <li>• Gap filling of existing crop,</li> <li>• Postponement of top dressing</li> </ul>	<ul style="list-style-type: none"> <li>• Inter cultivation</li> <li>• Mulching</li> <li>• Conservation tillage</li> <li>• Life saving irrigation</li> <li>• Spray of potassic fertilizer with adjuvant</li> <li>• Foliar spray (1%) Urea on the crops</li> </ul>	
	2) Medium land	Rice-Wheat-Greengram Rice - - Rajendra Bhagawati, Rajendra Suwasni Rajshree, Prabhat	<ul style="list-style-type: none"> <li>• Gap filling of existing crop</li> <li>• Postponement of top dressing</li> </ul>	-	

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	Upland  Very deep, calcareous fine loamy soils	Rice-Wheat Vegetables – Wheat  Rice-Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	<ul style="list-style-type: none"> <li>• Foliar application of 1% urea to boost up the vegetative growth</li> </ul>	<ul style="list-style-type: none"> <li>• Intercultivation</li> <li>• Mulching</li> <li>• Conservation tillage</li> <li>• Life saving irrigation</li> </ul>	
		2. Medium land	Maize-Wheat Maize - Shaktiman-1,2,3,4 Suwan, Ganga-11, Deoki,Pusa early hybrid Maka-3		
	Pigeonpea-Blackgram Pigeonpea : Var. Bahar, Narendra Arhar-I		<ul style="list-style-type: none"> <li>• IPM practices</li> </ul>		
	3. Lowland	Rice-Wheat-Green gram  Rice- Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta	-		

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Rabi Crop planning	Remarks on Implementation
Terminal drought (Early withdrawal of monsoon)					
	1. Upland  Very deep, calcareous fine loamy soils	Rice-Wheat  Rice-Prabhat, Dhanlaxmi, Richharia, Turanta , Saroj	<ul style="list-style-type: none"> <li>• Foliar spray of potassic fertilizer with adjuvant</li> <li>• Life saving irrigation</li> <li>• Mulching</li> <li>• Thinning</li> <li>• Clipping of leaves in maize</li> </ul>	Open the furrow during evening and left furrow open overnight and plank in the next morning before sunrise for growing of early rabi crops like wheat, Rabi Maize/Pulses /Oilseeds/ Vegetables	
	2. Medium land	Maize-wheat Maize - Shaktiman-1,2,3,4, Suwan, Ganga-11, Deoki, Pusa early hybrid Maka-3 Pigeonpea Var. Bahar, Narendra Arhar-1			
	3 Lowland	Rice-Wheat-Green gram  Rice- Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta			

### 2.1.2 Drought – Irrigated situation :

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed release of water in canals due to low rainfall	Not applicable				
Limited release of water in canals due to low rainfall					
Non release of water in canals under delayed onset of monsoon in catchment					

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Lack of inflows into tanks due to insufficient/delayed onset of monsoon					

Condition	Suggested Contingency measures				
	Major Farming situation <sup>f</sup>	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall	Upland Medium land Lowland	Not Applicable			

## 2.2 Unusual rain (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	Provide drainage	Provide drainage		
Maize	Provide drainage	Provide drainage		
Pigeonpea	Provide drainage	Provide drainage		
<b>Horticulture</b>	Provide drainage	Provide drainage		
Mango	Provide drainage	Provide drainage	Provide drainage	Safe storage and transportation
Litchi	Provide drainage	Provide drainage	Provide drainage	
Banana	Provide drainage	Provide drainage	Provide drainage	
Guava	Provide drainage	Provide drainage	Provide drainage	
<b>Heavy rainfall with high speed winds in a short span<sup>2</sup></b>				
Rice	Replanting with Dapog seedlings , Gap filling, Adopt Kharuhan (double			



	transplanting) method			
Maize	Earthing up			
Pigeonpea	Earthing up			
<b>Horticulture</b>				
Mango	Re planting	Provide wind breaks	Provide wind breaks	
Litchi	Re planting			
Banana	Re planting	Provide wind break	support with Bamboo plant	
Guava	Re planting	Provide wind break	Provide wind break	
<b>Outbreak of pests and diseases due to unseasonal rains</b>				
Rice	<ul style="list-style-type: none"> <li>❖ Seedling treatment with granular insecticide – Cartap hydrochloride or phorate 10G or carbofuran 3G.</li> <li>❖ Maintain shallow water in nursery beds</li> <li>❖ Providing good drainage.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use copper fungicides against Bacterial leaf blight.</li> <li>❖ Split application of N fertilizer (3-4 times)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Harvest at physiological maturity</li> </ul>	<ul style="list-style-type: none"> <li>Proper drying and safe storage</li> </ul>
Maize	<ul style="list-style-type: none"> <li>❖ Drainage, and yellowing mainly due to nitrogen deficiency apply N split doses</li> <li>❖ Application of granular insecticides viz. Thimet 10g, or Carbofuran 3g. in whorl of maize</li> </ul>	<ul style="list-style-type: none"> <li>❖ 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)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Cob harvesting from standing crop</li> <li>❖ Harvest at physiological maturity</li> </ul>	<ul style="list-style-type: none"> <li>❖ Storage in safe places like farmer warehouse/tent covering of produce</li> <li>❖ Ensure 10-12% moisture in grains before storage</li> <li>❖ Proper drying</li> </ul>
Pigeonpea	<ul style="list-style-type: none"> <li>❖ Provide drainage</li> <li>❖ Seed treatment with 1 g carbendazim +2g thiram/kg seed.</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>❖ Proper drying</li> <li>• Storage at safe place and transportation</li> </ul>
<b>Horticulture</b>				
Vegetables	<ul style="list-style-type: none"> <li>• Drainage management</li> </ul>	<ul style="list-style-type: none"> <li>• Drainage management</li> </ul>	<ul style="list-style-type: none"> <li>• Drainage management</li> </ul>	
Mango	<p><b>Anthracnose:-</b> The foliar infection can be controlled by spraying of copper oxychloride (0.3%)</p>	<p><b>Anthracnose:-</b> Apply Carbendazim/ Thiophanate methyl (1g/lit) to control of Anthracnose. Blossom infection can be</p>	<p><b>Mango powdery mildew:</b> Prune diseased leaves and malformed panicles harbouring the pathogen to reduce primary inoculum</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>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>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>	
Litchi	<p><b>Fruit Fly:</b> Monitor adult fruit flies emergence by using methyl eugenol or sex pheromone traps.</p>	<p><b>Fruit Fly:</b> First Spray delta menthrin 0.0025% plus molasses 0.1% . after 10-12 days spray fenthion 0.05% + molasses 0.1% followed by dimethoate 0.045% + molasses 0.1% if required</p>	Harvest at proper time	<p><b>Fruit Fly:</b> Collect all fallen infested fruits and put in a drum covered with fine wire mesh. Harvest fully matured fruits one week earlier to escape egg laying</p>
Banana			Harvest at proper time	
Papaya			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>				

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</li> <li>• 40-45 days old seedlings may be used</li> <li>• Adopt Kharuhan (double transplanting) method</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
Pigeonpea	<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>• Replanting</li> <li>• Gap filling</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	Judicious harvesting
Litchi	<ul style="list-style-type: none"> <li>• Gap filling</li> <li>• Replanting</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	Judicious harvest
Banana	<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>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	Judicious harvesting
Guava	<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>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	<ul style="list-style-type: none"> <li>• Drenching with copper fungicides</li> <li>• Provide drainage</li> </ul>	Judicious harvesting
<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) 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>			
Guava	<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 / Hailstrom / Cyclone

Extreme event type	Suggested contingency measure <sup>f</sup>			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
<b>Heat Wave<sup>p</sup></b>				
Maize	Provide irrigation	Provide irrigation	Provide irrigation	
Pigeonpea	Provide irrigation	Provide irrigation	Provide irrigation	
Wheat			Provide irrigation (Terminal heat)	
<b>Horticulture</b>				
Vegetables	Provide irrigation	Provide irrigation, Mulching		
Mango		Provide irrigation	Provide irrigation	
Litchi	Provide irrigation	Provide irrigation	Provide irrigation	
Papaya	Provide irrigation	Provide irrigation	Provide irrigation	
<b>Cold wave<sup>q</sup></b>				
Wheat		Provide light irrigation , Mulching		
Maize				
Mustard				
Potato				
Pulses				
<b>Horticulture</b>				
Bhendi		Provide light irrigation , Mulching		
Brinjal				
Chili				
Tomato				
Lauki				
<b>Frost</b>				
wheat				
Chickpea				
Pigeonpea				
Lentil				
<b>Horticulture</b>				
Vegetables		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

### 2.5.1 Livestock

	Suggested contingency measures		
	Before the event <sup>s</sup>	During the event	After the event
<b>Drought</b>			
Feed and fodder availability	<ul style="list-style-type: none"> <li>• Hay and silage making</li> <li>• Urea molasses mineral block</li> <li>• Urea treated straws</li> <li>• Use of conventional feeds (aquatic plants, water hyacinth, water chest nut, lotus, aquatic weeds)</li> <li>• concentrate mixture supplement</li> <li>• Cultivation of fodder</li> <li>• Creation of feed &amp; fodder banks</li> </ul>	<ul style="list-style-type: none"> <li>• Arrangement of fodders be made.</li> <li>• The fodder such as straw, hay, silage should be made available along with oil seed cake. If dry fodders are not available, then leaves of trees like peepal, bargad, bamboo, jute, neem, seesam, babul etc. may be provided as feed.</li> <li>• Feeding of Complete feed block</li> </ul>	<ul style="list-style-type: none"> <li>• Urea – Molasses feed should be use.</li> <li>• Production of forage crops</li> <li>• Balanced feed must be supplied to animals with little higher concentrate mixture</li> </ul>
Drinking water	Recharge the pond with fresh water.	Provide water from well, tube well, hand pump Recycling of water should be done	Provide plenty of clean drinking water
Health and disease management	<ul style="list-style-type: none"> <li>• Mineral mixture must be given in the feed.</li> <li>• Mass vaccination against some contagious disease like HS, BQ and FMD as well as preventive measures for fly born diseases like trypanosomiasis (surra) by SC injection of diaminazine aceturate, isometamidium chloride be made.</li> <li>• Mobile veterinary clinic must be ready at hospital.</li> <li>• Telephone directory of vets, paravets etc must be maintained at district level.</li> </ul>	<ul style="list-style-type: none"> <li>• Due to high temperature milk production decrease during drought condition. Hence availability of drinking water must be increased as well as bath the animals 3–4 times daily. Proper availability of Green fodder must be maintained.</li> <li>• In case of persisting high fever If the body temperature doesn't come to normal them. Blood test must be done to check the presence of protozoal-parasites.</li> <li>• Ectoparasitic management/vector control must be done by</li> </ul>	<ul style="list-style-type: none"> <li>• Deworming of animals with broad spectrum dewormer must be done.</li> <li>• Provide herbal anit stress like stenot, Restobal or stress check medicines (50 ml daily for 10 – 15 days)</li> <li>• Health camp must be organized.</li> </ul>

		<p>cypermethrin, Deltamethrin or Flumethrin group of drugs.</p> <ul style="list-style-type: none"> <li>• Disinfect the premises with the help of bleaching powder, phenol, carbolic acid etc.</li> <li>• Check the population of tick, fleas, mosquitoes by keeping the environment clean and disinfecting by chemical.</li> </ul>	
<b>Floods</b>			
Feed and fodder availability	<ul style="list-style-type: none"> <li>• Concentrate mixture supplement.</li> <li>• Treatment of straw (preservation, sundrying, ensiling, urea treatment)</li> <li>• Sugarcane crop residue</li> <li>• Compressed complete feed block</li> <li>• Urea molasses mineral block (UMMB).</li> <li>• Forest by product, Aquatic plants</li> <li>• Creation of feed and fodder bank</li> <li>• Storage of fodder and feed block in upland area.</li> <li>• Plantation of fast growing forest trees like 'Poplar' as well as perennial herbs on both sides of roads as well as river embankments.</li> </ul>	<ul style="list-style-type: none"> <li>• Arrangement of fodders be made.</li> <li>• The fodder such as straw, hay, silage should be made available along with oil seed cake. If dry fodders are not available, then leaves of trees like peepal, bargad, bamboo, jute, neem, siries, babul etc. may be provided as feed.</li> </ul>	Do not feed mouldy or spoiled feeds
Drinking water	<ul style="list-style-type: none"> <li>• Recharge the pond with fresh water.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide water from well, tube well, hand pump</li> <li>• Recycling of water should be done.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide plenty of clean drinking water</li> </ul>
Health and disease management	<ul style="list-style-type: none"> <li>• Mass vaccination against some contagious disease like HSBQ and FMD as well as preventive measures for fly born diseases like trypanosomiasis (surra) by SC injection of diaminazine aceturete, isometamidium chloride.</li> <li>• Telephone directory of vets, paravets etc must be maintained at district level.</li> </ul>	<ul style="list-style-type: none"> <li>• Livestock carcass pose health hazard and have to be disposed off properly to prevent epidemic and zoonoses (lime, bleaching powder can be used)</li> <li>• All efforts be made to rescue most of the livestock as carefully as possible.</li> <li>• Mobile veterinary clinic must be ready at hospital.</li> </ul>	<ul style="list-style-type: none"> <li>• Mass deworming against round worms, tape worms, hook worms, fasciola and amphistomes</li> <li>• Health camps must be organized after flood.</li> <li>• Disinfection of permises of temporary sheds with the help of bleaching powder, phenol, carbolic acid etc.</li> </ul>

<b>Cyclone</b>			
Feed and fodder availability	Hay and silage making (fodder conservation	Feed animals silage or hay, urea molasses	Do not feed animals, moist or mouldy fodder, feed animals dry fodder
Drinking water			Provide plenty of clean drinking water
Health and disease management	Mineral mixture must be given in feed. Timely vaccination is important.		Provide animal antistress drug
<b>Heat wave and cold wave</b>			
Feed and fodder availability	Hay and silage making (fodder conservation	Feed animals silage or hay, urea molasses	Mineral mixture must be given in feed.
Drinking water			Provide plenty of clean drinking water
Health and disease management	Mineral mixture must be given in feed. Timely vaccination is important.	Avoid day grazing. Animal should be protected form heat wave. During cold wave animal should be protected with gunny bags and provide proper housing	Proper of dead carcass. Deworming of animals with broad spectrum dewomer Provide animal antistress drug

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

### 2.5.2 Poultry

	<b>Suggested contingency measures</b>			<b>Convergence/ linkage with ongoing programs, if any</b>
	<b>Before the event<sup>a</sup></b>	<b>During the event</b>	<b>After the event</b>	
<b>Drought</b>				
Feed and fodder availability	Storage of poultry feed and maize as per requirement from market.	In case of shortage or non availability of supplies like compounded balanced poultry feed, they may be fed survival (holding diet), using locally available feed stock like Rice grain, rice kani (broken rice), rice brand, beaten rice or crushed maize in combination 5 – 7% mustard cake or some other locally available vegetable protein source @ 90 – 100 gm per layer or broiler.		
Drinking water	Harvest water in water tanks with proper		Provide plenty of clean drinking water	

	disinfection of water			
Health and disease management	Depending on the endemicity, commercial poultry stock should be immunized against Ranikhet, Marek's, infectious bursal and fowlpox diseases prior to the onset of monsoon. Anticoccidil drug should be use.	Chickens showing signs of lethargy, depression, loss of appetite/injury need to be examine	Dead chicken should be buried properly  Poultry house should be thoroughly clean Provide birds antistress drug	
<b>Floods</b>				
Feed and fodder availability	Storage of poultry feed and maize as per requirement from market	Azolla can be used at poultry feed.		
Drinking water	In case of emergency chicken have access to high ground to perch Clean drinking water from hand pump must be provided.	Clean water preferably chlorinated (2 – 3 drops of chlorine bleach per liter be provided adlibitum	Plenty of fresh and clean drinking water should be provided.	
Health and disease management	Depending on the endemicity, commercial poultry stock should be immunized against Ranikhet, Marek's, infectious bursal and fowlpox diseases prior to the onset of monsoon. Anticoccidil drug should be use.	Chickens showing signs of lethargy, depression, loss of appetite/injury need to be examine	Provide proper treatment to injured bird deep burial dead bird and disinfact the environment  Provide birds antistress drug	
<b>Cyclone</b>				
Feed and fodder availability	Poultry feed (maize, wheat, bran etc.) should be stocked at higher place			
Drinking water	Fresh water should be used	Disinfected fresh water should be use		
Health and disease management	Use De wormer and vaccinated the bird	Proper housing is important	Deep burial of dead and disinfected the environment with good quality disinfectant like bleaching power.	



<b>Heat wave and cold wave</b>				
Feed and fodder availability				
Drinking water			Plenty of fresh and clean drinking water should be provided.	
Health and disease management	Anthelminthes and antiprotozoal (drug) must be provided	Provide poultry cool place Protected from heat stroke and cold wave		

<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 depth 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 • Monitoring of water quality • 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>s</sup> based on forewarning wherever available