State: Bihar

Agriculture Contingency Plan for District: Khagaria

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	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)	Begusaria, Saharsa, Supoul, Madhepura, Purnea , Kishanganj, Araria, Katihar, Khagaria,		
	Geographic coordinates of district headquarters	**Latitude**	**Longitude**	**Altitude**
		25^0 15" to 25^0 44" N	86^0 17.14 " to 86^0 52.5 " E	36m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Regional Research Sub-station, Saharsha		
	Mention the KVK located in the district with address	Krishi Vigyan Kendra,Charvak Socio-Eco Development Trust, Vijaya Lodge, Chandranagar, Koshi college, Khagaria- 851205		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	Rajendra Agricultural University, Pusa, Samastipur		

1.2	**Rainfall**	**Normal RF(mm)**	**Normal Rainy days (number)**	**Normal Onset**	**Normal Cessation**
	SW monsoon (June-Sep)	1107	45	1^{st} week of June – 2^{nd} week of June	3^{rd} week of October
	NE Monsoon(Oct-Dec)	13	1		
	Winter (Jan-Feb)	29	4		
	Summer (March -May)	135	9		
	Annual	1284	59		

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)	149.3	104	8	3	0.6	2.2	2.7	-	6	22.8

1.4	**Major Soils**	**Area (‘000 ha)**	**Percent (%) of total**
	sandy to coarse-loamy soils	5.2	3.5
	fine loamy soils	63.6	37.2
	loamy to fine loamy soils	30.2	20.4
	coarse-loamy to fine-loamy soils	2.3	1.6
	fine-loamy to fine silt soils	32.3	21.8
	clayey soils	7.1	4.8
	sandy to loamy soils	1.4	1.0

1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	87.1	152.7 %
	Area sown more than once	46.0	
	Gross cropped area	133.1	

1.6	**Irrigation**	Area (‘000 ha)
	Net irrigated area	68.3
	Gross irrigated area	72.0

	Rainfed area			
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals	-	-	
	Tanks		-	
	Open wells		-	
	Bore wells		53	76.6
	Lift irrigation schemes		-	
	Micro-irrigation		-	
	Other sources (please specify)		19	26.3
	Total Irrigated Area		72	
	Pump sets		-	
	No. of Tractors		-	
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited			
	Critical			
	Semi- critical			
	Safe			
	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)**							
		Kharif			***Rabi***				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Rice	-	-	15.6	-	-	-	-	15.6

	Wheat	-	-	-	-	-	31.5	-	31.5
	Maize	-	-	-	-	-	31.6	-	31.6
	Chickpea	-	-	-	-	-	0.1	-	0.1
	Greengram	-	-	-	-	-	1.5	-	1.5

	Horticulture crops - Fruits	Area (‘000 ha)		
		Total	Irrigated	Rainfed
	Mango	1.6		
	Guava	0.3		
	Litchi	0.3		
	Banana	0.8		
	Lemon	0.3		
	Horticulture crops - Vegetables	Total	Irrigated	Rainfed
	Potato	5.3		
	Tomato	1.08		
	Brinjal	1.4		
	Okra	1.5		
	Medicinal and Aromatic crops			
	Plantation crops			

	Fodder crops			
	Total fodder crop area			
	Grazing land			
	Sericulture etc			

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (local low yielding)	32.7	165.9	198.7
	Improved cattle			
	Crossbred cattle	5.03	30.7	35.8
	Non descriptive Buffaloes (local low yielding)	101.3	72.5	82.6
	Descript Buffaloes			
	Goat	50.2	141.5	191.8
	Sheep	0.004	0.01	0.02
	Others (Camel, Pig, Yak etc.)			
	Commercial dairy farms (Number)			

1.9	Poultry	No. of farms	Total No. of birds ('000)
	Commercial		122.8
	Backyard		

1.10	**Fisheries** (Data source: Chief Planning Officer)				
	A. Capture				
	i) Marine (Data Source:	**No. of fishermen**	**Boats**	**Nets**	**Storage**

	Fisheries Department)		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	**facilities (Ice plants etc.)**
	ii) Inland (Data Source: Fisheries Department)	**No. Farmer owned ponds**		**No. of Reservoirs**		**No. of village tanks**	
	B. Culture						
				Water Spread Area (ha)		**Yield (t/ha)**	**Production ('000 tons)**
	i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)						
	ii) **Fresh water** (Data Source: Fisheries Department)			4640			

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)	
Major Field crops (Crops identified based on total acreage)										
	Rice	8.7	3420					8.7	3420	
	Wheat							71.7	2104	
	Maize			226.8	4007			226.8	4007	
	Chickpea			0.1	992			0.1	992	
	Greengram			1.0	683			1.07	683	
Major Horticultural crops (Crops identified based on total acreage)										

	Mango							15.3	9431	
	Guava							3.2	8769	
	Litchi							2.3	7176	
	Banana							37.2	44944	
	Lemon							1.6	5043	

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	**Rice**	**Wheat**	**Maize**	**Potato**	**Greengram**
	Kharif- Rainfed	4th week of May – 2nd week of July	-	-	-	-
	Kharif-Irrigated	4th week of May – 2nd week of July	-	-	-	-
	Rabi- Rainfed	-	-	-	-	-
	Rabi-Irrigated	-	2nd week of November- 2nd week of December	4th week of October – 2nd week of November	4th week of October - 2nd week of November	4th week of October - 2nd week of November

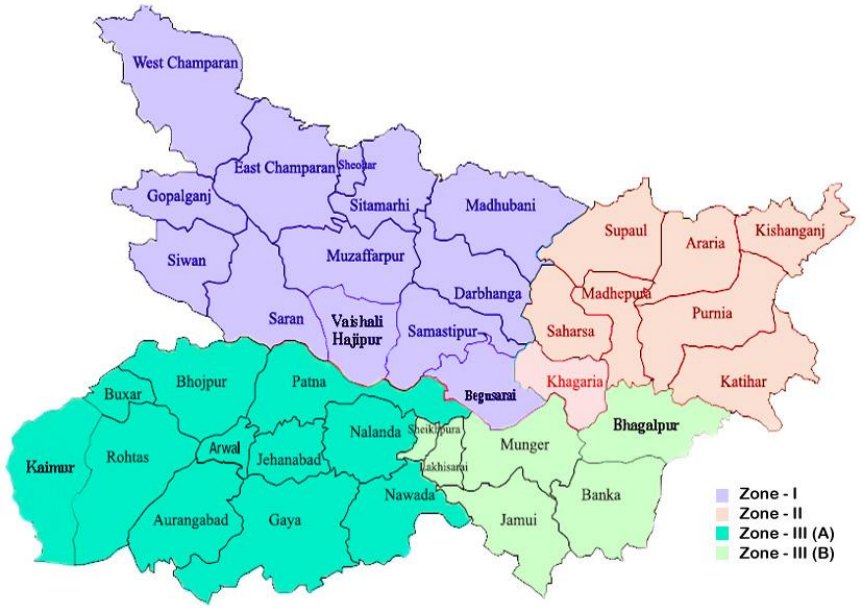
1.13	**What is the major contingency the district is prone to?** (Tick mark)	**Regular**	**Occasional**	**None**
	Drought		√	
	Flood		√	
	Cyclone			√
	Hail storm		√	
	Heat wave		√	
	Cold wave		√	
	Frost		√	

	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

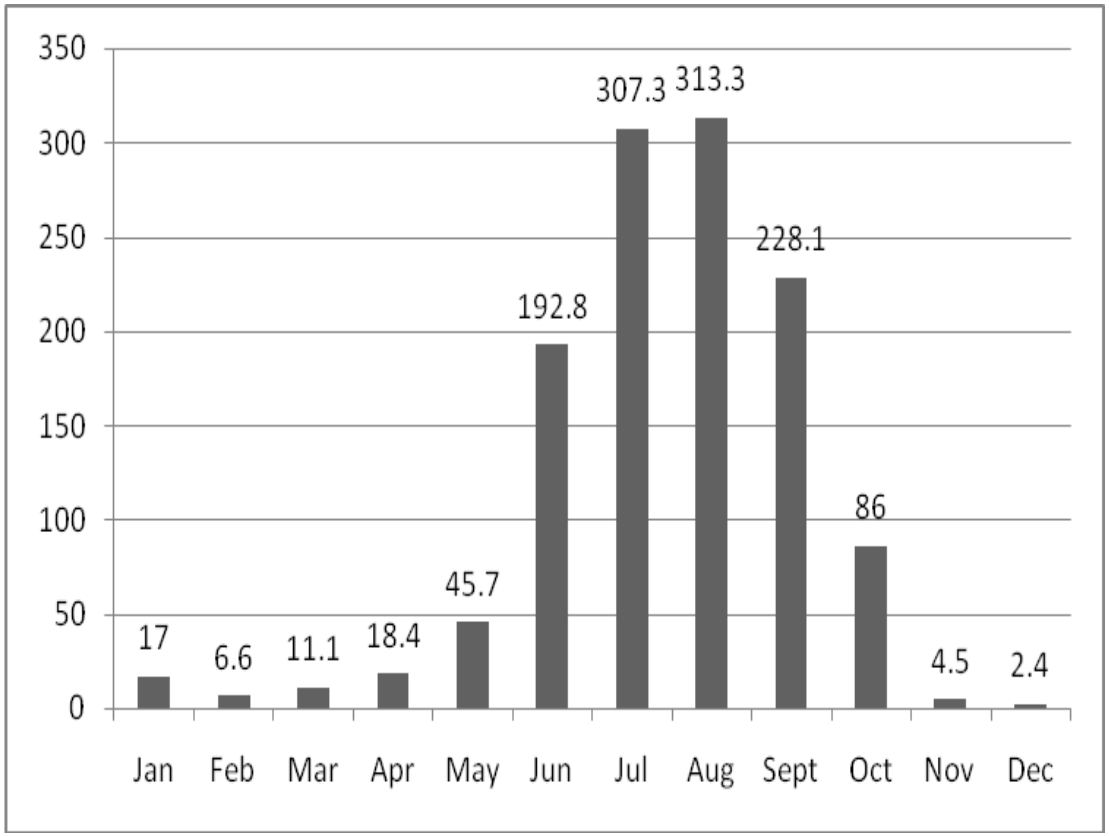
Agro climatic Zones of Bihar



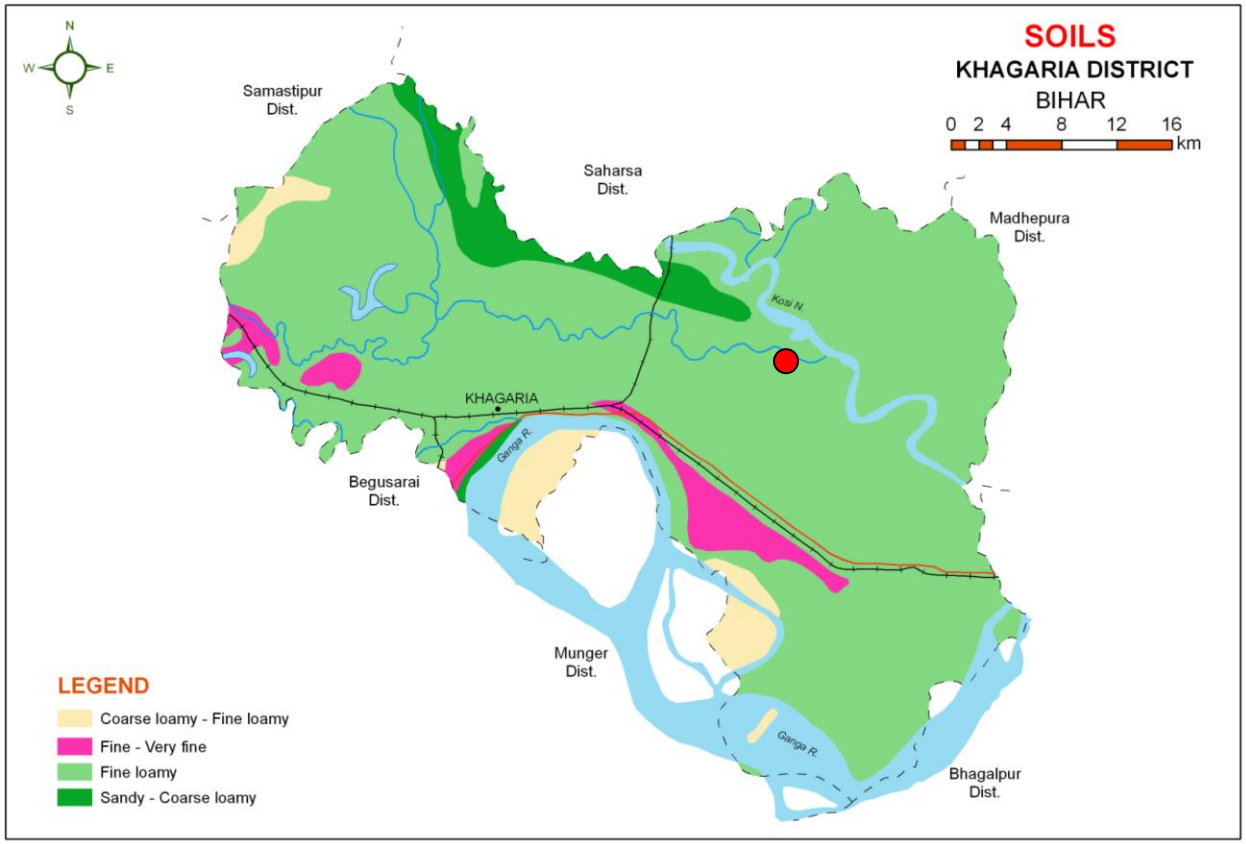
Source: krishi.bih.nic.in

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			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks 4th week of June	Upland coarse loamy soils	Rice-Rabi maize Maize-Rabi maize Maize-Wheat	**Maize +cucurbits-Wheat** Maize- Shaktiman-1,2,3,4, 5 Suwan, Ganga-11, Deoki, Pusa early hybrid Maka-3	• Normal Package of practices Direct sowing of rice • • Life saving irrigation	-
			Rice- Wheat No change		
			Maize-Rabi Maize Maize- Shaktiman-1,2,3,4, Suwan, Ganga-11, Deoki, Pusa early Maka-3		
	Upland fine loamy soils	Rice –Wheat Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Rice – Wheat / Rice- Rabi maize Direct sowing / 20d old dapog seedlings with medium to short duration varieties – BR34, Rajendra Dhan-201(130-135d), Rajendra Bhagwati,		
			Maize-Rabi maize Maize- Shaktiman-1,2,3,4, Suwan, Ganga-11, Deoki, Pusa early hybrid Maka-3		
	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,	• Normal package of Practices • Direct seeding of rice can be done • Life saving irrigation	

	Low land	Rice – Wheat	**Rice – Wheat** Rice- Direct/ dapog seedlings with Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta, Swarna sub-1	• Normal package of Practices • Direct seeding of rice can be done • Life saving irrigation	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks 2nd week of July	Upland Rain fall between 1200-1400 mm Coarse loamy soils	Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Pigeonpea- Blackgram Pigeonpea – Bahar, Pusa-9, Narendra Arhar-I	-	
			Rice – Wheat Rice- Prefer Medium to short duration varieties like Saroj (100-110d), Birsa Dhan-201 (100-115d)	• 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. • Normal sowing of rice can be used with enhanced NPK to boost the early vegetative growth in late plantings under sufficient moisture • Interculture for timely weed control in direct seeded rice	Seeds from BRBN, BAU, Sabour, NSC, TDC
	Upland heavy soils	Rice –Wheat Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Vegetables-Wheat		
			Pigeonpea- Blackgram Pigeonpea – Bahar, Pusa-9 Narendra Arhar-I		
			Blackgram -Maize Blackgram- T-9, Navin, Pant U-31 , Pant U-19		
	Mid land	Rice-Wheat	Rice-Wheat Direct sowing / 20d old dapog seedlings with medium to short duration varieties – BR34, Rajendra Dhan-201(130-135d), Rajendra	• Where field is moist, direct seeding of medium duration varieties (125 days) can be done during second fortnight	

			Bhagwati,	of July in midlands. Post-emergence herbicide application use is essential • 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 • Raise staggered community nursery preferably with short duration varieties in mid and lowlands • Transplant with 30-35 days old seedling may be used with 3-4 seedling per hill with close spacing. • Para grass cultivation for fodder in low land • 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 • Timely interculture for weed control in direct seeded rice • Life saving irrigation	
	Low land	Rice-Wheat	Rice - Wheat Rice- Rajshree, Rice- Direct/ dapog seedlings with Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta, Swarna sub-1, Sakuntala, Satyam, Kishori, , Rajendra Mashuri		

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks 4th week of July	Coarse loamy soils	Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Blackgram / Finger millet-Wheat Blackgram - T-9, Navin, Pant U-31,19	• Direct seeding of rice • Transplanting can be done with 40-45 days old seedlings (Medium duration varieties) with 3-4 seedlings per hill with closer spacing • Enhanced basal dose of NPK to boost the early vegetative growth. • Moisture conservation measures through mulching • Intercultivation	Seeds from BRBN, BAU, Sabour, NSC, TDC
	Medium to heavy textured soil	Rice –Wheat Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Rice- (Short duration)-Wheat Rice- Prefer short (early matured) varieties like Birsa Dhan 105 (85-90d), Birsa Dhan-106 (90-95d), Rajendra Bhagavathi (early-upland and midland), Dhanlaxmi , Richharia(<100d), Saroj (100-110d), Birsa Dhan-201 (100-115d) Blackgram / Finger millet-Wheat Blackgram: T-9, Navin, Pant U-31 , Pant Urd-19 Finger millet – RAU-7&8		
	Medium land	Rice – Wheat	Rice (Short duration)-Wheat Rice- Prabhat, Dhanlaxmi, Richharia, Turanta Saroj Wheat- HD-2733, PBW-443, HP-1731	• 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 • Direct seedling of Rice • Raise staggered community	

	Low land	Rice-wheat-Green gram	Rice (short duration)-Wheat/ Rice- Lentil/Chickpea Rice- Mustard Rice- 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 25th August	nursery preferably with medium duration varieties in mid and lowlands • Enhanced basal dose of NPK to boost the early vegetative growth • Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions • Life saving irrigation	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks 2nd week of August	Coarse loamy soils	Rice-Rabi maize Maize-Rabi maize Maize-Wheat	Blackgram /Finger millet - Rabi maize Blackgram - T-9, Navin, Pant U-31 , 19 Finger millet – RAU-7&8	• Moisture conservation • Inter cultivation • Sowing of *rabi* crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables	Seeds from BRBN, BAU, Sabour, NSC, TDC
			Blackgram/Finger millet -Sep. Pigeonpea Blackgram- - T-9, Navin, Pant U-31 , 19 Finger millet – RAU-7&8		
			Blackgram /Finger millet -Lentil/ Rai/Mustard Blackgram- - T-9, Navin, Pant U-31 , 19 Finger millet – RAU-7&81		
	Medium to heavy textured soil	Rice –Wheat Rice-Rabi maize Maize-Rabi maize	Blackgram/ Finger millet - Rabi maize/ Late wheat/ Vegetables/Potato Blackgram - - T-9, Navin, Pant U-31 , 19 Finger millet – RAU-7&8		

		Maize-Wheat			
	Medium Land	Rice - Wheat Rice -Pulses Rice-Oilseeds Rice -Vegetables Rice -Potato	Rice(Short duration)- Wheat/ Lentil/ Chick pea Direct seeded rice (DSR) with short duration (80-90 days) varieties (Turanta dhan, Prabhat, Anjali, Vandana, CR-Dhan-40 etc.) can be taken up in midlands till the end of August subject to availability of at least one assured irrigation Early Rice-Prabhat, Dhanlaxmi, Richharia, Turanta	• Direct seeding 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 • Use of 20 days old dapog seedling in rice. • • 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	
	Low land	Rice–Wheat Rice-Oilseeds Rice–Vegetables Rice–Potato Rice-Lentil Rice-Chickpea	Rice (Short duration)-Wheat/Lentil/ Chickpea/Vegetables Rice- Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta,BPT-5204	• RE-transplanting of rice (karuhan) can be done with 30 + 45 days old seedlings of long duration or photosensitive varieties up to 30th August with close planting (40-45 hills per square meter) • Application of organic manure and vermi compost initially for Rice and other crops. • Sowing of *rabi* 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 *rabi* production would compensate the production loss during *kharif*. • 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	

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/	Upland Very deep, Calcareous coarse loamy to fine loamy soils	Rice-Wheat Rice- Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	• Gap filling of existing crop • Thinning • Weed management • Inter culturing	• Mulching for moisture conservation • Conservation tillage	Seeds from BRBN, BAU, Sabour, NSC, TDC

crop stand etc.	Medium land	Rice-Wheat Rice- Rajendra Bhagawati, Rajendra Suwasni,Saroj, Rajendra Kasturi, Santosh	• Life saving irrigation		
	Low land	Rice-Wheat Rice- Rajshree, Sakuntala, Satyam, Kishori Rajendra Sweta Rajendra Mashuri	• Gap filling through Dapog nursery • Weed management • Life saving irrigation	• Mulching	

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At vegetative stage	Up land Very deep, Calcareous coarse loamy to fine loam soils	Rice –Wheat Rice- Prabhat, Dhanlaxmi, Richharia, Turanta,	• Gap filling •	• Interculturing • Foliar application of 2% MOP • Mulching for moisture conservation • Life saving Irrigation	
		Maize-Wheat Maize- Shaktiman-1,2,3,4,5 Suwan, Ganga-11, Deoki, Pusa early hybrid Macca-3	• Gap filling • Life saving Irrigation •	• Interculturing • Foliar application of 2% MOP • Mulching	

	Mid land	Vegetables	• Gap filling • Foliar application of 2% Urea • Postponement of top dressing •	• Interculturing • Foliar application of 2% MOP • Mulching with biomass • Life saving Irrigation	
	Low land	Rice-wheat-green gram Rice- Rajshree, Santosh, Sita, Rajendra Suwasni Rajendra Sweta	• Gap filling of existing crop • Postponement of top dressing • Foliar application of (1%) urea on the crops	• Inter culturing • Mulching through weeds • Foliar application of 2% MOP • Conservation tillage • Life saving irrigation	

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 Implement ation**
At flowering/ fruiting stage	Up land	Vegetables-Wheat Rice-Wheat Rice-Prabhat, Dhanlaxmi, Richharia, Turanta	• Life saving irrigation • Postpone the top dressing	• Interculturing • Mulching • Foliar application of 2% MOP •	
		Maize – Wheat Maize- Shaktiman-1,2,3,4, Suwan, Ganga-11, Deoki, Pusa early hybrid Macca-3	• Clipping of leaves in maize	• Interculturing • Mulching • Foliar application of 2% MOP • Life saving irrigation	
	Medium land	Rice-Wheat Rice- Rajendra Bhagawati, Rajendra Suwasini Saroj, Rajendra Kasturi, Santosh	• IPM practices • Life saving irrigation • Spray of potassic fertilizer with adjuvant	• Interculturing • Mulching • Foliar application of 2% MOP •	

	Low land	Rice-Wheat Rice- Rajshree, Sakuntala, Satyam, Kishori , Rajendra Sweta Rajendra Mashuri	• IPM practices • Life saving irrigation • Spray of potassic fertilizer with adjuvant	• Interculturing • Mulching • Postponement of top dressing • Foliar application of 2% MOP	

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 Very deep, Calcareous coarse to fine loam soils	Vegetables	• Foliar application of 2% MOP • Life saving irrigation • Mulching	• Open the furrow during evening and leave furrow open overnight and planking in the next morning before sunrise for growing of early rabi crops	
	Medium land	Rice-Wheat Rice- Rajendra Bhagawati, Rajendra Suwasn Saroj, Rajendra kasturi, Santosh	• Foliar application of 2% MOP • Life saving irrigation • Mulching		
	Low land	Rice- Wheat Rice- Rajshree, Sakuntala, Satyam, Kishori Rajendra Sweta, Rajendra Mashuri	• Foliar application of 2% MOP • Mulching • Moisture conservation through mulching • Life saving irrigation		

2.1.2 Drought - Irrigated situation

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed release of	Not Applicable				

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

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	Upland	Rice-Wheat	Short duration Rice-Wheat Rice-Prabhat, Dhanlaxmi, Richharia, Turanta	• Mulching for moisture conservation •	Seeds from BRBN, BAU, Sabour, NSC, TDC
		Maize –Wheat	Maize : Shaktiman-1,2,3,4,5 Suwan, Ganga-11, Deoki, Pusa early hybrid Macca-3	• Mulching for moisture conservation	
	Medium land	Rice-Wheat	Medium duration Rice -Wheat Rice- Rajendra Bhagawati, Rajendra Suwasni Saroj, Rajendra Kasturi, Santosh	• Mulching • Application of organic manure and vermicompost initially • Life saving irrigation	
	Low land	Rice-Wheat	Medium duration Rice – Wheat Rice- Rajshree, Sakuntala, Satyam, Kishori , Rajendra Sweta , Rajendra Mashuri	-	

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient groundwater recharge due to low rainfall	Upland Very deep, Calcareous, coarse to fine loam soils	Vegetables	• Sesame – Wheat • Blackgram -Wheat • Pigeonpea-Sesame Sesame: Pragati, Krishna Pigeonpea – Bahar, Pusa-9, Narendra Arhar-I	• Micro irrigation/row irrigation/ limited area irrigation / Mulching etc. • Life saving irrigation	Seeds from BRBN, BAU, Sabour, NSC, TDC
	Medium	Rice -Wheat	• Pigeonpea • Short duration deep rooted Rice –Wheat Rice- Rajendra Bhagawati, Rajendra Suwasni, Saroj, Rajendra Kasturi, Santosh Pigeonpea – Bahar, Pusa-9, Narendra Arhar-1	-	
	Low	Rice –Wheat	Coarse cereal-Wheat Blackgram-Wheat Blackgram : Urd- T-9, Navin, Pant Urd-30,19	• Application of potassic fertilizer with adjuvant • Mulching for moisture conservation	

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

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Rice	• Drainage management • Gap filling, if required • Re sowing through drum seeder • Re transplanting through Dapog nursery if needed	• Drainage management • Subsequent crop like toria may be taken if present crop is substantially damaged/affected	• Drainage management • Harvest at physiological maturity	• Proper drying • Safer storage and Transportation

Maize	• Drainage management • Gap filling, if needed • Resowing, if sequentially affected • Sowing of R&F should be adopted	• Drainage management • Alternative Rabi maize or other rabi crop if substantially damaged	• Drainage management • Harvest at physiological maturity	• Proper drying • Safer storage and Transportation
Pigeon pea	• Drainage management • Gap filling if needed • September sowing of pigeonpea if Kharif pigeonpea is completely affected	• Drainage management • Spray of pesticides		• Proper drying • Safer storage and Transportation
Vegetable	• Resowing , if required • Replanting	• Drainage management	• Drainage management	Storage at safer place
Horticulture				
Mango	• Drainage management • Gap filling • Replanting if completely damaged	• Drainage management • Spray of pesticides	• Drenching with copper fungicides • Drainage management	
Litchi	❖ Drainage management ❖ Replanting ❖ Gap filling	❖ Pesticides spray ❖ Drainage management	❖ Drainage management ❖ Harvest at proper time	
Banana	• Drainage management • Gap filling • Replanting if completely damaged	• Drainage management	• Drainage management	
Papaya	❖ Drainage management ❖ Gap filling ❖ Replanting	❖ Pesticides spray ❖ Drainage management	❖ Drainage management ❖ Harvest at proper time	
Heavy rainfall with high speed winds in a short span				
Rice	❖ Drainage management ❖ Gap filling ❖ Replanting with Dapog seedling ❖ Kharuhan (double transplanting)	❖ Pesticides spray ❖ Drainage management ❖ Alternative crop if completely failed	❖ Drainage management ❖ Harvest at proper time	❖ Proper drying ❖ Safer storage and Transportation
Maize	❖ Drainage management	❖ Pesticides spray	❖ Drainage management	❖ Proper drying

	❖ Gap filling ❖ Replanting ❖ Earthing up	❖ Drainage management ❖ Alternative crop if completely failed	❖ Harvest at proper time	❖ Safer storage and Transportation
Pigeon pea	❖ Drainage management ❖ Gap filling ❖ Resowing	❖ Pesticides spray ❖ Drainage management ❖ Alternative crop if completely failed	❖ Drainage management ❖ Harvest at proper time	❖ Proper drying ❖ Safer storage and Transportation
Horticulture				
Mango	❖ Drainage management ❖ Replanting or gap filling	❖ Pesticides spray ❖ Drainage management	❖ Drainage management ❖ Harvest at proper time	
Litchi	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Pesticides spray	❖ Drainage management ❖ Harvest at proper time	
Banana	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Pesticides spray	Drainage management Harvest at proper time	
Papaya	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Pesticides spray	❖ Drainage management ❖ Harvest at proper time	
Outbreak of pests and diseases due to unseasonal rains				
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 dying
Pigeonpea	❖ Provide drainage ❖ Seed treatment with 1 g carbendizim +2g thiram/kg seed.	Provide drainage	Provide drainage	❖ Proper dying • Storage at safe place and transportation
Black gram & Greengram	❖ Drain off water to avoid diseases	❖ Field drainage to avoid diseases ❖ Application of Mancozeb @ 2 kg with 1000 lit water per ha or carbendizim @ 0.05% at first notice of the disease and subsequent sprays may be applied at 10-15 days interval to control the leaf spots.	❖ Drain off water and harvest the crop	❖ Storage in safer places like warehouse/tent houses
Horticulture				
Vegetables	• Drainage management	• Drainage management	• Drainage management	
Mango	**Anthracnose:-** The foliar infection can be controlled by spraying of copper oxychloride (0.3%) Use bio control agent viz *Streptosporangium pseudovulgare* **Bacterial canker:** 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.	**Anthracnose:-** 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. **Mango powdery mildew:** Spray wettable sulphur(0.2%) & calixin or karathane (0.1%) during second week of December	**Mango powdery mildew:** Prune diseased leaves and malformed panicles harbouring the pathogen to reduce primary inoculum load. Spray wettable sulphur (0.2%) when panicles are 3-4” in size Spray dinocap (0.1%) 15-20 days after first spray. Spray tridemorph (0.1%) 15-20 days after second spray. Spraying at full bloom needs to be avoided. **Mango bacterial canker:** Three sprays of Streptocycline (200 ppm) at 10 days intervals reduce fruit infection.	Harvest at proper time **Anthracnose:-** 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. Diseased leaves, twigs, and fruits, should be collected and burnt to avoid the

	Use of wind-breaks helps in reducing brushing/ wounding and thus reduces the chance of infection.		In severe infection, spraying of Streptocycline (300 ppm) or copper oxychloride (0.3%) is more effective.	spread for next season
Litchi	Fruit Fly: Monitor adult fruit flies emrgence by using methyl eugenol or sex pheromone traps.	Fruit Fly: 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	Harvest at proper time	Fruit Fly: 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
Banana			Harvest at proper time	
Papaya			Harvest at proper time	

2.3 Floods

Condition	**Suggested contingency measure[o]**			
Transient water logging/ partial inundation[1]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Rice	• Drainage management • Resowing, if completely damaged	• Drainage management • Gap filling • Transplanting using 40-45 days old seedling • Double transplanting through Kharuan	Lentil as Paira crop	• Proper drying • Safer storage • Transportation
Maize	• Drainage management • Replanting , if substantially damaged	• Drainage management • Resowing if completely damaged • Toria if standing crop damaged	Lentil if standing crop damaged	• Proper drying • Safer storage • Transportation

Pigeonpea	• Drainage management Resowing, if substantially damaged	• Drainage management • Rabi Maize if standing crop damaged	Spring maize Var. Suwan if crop is substantially damaged	• Proper drying • Safer storage • Transportation
Horticulture				
Vegetable	• Resowing • Drainage management • Replanting, if substantially damaged	• Drainage management	-	• Safer storage and Transportation
Mango	• Drainage management • Gap filling • Replanting, if substantially damaged	❖ Drainage management ❖ Drenching with copper fungicide	❖ Drainage management ❖ Drenching with copper fungicide ❖ Harvest at proper time	
Litchi	• Drainage management • Gap filling • Replanting, if substantially damaged	• Drainage management • Drenching with copper fungicide	• Drainage management • Drenching with copper fungicide • Harvest at proper time	
Guava	• Drainage management • Gap filling • Replanting, if substantially damaged	• Drainage management • Drenching with copper fungicide	• Drainage management • Drenching with copper fungicide • Harvest at proper time	
Continuous submergence for more than 2 days[2]				
Rice	Re-sowing, if damaged after receding of floods	Re-sowing, gap filling	Toria /late wheat, if substantial damaged	Storage at safe place
Maize	Re-sowing, if damaged after receding of floods	Re-sowing, gap filling	Toria /late wheat, if substantial damaged	Storage at safe place
Redgram	Re-sowing, if damaged after receding of floods	Re-sowing, gap filling	Rabi maize/Summer maize, if substantial damaged	Storage at safe place
Horticulture				
Mango	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Replanting	❖ Drainage management	

Litchi	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Replanting	❖ Drainage management	
Guava	❖ Drainage management ❖ Replanting	❖ Drainage management ❖ Replanting	❖ Drainage management	
Sea water intrusion	**Not Applicable**			

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

Extreme event type	**Suggested contingency measure**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave				
Maize	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Pigeonpea	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Wheat	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Rice				
Horticulture				
Mango	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Litchi	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Papaya	Life saving irrigation	Life saving irrigation	Life saving irrigation	
Cold wave				
Wheat		Irrigation, mulching		
Chickpea		Irrigation, , mulching		
Pigeonpea		Irrigation, mulching		
Lentil		Irrigation, mulching		
Horticulture				
Bhendi		Irrigation, mulching		
Brinjal		Irrigation, mulching		
Chili		Irrigation, mulching		
Tomato		Irrigation, mulching.		

Bottle gourd		Irrigation, mulching		
Frost				
Wheat		Irrigation, mulching		
Chickpea		Irrigation, mulching		
Pigeonpea		Irrigation, mulching		
Lentil		Irrigation, mulching		
Horticulture				
Bhendi		Irrigation, mulching		
Brinjal		Irrigation, mulching		
Chilli		Irrigation, mulching		
Tomato & Potato		Earth up to 15cm ht. Irrigation , mulching		Harvest in dry weather
Cyclone	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**
Drought			
Floods			
Feed and fodder availability	1. Advance planning for cultivation of fodder tree 2. Storage of Improved Quality Fodder 3. Conservation & Storage of Feed & Fodder • Hay & Silage: — Preserve the fodder in the form of hay from Berseem & other grasses as well as silage from (a Maize- harvesting at well developed cob. (b) Jowar - at flowering stage. (c) Oat (d) Hybrid Napier – 40-45 day old.	1. Feeding of Complete Feed Block 2. Feeding of Urea-Molasses-Mineral-Block & Fodder 3. Feeding of stored Hay/Silage/Improved Quality Fodder 4. Feeding of Tree leaves some of which are as follows: 1. Bamboo leaves 2. Neem 3. Bargad 4. Peepal 5. Seesam	Production of forage crops 1. Balanced feeding of Animal supported with little higher concentrate mixture 2. Cultivation of fodder Rabi maize if water stagnated upto Nov/ December 3. Jowar/Cowpea 4. Maize in September

	(e) Water hycianth mixing with Rice straw in ratio of 4:1 with 70 kg molasses /ton of clean water hycianth. (f) Potato leaves mixing with wheat straw in ratio of 7:1 and should be supplemented with 3% molasses. Hay: – • Berseem/Lucerne and other grasses. • 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. 4. Development & storage of: – (a) Complete Feed Block (CFB) (b) Urea-Molasses-Mineral-Block (U.M.M.B) 5. Development of Fodder Bank	6. Subabul Use of unconventional feed stuff: (i) Aquatic Plants – water hycianth (i) Lotus (ii) Aquatic weeds	
Drinking water			
Health and disease management	Veterinary Preparedness with Medicines, Vaccines and provision for mobile ambulatory van. • Vaccination During flood stress becomes an incriminating factor for the precipitation of diseases in livestock and poultry. So, necessary vaccination of livestock and poultry should be done against economically important contagious disease. This will be helpful not only to check epidemic in animals, but also to reduce the probability of zoonoses in human beings. 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. Mass vaccination should be conducted by a team of Department staff with proper	Animal safety, Health camp and Treatment Important Suggestions for animal and Poultry safety During flood, all efforts should be made to rescue most of the livestock and poultry as carefully as possible. 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. The fisherman or the people who knows swimming should be deputed for the rescue of drowning and floating animals and birds. During flood do not leave halter or	treatment, health camps Culling of Sick animals and disposal of carcass Maintenance of Sanitation: 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. **De-worming after the flood:**

	maintenance of detailed Inoculation Register. 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.	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. **Health camp and treatment** Water borne diseases are one of the most common phenomena during the flood Diarrhoeal diseases outbreaks can Report the location, identification and disposition of livestock and poulrty to authorities handling the disaster. **Health camp and treatment** Water borne diseases are one of the most common phenomena during the flood Diarrhoeal diseases outbreaks can occur after drinking contaminated water. 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. Salmonella spp. Escherichia coli Giardiasis Amoebiasis Rotavirus Leptospirosis Scabies	Immediately after flood, the animals like cattle, buffalo. Sheep, goat, pig, dog and poultry need to be de-wormed with suitable broad spectrum anthelmentics. This will enable the animals to regain proper health. In water logged area, sucks can be introduced as biological control measures against snails to protect livestock from parasitec disease. **Treatment of sick animals:** The **Disposal of Carcass:** 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. 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

		Black leg Malignant Edema Foot rot Anthrax Botulism Tetanus Red water Black disease Entertoxemia Liver fluke Amphistomiasis Brooders pnemonia **Treatment of Non infectious** Arrangement should be made for the treatment of drowning and traumatic injuries, aspiration pneumonia, lameness and other surgical cases in the health camp. **Disinfection of livestock premises and Poultry shed** Disinfection of livestock premises and the temporary sheds should be done with the help of bleaching powder, phenol, carbolic acid etc	surrounding soil. **Methods of Carcass disposal to be adopted** **Burial** **Burning** **Composting** **Vulturing** **s. Health Camp after the flood:** 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.
Cyclone			
Heat wave and cold wave			

[s] based on forewarning wherever available

2.5.2 Poultry etc.

	Suggested contingency measures	**Convergence/linkages with**

				ongoing programs, if any
	Before the event	**During the event**	**After the event**	
Drought				
Floods				
Shortage of feed ingredients				
Drinking water				
Health and disease management	**Vaccines to be used for different animals and Poultry** **Cattle and Buffalo** Hemorrhagic SepticemiaVaccine Black Quarter Vaccine FMD Vaccine Anthrax Vaccine as per endemicity. **Sheep and Goat** Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity **Pigs** Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity. **Dogs** Rabies Vaccine **Poultry** Mareks disease vaccine RDV (F_1 & R_2B),			

	FPV, IBRV & IBDV **(Annexure-1)** • **Medicines** All Districts should be earmarked for flood. An inventory of required medicines to treat the affected livestock in case of eventualities should be made. The Govt. should take steps to procure sufficient quantity of essential life saving medicines. **List of life saving Medicines** Corticosteroids Nikethamide Antibloat Adrenaline Antihistaminic Antidotes for common poisoning Antisnake venom Broad spectrum antibiotics Anti-inflammatory Antipyretic and Analgesics Fluids and Electrolytes • **Mobile Veterinary Clinics** 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. For this MVC must have adequate drugs like antibiotic, analgesic, dewormer, ointment, antisnake venom and emergency health care facilities along with trained personnel.			

	A good no. of mobile clinic teams should be planned consisting dedicated and experienced technical workers with allotment of area of operation. The teams should be kept in readiness **having required stock of medicines and equipment** to work in any adverse situation. 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. An emergency kit for poultry should be made ready well in advance. The Poultry kit should have Cage, mask, mash, pellet feed trough, waterers, detergents, poultry vaccines, Veterinary drugs, workers protection uniform etc.			
Cyclone				
Heat wave and cold wave				

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

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

(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.	
2) Floods			
A. Capture			
B. Aquaculture			
(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,	Repairing/ arrangement of alternate	A regular water on the flood and	Re establishment of the infra structural

aerators, huts etc)	safe place to keep pumps aerators	infrastructure facilities.	facility.
3. Cyclone / Tsunami			
4. Heat wave and cold wave			