

STATE : BIHAR
Agriculture Contingency Plan for District: Madhubani

1.0 District Agriculture Profile				
1.1	Agro-Climatic/Ecological Zone			
	Agro Ecological Sub Region (ICAR)	Eastern Plain, Hot Subhumid (moist) Eco-Region (13.1)		
	Agro-Climatic Zone (Planning Commission)	Middle Gangetic Plain Region (IV)		
	Agro Climatic Zone (NARP)	North West Alluvial Plain Zone (BI-1)		
	List all the districts falling under the NARP Zone* (*> 50% area falling in the zone)	Zone-1 (Saran, Siwan, Gopalganj, Muzaffarpur, E-Champaran, Sitamarhi, Sheohar, Vaishali, Darbhanga, Madhubani, Samastipur.		
	Geographic coordinates of district headquarters	Latitude 25 ⁰ 59' N	Longitude 26 ⁰ 39' E	Altitude 45-80m
	Name and address of the concerned ZRS/ZARS/RARS/RRS/RRTTS	Regional Resarch substation, Jhanjharpur.		
	Mention the KVK located in the distirct with address	KVK SK Chaudhary Educational Trust, Chanpura-Basaith, Madhubani-847102.		
	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	Nomal RF (mm)	Normal Rainy days	Normal onset	Normal Cessation
	SW monsoon (June- Sep)	984.8	44	3 rd week of June	2 nd week of October
	NE Monsoon (OCt- Dec)	72	5		
	Winter (Jan-Feb)	24.6	4		
	Summer (Mar-May)	103.6	5		
	Annual	1185	58		

1.3	Land use pattern of the district (latest statistics)	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable waste land	Land under Misc. crops and tree groves	Barren and uncultivable land	Current fallows	Other fallows
	Area ('000 ha)	353.5	232.7	0	75.7	1.4	0.5	22.6	2.3	14.5	3.4

1.4 Major soils of the district

1.4	Major Soils	Area ('000 ha)	Percent (%) of total
	1. Silty clay loam solis	46.6	13.3
	2. Silty clay loam- silt loam solis	46.8	13.4
	3. Silty clay loam – sandy loam solis	38.7	11.0
	4. Loam- Silty loam solis	25.2	7.2
	5. Silty loam- Silty clay loam solis	30.7	8.7
	6. Silty loam solis	110.7	31.6
	7. Silty loam to sandy loam solis	19.9	5.7
	8..Sandy loam to loam solis	15.9	4.5
	9. Sandy loam solis	15.4	4.4

1.5	Agricultural land use	Area ('000 ha)	Cropping intensity %
	Net sown area	232.7	134.23
	Area sown more than once	81.9	
	Gross cropped area	312.6	

1.6	Irrigation	Area ('000 ha)		
	Net irrigated area	80		
	Gross irrigated area			
	Rainfed area	152.7		
	Sources of irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals	2	30.0	37.5
	Tanks			
	Open wells			
	Bore wells	19147	40.3	50.1
	Lift irrigation Schemes	106	0.03	
	Micro –irrigation			
	Other sources			
	Total irrigated area			
	Pump sets			

No. of Tractors			
Groundwater availability and use* (Data source : State/ central Ground water Department /Board	No. of Blocks/ Tahsils	(%) area	Quality of water
Over exploited			
Critical			
Semi-critical			
Safe	21	100%	Arsenic-0-04pp m or 0.400 PPB
Wastewater availability and use			

*Over-exploited: Ground water 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			Summer	Grand Total
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total		
	Rice	-	-	141.7					141.7
	Wheat	-	-		80.2		80.2		80.2
	Maize	-	-	3.2					3.2
	Mustard/ Toria	-	-				6.2		6.2
	Greengram	-	-						
	Lentil	-	-				16.1		16.1
	Horticulture crops –Fruits	Area ('000 ha)							
		Total			Irrigated			Rainfed	
	Mango	8.5							
	Guava	0.4							
	Banana	0.6							
	Litchi	0.4							
	Horticulture crops-Vegetables	Total			Irrigated			Rainfed	
	Potato	9.7			6.8			2.9	

	Onion	1.8	1.6	0.16
	Brinjal	0.6	0.5	0.13
	Tomato	0.7	0.7	0.01
	Ladies finger	0.3	0.2	0.07
	Medicinal and Aromatic crops	Total	Irrigated	Rainfed
	Lemon Grass	0.005		
	Japani Pudina	0.035		
	Safed Musli	0.007		
	Fodder crops	Total	Irrigated	Rainfed
	Total fodder crop area			
	Grazing land			
	Sericulture etc			

1.8	Livestock	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (Local low yielding)			378.9
	Improved cattle			
	Crossbred cattle			
	Non descriptive Buffaloes (local low yielding)			233.5
	Descript Buffaloes			
	Goat			311.1
	Sheep			0.5
	Others (Camel, Pig, Yak etc)			11.1
	Commercial dairy farms (Number)			

1.9	Poultry	No. of Farms	Total No. of birds ('000)
	Commercial		248.1
	Backyard		

1.10	Fisheries (Data source: Chief Planning Officer)
	A. Capture

i) Marine (Data Source: Fisheries Department)	No. of Fishermen	Boats		Nets		Storage facilities (Ice plants etc.)
		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
ii) Inland (Data Source: Fisheries Department)	No. Farmer owned ponds		No. of Reservoirs		No. of village tanks	
	5891		2		10.7	
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)		5.4		1.1		5.9
Others						

1.11 Production and Productivity of major crops

1.11	Name of crop	Kharif		Rabi		Summer		Total		Crop residue as fodder ('000tons)
		Production ('000t)	Productivity (kg/ha)							
Major Field crops (Crops identified based on total acreage)										
	Rice	226.8	1600					226.8	1600	
	Wheat			141	1759			141	1759	
	Maize	0.3	1100	1.2	3000	532	2567	535.5	6667	
	Mustard			5.8	925			5.8	925	
	Lentil			12	746					
	Green gram					2.9	600	2.9	600	
Major Horticultural crops (Crops identified based on total acreage)										
	Mango									
	Guava							75.7		
	Banana							2.8		
	Litchi							72.7		

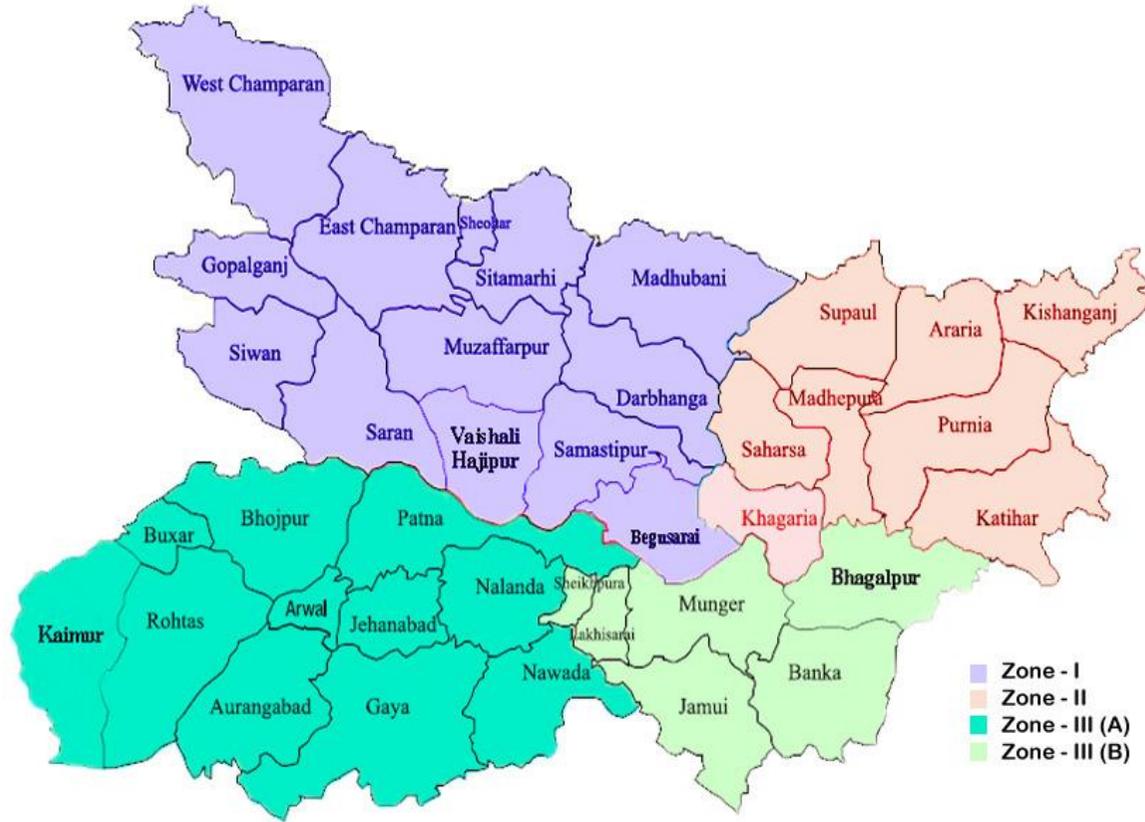
1.12	Sowing window for 5 major field crops	Rice	Wheat	Maize	Lentil	Potato
	Kharif- Rainfed 1. Up land 2. Mid Land	1 -2 nd week of July 2 nd -3 rd week of June	-	3 rd week of May-	-	-

	3. Lowland	3 rd week of May- 1 st week of June		2 nd week of June		
	Kharif-Irrigated	3 rd week of May – 4 th week of June	-	4 th week of June – 1 st week of July	-	-
	Rabi-Rainfed	-	-	-	2 nd week of October – 1 st week of November	-
	Rabi-Irrigated	-	2 nd week of October - 4 th week of December	-	2 nd week of October – 2 nd week of November	3 rd week of October – 2 nd week of November

1.13	What is the major contingency the district is prone to?	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

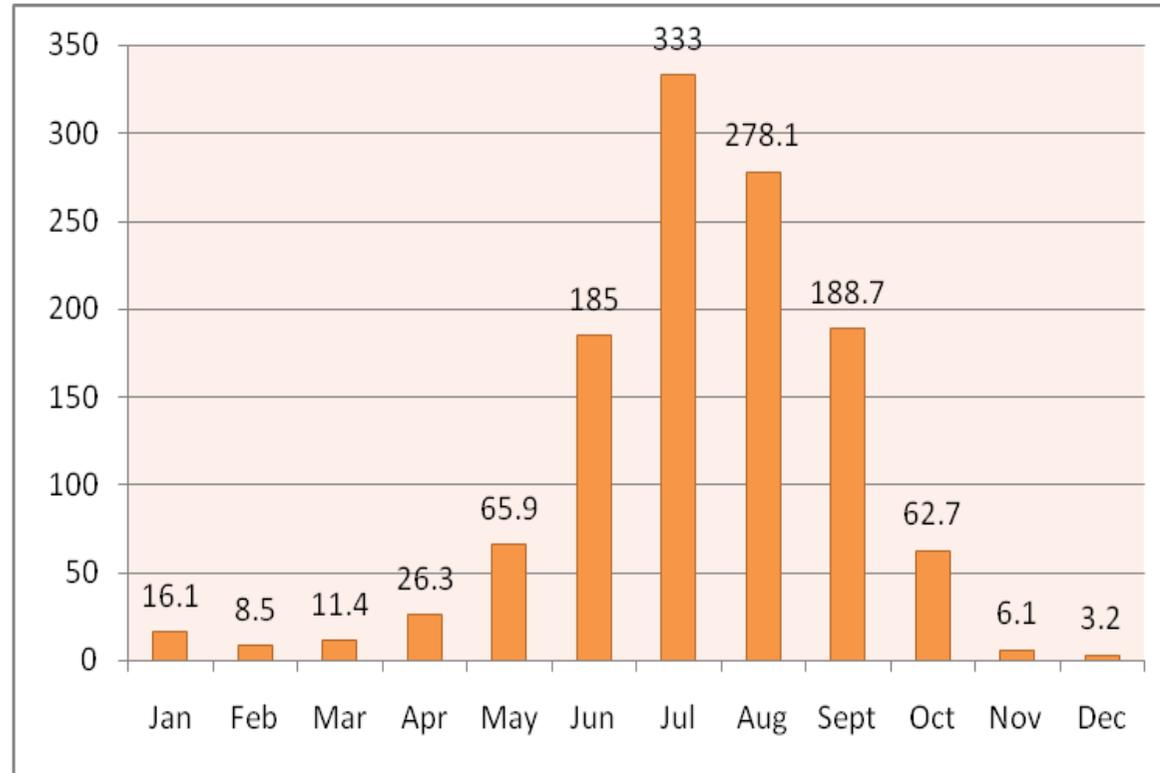
Annexure I
Agro climatic Zones of Bihar



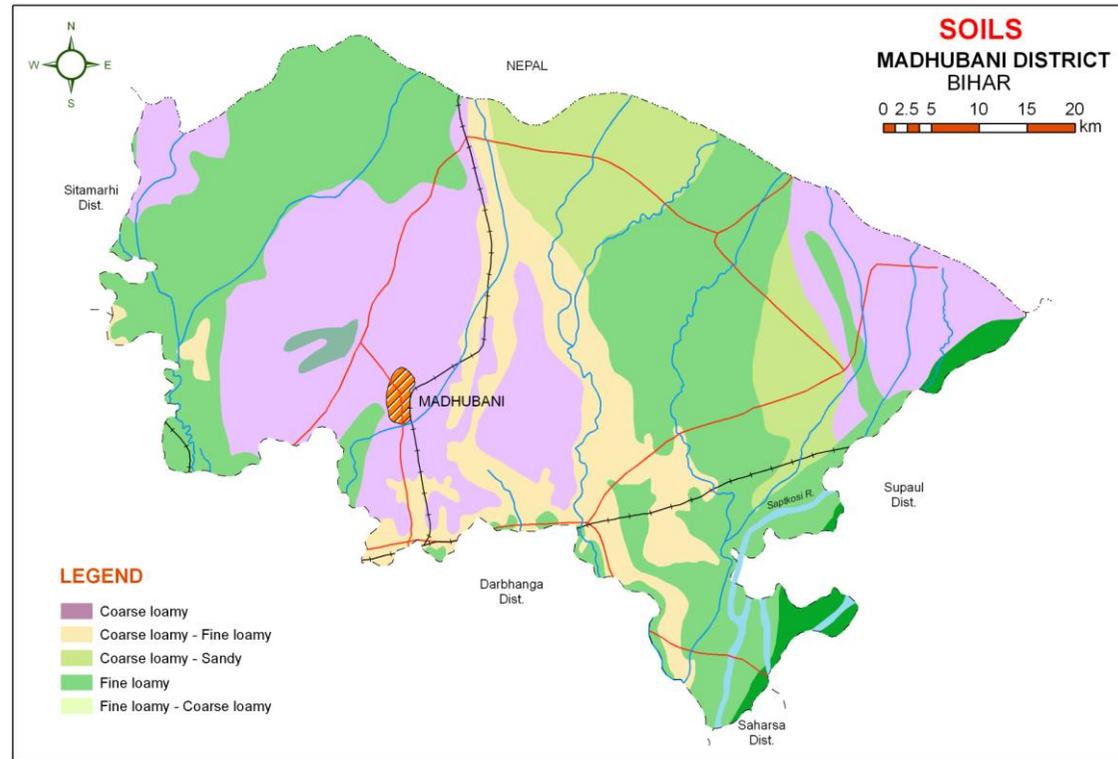
Source: krishi.bih.nic.in

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 Implement
Delay by 2 weeks 1 st week of July	Upland Clay loamy soils	Rice- Toria/Mustard	Early Rice- Toria-Mustard	Normal package of Practices, Direct seeding of rice can be done, Life saving irrigation	-
	Upland calcareous fine loamy soils	Pigeonpea- Greengram	Pigeonpea-Greengram-Toria	Normal package of Practices Life saving irrigation	
	Clay loam soils	Rice- Wheat	Rice-Wheat	Normal Package of Practices, Direct seeding of rice can be done, Life saving irrigation	
	Lowland Loamy clay soil	Rice-Wheat – Lentil/Linseed (Para crop)/ Greengram	Rice-wheat–Lentil		

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/Cropping system	Change in Crop/cropping system	Agronomic measures	Remarks Implement
Delay by 4 weeks 3 rd week of July	Upland Calcareous fine Loamy soils	Rice- Toria, Pigeonpea- Greengram	Rice- Toria/ Rice-Wheat Rice- Prefer Medium to short duration varieties like Saroj (100-110d), Birsa Dhan-201 (100-115d) Pigeonpea- No change	Normal seedling of rice can be used with adequate NPK Direct seeding of rice	Seeds From RAU, Pusa, NSC, TDC, BRBN etc.
	Medium land	Rice- Wheat	Rice- Wheat Rice- Rajendra Bhagawati,	<ul style="list-style-type: none"> Where field is moist, direct 	

			Rajendra Suwasni, Rajshree, Prabhat	seeding of medium duration varieties (125 days) can be done during second fortnight of July in midlands. Post-emergence herbicide application use is essential	
	Lowland	Rice- Wheat Greengram-Sesame	Rice- Wheat Greengram-Sesame Rice- Direct/ dapog seedlings with Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta, Swarna sub-1 Greengram-PDU-139, SML-668, Pusa- Baishaki		

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 st week of August	Upland clay loam soils	Rice-Wheat	<p>Early Rice- Wheat Black gram/Finger millet- Wheat</p> <p>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) Finger millet- RAU 7&8 Birsa Kulti-1</p>	<ul style="list-style-type: none"> • Direct seeding of Rice • Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions in severely affected districts <p>Life saving irrigation</p>	Seeds from RAU,Pusa,NSC, TDC,BRBN etc.
	Upland calcareous fine loamy soils	Pigeonpea-Greengram	<p>Blackgram/ Finger millet- Wheat Blackgram- T-9, Navin, Pant Blackgram-30 , Pant Blackgram-19 Finger millet- RAU 7&8 Birsa Kulti-1</p>	<ul style="list-style-type: none"> • Life saving irrigation 	
	Medium land	Rice- Wheat	<p>Rice (short duration)-Wheat Black gram/Finger millet -Wheat Blackgram/ Finger millet- Wheat</p> <p>Rice- Prabhat, Dhanlamxi, Richharia Turanta, Saroj Black gram- Navin Pant urd-30,19</p>	<ul style="list-style-type: none"> • 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 nursery preferably with medium duration varieties in mid and 	

			Finger millet- RAU 7&8 Birsa Kulti-1 Blackgram- T-9, Navin, Pant urd-30 , 19	lowlands <ul style="list-style-type: none"> • 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 in severely affected districts • Life saving irrigation 	
	Lowland	Rice-wheat-Green gram(Greengram)	Rice (Short Duration)-Wheat 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 25 th August		

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 8 weeks 3 rd week of August	Upland Calcareous fine loamy soils	Rice-Wheat/ Rapeded/ Mustard	Black gram/Finger millet- Rabi maize/ Sep. Pigeonpea/ Late Wheat/ Vegetables/ Lentil/Potato/ Rai Black gram-, Navin, Pant urd- 30,19 Finger millet-DB-7,BR-5BR-10 Coimbatore-1 Birsa Finger millet-1 Rice- Prefer Early matured varieties like Turanta dhan (75d), Prabhat (90d), 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)	<ul style="list-style-type: none"> • Moisture conservation • Inter cultivation Sowing of <i>rabi</i> crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables -	seeds from RAU,Pusa, NSC,TDC,BRBN etc

	Upland loamy clay soils	Maize-wheat	Sesame- Rabi maize Sesame- Late wheat Sesame- Krishna, Pragati	
		Pigeonpea-Greengram	September Pigeonpea-Greengram Sept. Pegejonpea-Pusa-9, Sharad Narendra Arhar-1 Greengram-Samrat, pusa Vishal, SML 668, PDM 139,T-44	-
	Medium land	Rice-Wheat	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	<ul style="list-style-type: none"> • 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. • Enhanced basal dose of NPK in rice to boost early vegetative growth • 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
Lowland Clay loam soils	Rice-Potato/ Rice –Wheat- Green gram	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		

Condition			Suggested Contingency measures		
Early season drought (delayed 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 sowing leading to poor germination /crop stand etc.	Upland calcareous fine loamy soils	Rice-Wheat/Rapseed/ Mustard Rice-Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	Life saving irrigation, Gap filling of existing crop, Thinning	Inter cultivation, Mulching for moisture conservation, Conservation tillage	Seeds from RAU, Pusa, NSC, TDC BRBN etc
	Medium land loamy soils	Maize-wheat Maize- Shaktiman- 1,2,3,4,5 , Suwan Ganga-11Deoki, Pusa early Hybrid Maka-3	Life saving irrigation, Gap filling,		
		Pigeonpea-Greengram Pigeonpea-Bahar , Pusa-9 Narendra Arhar-1	Pre sowing irrigation, Higher seed rate, Gap filling		
	Lowland	Rice- Wheat/ Green gram Rice- Rajshree, Santosh, Sita, Rajnedra suwasni, Rajendra Sweta	Life saving irrigation Gap filling through Dapog nursey	Inter cultivation, Mulching, Conservation tillage	

Condition			Suggested Contingency measures		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5mm) Period)	Major Farming situation	Normal crop/cropping system	Crop Management	Soil nutrient & moisture Conservation measures	Remarks on implementation
At vegetative stage	Upland Calcareous fine	Rice-Potato Rice-Wheat, Rai- Mustard	Gap filling Postponement of top dressing	Inter cultivation Mulching Conservation tillage,	-

	loamy, loamy soils			Life saving irrigation, Foliar spray of (1%) MOP	
		Pigeonpea – Greengram	-		
	Medium land	Rice-Wheat-Green gram	Gap filling Postponement of top dressing		

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	Up land	Rice-wheat Vegetables-Wheat Rice- Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj,	<ul style="list-style-type: none"> Adopt IPM practices Foliar application with 2% Urea or MOP 	Inter cultivation Mulching Conservation tillage, Life saving irrigation, Foliar spray of (1%) MOP	-
	Medium Land	Maize-wheat Maize-Shaktiman 1,2,3,4, 5, Suwan, Ganga-11 Deoki Pusa early hybrid maka-3	Clipping of maize leaves,		
		Pigeonpea - Greengram	-		
Lowland	Rice-Wheat/Green gram Rice-Rajshre, Sanosh, Sita, Rajendr Suwasni Rajendra Sweta	<ul style="list-style-type: none"> Adopt IPM practices Foliar application with 2% Urea or MOP 			

Condition			Suggested Contingency measures		
Terminal drought (Early withdrawal of monsoon)	Major Farming situation	Normal crop/cropping system	Crop Management	Soil nutrient & moisture conservation measures	Remarks on implementation
	Upland	Rice-Wheat Rice-Prabhat, Dhanlaxmi, Richharia, Turanta, Saroj	Life saving irrigation, Mulching, Thinning,	Open the furrow during evening and left furrow open overnight and plank in the next morning before sunrise for growing or early rabi crops like wheat/ Rabi Maize/Pulses/Oilseeds/ Vegetables	-
	Calcareous fine loamy soils				
	Medium land	Maize-Wheat Maize- Shaktiman-1,2,3,4,5 Suwan, Ganga-11,Deoki, Pusa,	-		

		early hybrid Maka-3			
		Pigeonpea Var. Bahar, Narendra Arhar 1, Sharad			
	Lowland Loamy clay soils	Rice-Wheat-Greengram Rice-Rajshree, Santosh, Sita, Rajendra Suwasni, Rajendra Sweta			

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 or 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					
Lack of inflows into tanks due to insufficient/delayed onset of monsoon	Upland	Rice-Wheat/Oilseeds/ Pulses/Rabi maize/ Black gram/Sesame	Short duration of Rice-pigeonpea/ Black gram/Sesame Rice-Prabhat,Dhanlaxmi, Richharia, Turanta, Saroj	<ul style="list-style-type: none"> • Dapog nursery for rice in midlands and lowlands • Direct seedling of rice • Foliar spray with (1%) Urea or MOP • Mulching • Application of organic manure and vermicompost • Groundwater to be used for life saving irrigation to upland crops, vegetables 	Seeds from RAU, Pusa, NSC, TDC , BRBN etc
	Medium Land	Rice-Wheat/Oilseeds/ Pulses/Rabi maize	Short duration Rice -Pigeonpea-Greengram Black gram-Wheat Sesame-Wheat Rice-Rajendra Bhagwati, Rajendra		

			Suwasni, Rajshree, Prabhat Sesame- Krishna, Pragati Black gram- T-9 Navin, Pant urd30,19	and transplanted rice	
	Lowland	Rice-Wheat/Oilseeds/ Pulses/	Short duration Rice -Wheat/ Lentil/ Mustard/Linseed Rice-Rajshree, Santosh Sita- Rajendra Suwasni Rajendra Sweta		

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	Rice-Wheat/Oilseeds/ Pulses/Rabi maize	Short duration of Rice-Wheat/ Pigeonpea/ Black gram/Sesame Rice-Prabhat,Dhanlaxmi Richharia,. Turanta, Saroj	Dapog nursery for rice under moist conditions Direct seedling of rice, Life saving irrigation, Mulching	Seeds from RAU, Pusa NSC, TDC BRBN etc
	Medium Land	Rice-Wheat/Oilseeds/ Pulses/ Rabi maize	Short duration of Rice- Wheat Pigeonpea/Blackgram/ Sesame- Wheat Rice- - Rajendra Bhagawati, Rajendra Suwasni, Rajshree, Prabhat		
	Lowland	Short duration of Rice- Wheat Pigeonpea/Blackgram/ Sesame- Wheat	Short duration Rice- Wheat/Lentil/Mustard/Linseed Rice- Rajshree, Santosh , Sita, Rajendra Suwasni, Rajendra Sweta		

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	<ul style="list-style-type: none"> • Provide drainage • Re transplanting through • Dapog nursery seedlings • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity 	Storage at safer place
Maize, Pigeonpea, Vegetables	<ul style="list-style-type: none"> • Provide drainage • Gap filling • Re sowing, 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity 	Storage at safer place
Horticulture				
Mango	<ul style="list-style-type: none"> • Provide drainage • Replanting , • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvesting at proper maturity 	
Litchi	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	
Banana	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	
Papaya	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Safe storage and transportation
Heavy rainfall with high speed winds in a short span²				
Rice	<ul style="list-style-type: none"> • Provide drainage • Replanting, • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	Storage at safer place
Maize	<ul style="list-style-type: none"> • Re sowing • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	Storage at safer place

	<ul style="list-style-type: none"> • Provide drainage 			
Pigeonpea	<ul style="list-style-type: none"> • Re sowing • Gap filling • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	Storage at safer place
Vegetables	<ul style="list-style-type: none"> ▪ Provide drainage ▪ Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage 	
Horticulture				
Mango	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity 	
Litchi	<ul style="list-style-type: none"> ▪ Provide drainage ▪ Gap filling 	Provide drainage	<ul style="list-style-type: none"> • Provide drainage • Drenching with copper fungicide 	
Banana	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage • Staking 	<ul style="list-style-type: none"> • Provide drainage • Harvest at proper time 	
Guava	<ul style="list-style-type: none"> • Provide drainage • Replanting 	<ul style="list-style-type: none"> • Provide drainage • Drenching with copper fungicides 	<ul style="list-style-type: none"> • Provide drainage • Harvest at proper time 	
Outbreak of pests and diseases due to unseasonal rains				
Rice	<ul style="list-style-type: none"> ❖ Seedling treatment with granular insecticide – Cartap hydrochloride or phorate 10G or carbofuran 3G. <ul style="list-style-type: none"> ❖ Maintain shallow water in nursery beds ❖ Providing good drainage. 	<ul style="list-style-type: none"> ❖ Use copper fungicides against Bacterial leaf blight. ❖ Split application of N fertilizer (3-4 times) 	<ul style="list-style-type: none"> ❖ Harvest at physiological maturity 	<ul style="list-style-type: none"> ❖ Proper drying and safe storage
Maize	<ul style="list-style-type: none"> ❖ 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 	<ul style="list-style-type: none"> ❖ 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) 	<ul style="list-style-type: none"> ❖ Cob harvesting from standing crop ❖ Harvest at physiological maturity 	<ul style="list-style-type: none"> ❖ Storage in safe places like farmer warehouse/tent covering of produce ❖ Ensure 10-12% moisture in grains before storage ❖ Proper drying

Pigeonpea	<ul style="list-style-type: none"> ❖ Provide drainage ❖ Seed treatment with 1 g carbendizim +2g thiram/kg seed. 	Provide drainage	Provide drainage	<ul style="list-style-type: none"> ❖ Proper drying • Storage at safe place and transportation
Horticulture				
Vegetables	<ul style="list-style-type: none"> • Drainage management 	<ul style="list-style-type: none"> • Drainage management 	<ul style="list-style-type: none"> • Drainage management 	
Mango	<p>Anthracnose:- 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>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. Use of wind-breaks helps in reducing brushing/ wounding and thus reduces the chance of infection.</p>	<p>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.</p> <p>Mango powdery mildew: Spray wettable sulphur(0.2%) & calixin or karathane (0.1%) during second week of December</p>	<p>Mango powdery mildew: 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>Mango bacterial canker: 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>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.</p> <p>Diseased leaves, twigs, and fruits, should be collected and burnt to avoid the spread for next season</p>
Litchi	Fruit Fly: Monitor adult fruit flies emergence	Fruit Fly: First Spray delta menthrin	Harvest at proper time	Fruit Fly: Collect all fallen

	by using methyl eugenol or sex pheromone traps.	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		infested fruits and put in a drum covered with fine wire mesh. Harvest fully matured fruits one week earlier to escape egg laying
Banana	Provide drainage	Provide drainage	Harvest at proper time	
Guava	Provide drainage	Provide drainage	Harvest at proper time	

2.3 Floods

Condition	Suggested contingency measure ^o			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation¹				
Rice	<ul style="list-style-type: none"> • Provide drainage • Re transplanting through Dapog nursery seedlings • Gap filling 	<ul style="list-style-type: none"> • Provide drainage • Gap filling with 40-45 days old seedlings • Kharuhan (double transplanting) 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity • Lentil as paira crop can be taken 	Storage at safer place
Maize	<ul style="list-style-type: none"> • Provide drainage • Re sowing • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity 	Storage at safer place
Pigeonpea	<ul style="list-style-type: none"> • Provide drainage • Re sowing • Gap filling 	<ul style="list-style-type: none"> • Provide drainage 	<ul style="list-style-type: none"> • Provide drainage • Harvest at physiological maturity 	Storage at safer place
Horticulture				
Mango	<ul style="list-style-type: none"> • Replanting • Gap filling • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	Judicious harvesting
Litchi	<ul style="list-style-type: none"> • Gap filling • Replanting • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	Judicious harvest
Banana	<ul style="list-style-type: none"> • Replanting • Gap filling • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	Judicious harvesting

Guava	<ul style="list-style-type: none"> • Replanting • Gap filling • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	<ul style="list-style-type: none"> • Drenching with copper fungicides • Provide drainage 	Judicious harvesting
Continuous submergence for more than 2 days²				
Rice	<ul style="list-style-type: none"> • Gap filling • Re sowing 	<ul style="list-style-type: none"> • Replanting through Kharuhan method (double transplanting) by 3-4 seedlings per hill • Short duration rice variety 	<ul style="list-style-type: none"> • Toria/Late wheat if completely damaged 	Storage at safer place
Maize	<ul style="list-style-type: none"> • Re-sowing 		<ul style="list-style-type: none"> • Toria/Late wheat if completely damaged 	Storage at safer place
Horticulture				
Mango	<ul style="list-style-type: none"> • Provide drainage 			
Guava	<ul style="list-style-type: none"> • Provide drainage 			
Banana	<ul style="list-style-type: none"> • Provide drainage 			
Sea water intrusion³	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^p				
Maize	Provide irrigation	Provide irrigation	Provide irrigation	
Pigeonpea	Provide irrigation	Provide irrigation	Provide irrigation	
Wheat			Provide irrigation (Terminal heat)	
Horticulture				
Mango	Provide irrigation	Provide irrigation	Provide irrigation	
Litchi	Provide irrigation	Provide irrigation	Provide irrigation	
Papaya	Provide irrigation	Provide irrigation	Provide irrigation	
Cold wave^q				
Wheat		Provide irrigation , Mulching		
Maize		Provide irrigation ,		

		Mulching		
Mustard		Provide irrigation , Mulching		
Potato		Provide irrigation , Mulching		
Pulses		Provide irrigation , Mulching		
Horticulture				
Bhendi		Provide irrigation, Mulching		
Brinjal		Provide irrigation, Mulching		
Chili		Provide irrigation , Mulching		
Tomato		Provide irrigation, Mulching		
Lauki		Provide irrigation , Mulching		
Frost		Provide irrigation, Mulching		
wheat		Provide irrigation, Mulching		
Chickpea		Provide irrigation , Mulching		
Pigeonpea		Provide irrigation , Mulching		
Lentil		Provide irrigation , Mulching		
Horticulture				
Bhendi		Provide irrigation , Mulching		
Brinjal		Provide irrigation , Mulching		
Chilli		Provide irrigation , Mulching		
Tomato & Potato		Earthing up Provide irrigation , Mulching		Harvest in dry weather
Hailstorm	Not Applicable			

2.5 Contingent strategies for livestock, Poultry & Fisheries

2.5.1. Livestock

	Suggested contingency Measures		
	Before the events	During the event	After the event
Drought			
Floods			
Feed and fodder availability	<ol style="list-style-type: none"> 1. Cultivation of fodder tree 2. Storage of Improved Quality Fodder 3. Conservation & Storage of <ul style="list-style-type: none"> • Feed & Fodder • Hay & Silage:- Preserve the fodder in the form of hay from Berseem & other grasses as well as silage from <ol style="list-style-type: none"> (a) Maize- harvesting at well developed cob. (b) Jowar-at flowering stage (c) Oat (d) Hybrid Napier – 40-45 day old. (e) Water hycianth mixing with Rice straw in ratio of 4:1 with 70kg molasses / ton of clean water bycyanth. (f) Potato leaves mixing with wheat straw in ratio of 7:1 and should be supplemented with 3% molasses. <p>Hay: -</p> <ul style="list-style-type: none"> • 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. 	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. Bamboo leaves 2. Neem 3. Bargad 4. Peepal 5. Seesam 6. Subabul <p>Use of unconventional feed stuff:</p> <ol style="list-style-type: none"> (i) Aquatic plant- water hycianth (ii) Lotus (iii) Aquatic weeds 	<p>Production of forage crops</p> <ol style="list-style-type: none"> 1. Balanced feeding of Animal supported with little higher concentrate mixture. 2. Cultivation of fodder Rabi maize if mater stagnated upto Nov/ December 3. Jowar/ Cowpea 4. Maize in September
	<ol style="list-style-type: none"> 4. Development & Storage of :- <ol style="list-style-type: none"> (a) Complete Feed Block (CFB) (b) Urea – Molasses- Mineral- Block (U.M.M.B.) 5. Development of Fodder Bank 		
Drinking Water			
Health and disease management	Veterinary Preparedness with Medicines, Vaccines and provision for mobile ambulatory Van.	Animal safety, Health camp and Treatment	Sanitation, deforming, treatment, health camps Culling of Sick animals and disposal of carcass.

	<ul style="list-style-type: none"> 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 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. 	<p>Important Suggestions for animal and poultry safety</p> <p>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. he 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 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.</p> <p>Health Camp and Treatment</p> <p>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 poultry to authorities handling the disaster.</p> <p>Health camp and treatment 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</p>	<p>Maintenance of Sanitation : Adequate attention is to be paid to disinfect the premises of temporary sheds with the help of bleaching power, 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>De-worming after the flood: 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. in water logged area, sucks can be introduced as biological control measures against snails to protect livestock from parasite disease.</p> <p>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 opening into the surrounding soil.</p> <p>Methods of Carcass disposal to be adopted Burial</p>
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		<p>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 Tatanus Red water Black Disease Entertoxemia Liver Fluke Amphistomiasis Brooders pnemonia</p> <p>Treatment of Non infections</p> <p>Arrangement should be made for the treatment of drowning and traumatic injuries, aspiration pneumonia, lameness and other surgical cases in the health camp.</p> <p>Disinfection of livestock premises and Poultry shed.</p> <p>Disinfection of livestock.</p> <p>Premises and the temporary sheds should be done with he help of bleaching power, phenol, carbolic acid etc.</p>	<p>Burning Composting Vulturing</p> <p>S. Health Camp after the flood : Protection of livestock from out breaking and communicable diseases be made. Health camps are to be organized 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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Cyclone			
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^s Based on forewarning wherever available.

2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event ^s	During the event	After the event	
Drought				
Floods				
Shortage of feed ingredients				
Drinking water				
Health and disease management	<p>Vaccines to be used for different animals and Poultry</p> <p>Cattle and Buffalo Hemorrhagic Septicemia Vaccine Black Quarter Vaccine FMD Vaccine Anthrax Vaccine as per endemicity</p> <p>Sheep and Goat Hamorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine</p>			
	<p>Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity</p> <p>Pigs.</p> <p>Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity. Dogs. Rabies Vaccine</p>			

	<p style="text-align: center;">Poultry</p> <p>Mareks disease vaccine RDV (F₁ & R₂B₁) FPV, IBRV & IBDV</p> <p style="text-align: center;">(Annexure-1)</p> <ul style="list-style-type: none"> • Medicines <p>All Districts should be earmarked for flood. An inventory of required medicines to treat the affected livestock in case of eneventualities should be made.</p> <p>The Govt. should take steps to procure sufficient quantity of essential life saving medicines.</p> <p>List of life saving Medicines Corticosteroids Nikethamide Antibloat Adrenaline Antihistaminic Antidotes for common poisoning Antisnake venom Broad spectrum antibiotics Anti-inflammatory</p>			
	<p>Antipyretic and analgesics Fluids and Electrolytes</p> <ul style="list-style-type: none"> • Mobile Veterinary Clinics <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. 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</p>			

	<p>consisting dedicated and experienced technical workers with allotment of area of operation.</p> <p>The teams should be kept in readiness having required stock of medicines and equipment 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, pellet feed trough, waterers, detergents, poultry vaccines, Veterinary drugs, workers protection uniform etc.</p>			
Cyclone				

^s Based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested Contingency measures		
	Before the events	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 of transfer of fishes may be done. (iii) Preparation of the pond for next crop.
(ii) Impact of salt load build up in pons/ change in water quality	(i) Regular monitoring of water quality parameter. (ii) Arrangement of aeration (iii) Addition of water from	(i) Arrangement of aeration. (ii) Addition of water (iii) Monitoring of water quality (iv) Reduction of manuring	

	external resource.	according to water level	
2) Floods			
A. Capture			
B. Aquaculture			
(i) Inundation with flood water			
(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.	<ul style="list-style-type: none"> - 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.		<ul style="list-style-type: none"> - 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 infrastructural facility.
3. Cyclone/ Tsunami			
4. Heat wave and cold wave			

^a based on forewarning wherever available