State: Uttar Pradesh

Agriculture Contingency Plan for District: BULANDSHAHAR District

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	Northern Plain (And Central Highlands) Including Aravallis, Hot Semi-Arid Eco-Region (4.1)		
	Agro-Climatic Zone (Planning Commission)	Upper Gangatic Plain Zone(V)		
	Agro Climatic Zone (NARP)	Western plain Zone (UP-3)		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Muzaffarnagar, Bagpat, Meerut, Gaziyabad, G.B.Nagar and Bulandshahr		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		28^0 23' 60N	77^0 50' 60E	207.1 / 195 Mt
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut ZRS, Bulandshahr, D.M.Road Bulandshahr, U.P.		
	Mention the KVK located in the district with address	S.V.P.U.A.&T, Krishi Vigyan Kandra, D.M.Road, Bulandshahr (U.P.) - 203001		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	S.V.P.U.A.&T, Crop Research Station, D.M.Road, Bulandshahar (U.P.) - 203001		

1.2	**Rainfall**	**Normal RF(mm)**	**Normal Rainy days (number)**	**Normal onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-Sep):	582.0	24	3rd week of June	2nd week of September
	NE Monsoon(Oct-Dec):	26.4	08	3rd week of December	2nd week of January
	Winter (Jan- March)	49.1	06	-	-
	Summer (Apr-May)	16.0	04	-	-
	Annual	673.5	42	-	-

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)	364.974	297.587	7.795	40.253	0.920	5.043	0.924	6.620	4.756	1.076

1. 4	**Major Soils (common names like red sandy loam deep soils (etc.,)***	**Area ('000 ha) Approx.**	**Percent (%) of total**
	Loamy Sand	232.3	78%
	Sandy Loam	50.58	17%
	Sandy silt Loam	14.88	5%
	Others (specify):		-

1.5	**Agricultural land use**	Area ('000 ha)	Cropping intensity %
	Net sown area	297.587	171.46
	Area sown more than once	212.666	
	Gross cropped area	510.253	

1.6	**Irrigation**	Area ('000 ha)		
	Net irrigated area	259.269		
	Gross irrigated area	510.253		
	Rainfed area	38		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals	-	150.102	59%
	Tanks		-	-
	Open wells		17.514	7%
	Bore wells	4543	-	
	Lift irrigation schemes	-	0.003	
	Micro-irrigation	584		
	Other sources (please specify)	1576		
	Total Irrigated Area			
	Pump sets	201149		
	No. of Tractors			
	Groundwater availability and use* (Data source: State/Central Ground water	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic,

	Department /Board)	Block-16		fluoride, saline etc)
	Over exploited	8	55%	Not reported
	Critical	4	26%	do
	Semi- critical	3	11%	do
	Safe	1	8%	do
	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 (as per latest figures) (2008-09)

1.7	**Major field crops cultivated**	**Area ('000 ha)**							
		Kharif			***Rabi***				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Wheat	-	-	-	171.030	25.555	196.585	-	196.585
	Rice	614.31	-	614.31	-	-	-	-	614.31
	Maize	-	36.108	36.108	-	-	-	12.606	48.794
	Pulses	-	0.394	0.394	0.620	0.931	1.551	0.271	2.216
	Sugarcane	-	-	-	56.891	-	56.891	-	56.891
	Barley	-	-	-	-	7.335	7.335	-	7.335
	Mustard	-	-	-	2.792	6.256	9.048	-	9.048

	Horticulture crops - Fruits	**Area ('000 ha)**		
		Total	**Irrigated**	**Rainfed**
	Mango	14.494	782.676	797.17
	Guava	1.580	1.580	-
	Bel	0.526	-	0.526
	Horticulture crops - Vegetables	**Total**	**Irrigated**	**Rainfed**

	Potato	12.120	12.120	-
	Other vegetable	96.154	96.154	
	Medicinal and Aromatic crops	**Total**	**Irrigated**	**Rainfed**
	Flowers	0.480	0.480	-
	Plantation crops	Total	Irrigated	Rainfed
	Popular	0.985	0.985	-
	Eg., industrial pulpwood crops etc.			
	Fodder crops	**Total**	**Irrigated**	**Rainfed**
	Sorghum	22.671	12.200	10.271
	Pearl millet	2.163	-	2.163
	Maize	0.261	0.261	-
	Berseem	2.231	2.231	-
	Total fodder crop area	27.326	14.692	12.434
	Grazing land	0.218	-	0.218
	Sericulture etc	-	-	-
	Others (specify)	-	-	-

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	36.164	175.474	211.638
	Improved cattle			
	Crossbred cattle	22.011	76.566	98.577
	Non descriptive Buffaloes (local low yielding)	136.620	644.340	780.961
	Descript Buffaloes	58.551	276.146	334.697
	Goat	38.749	97.641	136.390
	Sheep	0.806	1.431	2.237
	Others (Camel, Pig, Yak etc.)	-	-	1230.232
	Commercial dairy farms (Number)			
1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**	
	Commercial	03	2.750	
	Backyard	0.272	41.494	
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**	
		01/0.424ha		01/10.0ha		1050/835.917ha	
	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)			NA	0.27	0.2151	
	Others			-	-	-	

1.11 Production and Productivity of major crops (2008-09)

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 to be identified based on total acreage)										
	Rice	138.220	2250	-	-	-	-	138.220	2250	165.864
	Maize	627.528	1738	-	-	301.022	23.73	928.55	1903	334.278
	Pulses	0.926	235	6.545	422	2.282	842	9.753	440	426.00
	Wheat	-	-	777.887	395.7	-	-	777.887	3957	871.233
	Sugarcane			3233.684	56840	-	-	3233.684	56840	517.39

	Mustard	-	-	9.691	1071	-	-	9.691	1071	-
	Barley	-	-	26.318	3588	-	-	26.318	3588	34.213
Major Horticultural crops (Crops to be identified based on total acreage)										
	Mango	-	-	-	-	-	-	226.106	15600	-
	Guava	-	-	-	-	-	-	19.671	12450	-
	Bel	-	-	-	-	-	-	0.398	756	-

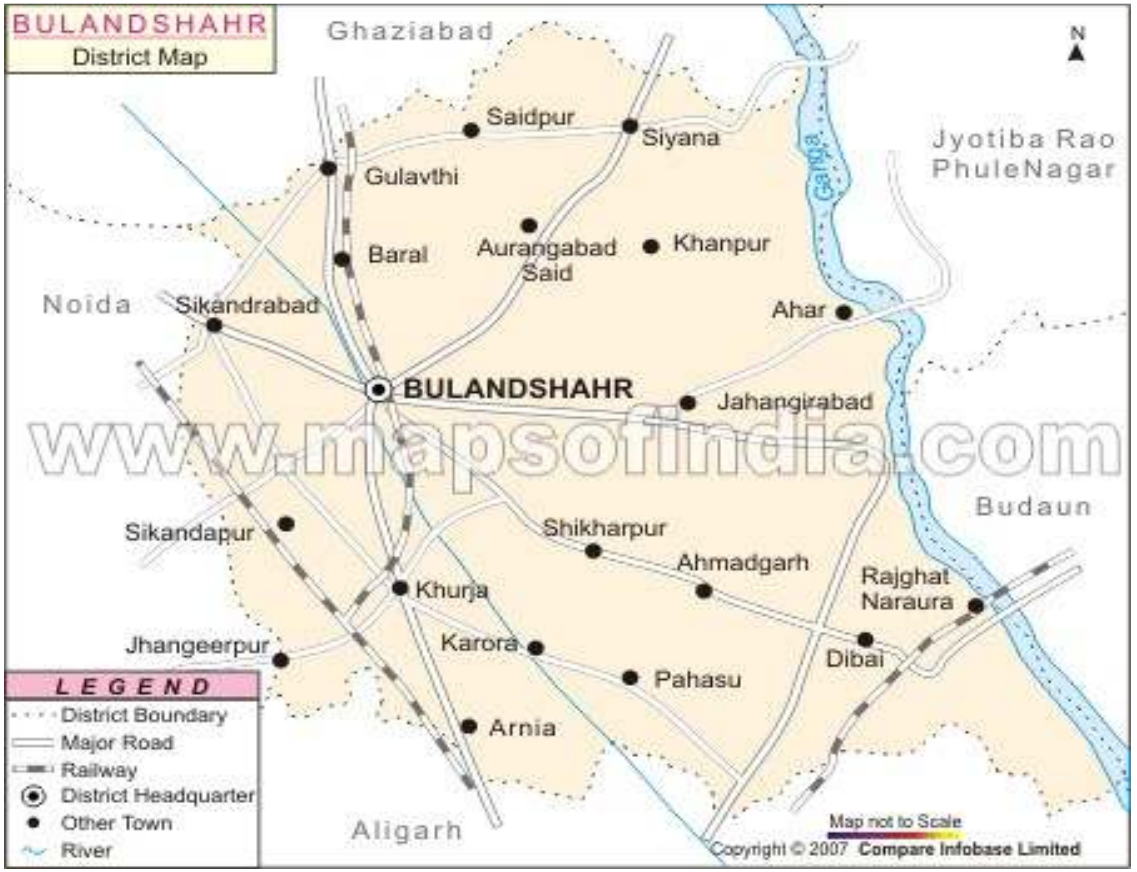
1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	Rice	Wheat	Sugarcane	Pulses	Potato
	Kharif- Rainfed	-	-	-	July-Aug	-
	Kharif-Irrigated	June-July	-	March-May	May-June	-
	Rabi- Rainfed	-	-	-	Oct-Nov	Oct-Nov
	Rabi-Irrigated	-	Nov-Dec	Oct-Nov	Nov-Dec	

1.13	**What is the major contingency the district is prone to?** (Tick mark)	**Regular**	**Occasional**	**None**
	Drought	X	√	X
	Flood	X	X	√
	Cyclone	X	X	√
	Hail storm	X	√	X
	Heat wave	X	√	X
	Cold wave	X	√	X
	Frost	X	√	X
	Sea water intrusion	X		√
	Pests and disease outbreak (specify) Sheath Blight, Grass hopper,Pyrilla, Neck blast etc	X	√	X
	Others (specify) Fog		√	X

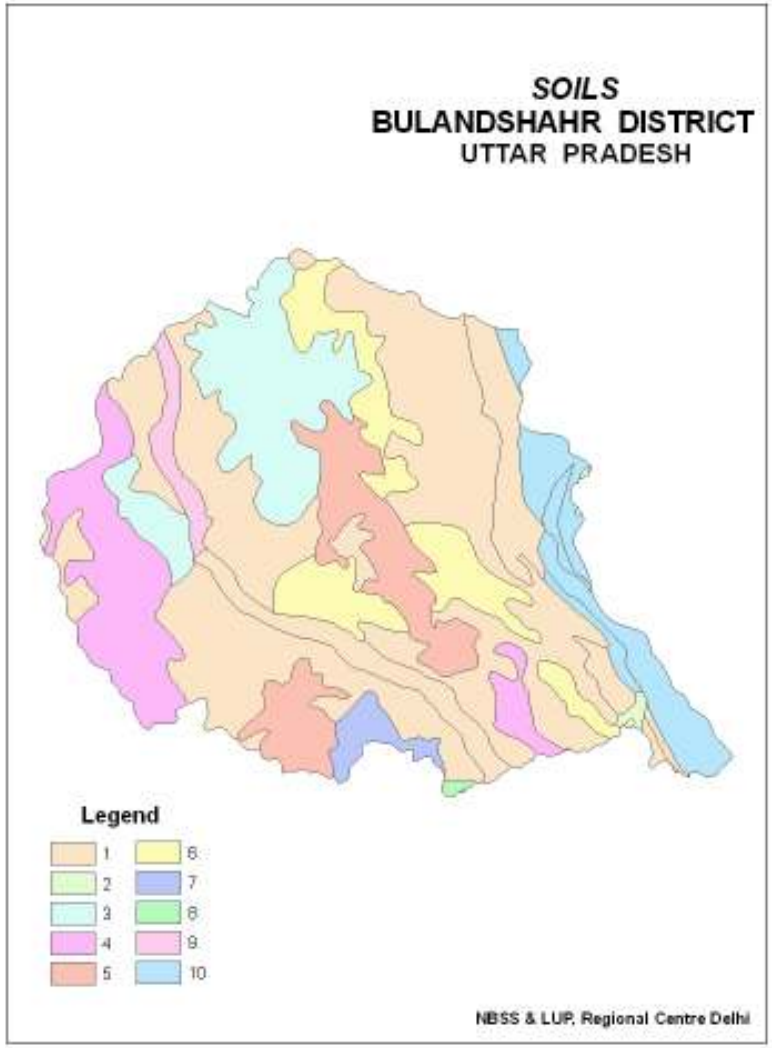
1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Enclosed: Yes

		Mean annual rainfall as Annexure 2	Enclosed: No
		Soil map as Annexure 3	Enclosed: Yes

Annexure I



Annexure III



Legend	Description
1& 9	Deep, loamy soils
2	Deep, loamy soils and silty soils
3	Deep, fine soils(moderately saline and sodic) and loamy soils
4	Deep, silty soils and loamy soils (slightly saline and slightly sodic
5	Deep, loamy soils (moderate saline and sodic)
6	Deep, loamy soils and loamy soils (moderate salinity and sodicity).
7	Deep, loamy soils (slightly saline and moderately sodici) and silty soils
8	Deep, silty soils and fine soils
10	Deep, sandy soils (moderate flooding) and loamy soils (slight flooding)

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[b]**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks 1st week of July	Deep soil, yellow colored alluvial loam soil	Maize/ Sorghum/ Pearl millet/ Pigeonpea	Maize: Kanchan, Navin Navjyoti, Azad utam,Surya,Meerut pili,Ganga 2,11 Samrat etc Sorghum:CSH 14, 16, CSB 13, 15, SPB 1338 etc Pearl millet: Raj-171,WCC-75,Pusa 23, 322 ICMH-451 Pigeonpea: UPAS 120, ICPL 151,Pusa 33,	• Conservation furrow • Inter-cultivation • Sowing with multi seed drill • Wider spacing for pigeonpea	• Seed-drill under RKVY • Supply of seed through govt. agencies *ie*. NFSM,RKVY • Re-scheduling of canal calendar
Delay by 4 weeks (Specify month) 3rd week of July	Deep soil, yellow colored alluvial loam soil	Maize/ Pearl millet/ Sesamum/ Blackgram	Maize: Kanchan, Navin Navjyoti, Azad utam,Surya,Meerut pili,Ganga 2,11 Samrat etc Pearl millet:Raj-171,WCC-75,Pusa 23, 322 ICMH-451 Sesame: Pergati, Shekar, TA-78, TA-12 Blackgram: Narender Blackgram-1, Pant U-30, 19, 35 etc	• Conservation furrow • Inter-cultivation • Sowing with multi seed drill	Seed-drill under RKVY Supply of seed through govt. agencies *ie*. NFSM
Delay by 6 weeks 1st week of August	Deep soil, yellow colored alluvial loam soil	Blackgram/Greengram / Toria/ Pearl millet	Blackgram: Narender Blackgram-1, Pant U-30, 19, 35 Greengram:Pantmoong -2, 3, Narender mung -1, 4, SML-668, PDM-11	• Sowing with multi seed drill	Re-scheduling of canal calendar

			Pearl millet:Raj-171,WCC-75,Pusa 23, 322 ICMH-451		

Condition			**Suggested Contingency measures**		
Early season drought	**Major Farming situation**		**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks 3rd week of August	Deep soil, yellow colored alluvial loam soil	Toria	Toria: P.T.-30, 507, 303, Bhawani, T-9	• Conservation furrow • Inter-cultivation • Sowing with multi seed drill	• Seed-drill under RKVY Supply of seed through govt. agencies *ie*. NFSM

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**[a]	**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/ crop stand etc.	Irrigated upland	Rice: PS 4, 5, PB 1, PRH 10/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284/Maize: Kanchan, Sweta, Navin, Surya, Azad uttam, Navjyoti, Jaunpuri, Meerut pili/Greengram: Pant mung 2,4 & Local/Blackgram: T 9, PU 19,30,35	1. Thinning, weeding and gap filling in existing crop. 2. Re sowing 3. Selection/nursery sowing of short duration rice cultivar	• Inter cultivation • Conservation furrow • Thinning and weeding • Mulching	• Supply of inter cultural implements through RKVY • Farm ponds through IWSM programme • Pulse crop seeds supply through NFSM
	Irrigated lowland	Rice: PS 2,3, PB 1, Sarju 52, Pant 4, Narendra 359, Saket 4/Sorghum (Fodder): Kanpuri, UP Chari 1,2/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284			

	Un irrigated upland	Maize/Sorghum/ Pigeonpea(UPAS 120, ICPL 151)			
	Un irrigated lowland	Pigeonpea: UPAS 120, ICPL 151/Pearl millet: Local Merut pili			

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	Irrigated upland	Rice: PS 4, 5, PB 1, PRH 10/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284/Maize: Kanchan, Sweta, Navin, Surya, Azad uttam, Navjyoti, Jaunpuri, Meerut pili/Greengram: Pant mung 2,4 & Local/Blackgram: T 9, PU 19,30,35	1. Thinning, weeding and gap filling in existing crop. 2. Re sowing 3.Postponement of top dressing 4.Life saving irrigation	• Inter cultivation • Conservation furrow • Thinning and weeding • Mulching	• Supply of inter cultural implements through RKVY • Farm ponds through IWSM programme • Pulse crop seeds supply through NFSM • Micro/drip/sprinkler irrigation under govt. schemes
	Irrigated lowland	Rice: PS 2,3, PB 1, Sarju 52, Pant 4, Narendra 359, Saket 4/Sorghum (Fodder): Kanpuri, UP Chari 1,2/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284			
	Un irrigated upland	Maize/Sorghum /Pigeonpea: UPAS 120, ICPL 151			
	Un irrigated lowland	Pigeonpea: UPAS 120, ICPL 151/Pearl millet: Local Meerut pili			

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation[a]**	**Normal Crop/cropping system[b]**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**

At flowering/ fruiting stage	Irrigated upland	Rice: PS 4, 5, PB 1, PRH 10/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284/Maize: Kanchan, Sweta, Navin, Surya, Azad uttam, Navjyoti, Jaunpuri, Meerut pili/Greengram: Pant mung 2,4 & Local/Blackgram: T 9, PU 19,30,35	1. Thinning, weeding and gap filling in existing crop. 2.Life saving irrigation 3. Weeding and weed mulching	• Conservation furrow • Thinning and weeding • Mulching • Urea spray or KCL spray	• Farm ponds through IWSM programme
	Irrigated lowland	Rice: PS 2,3, PB 1, Sarju 52, Pant 4, Narendra 359, Saket 4/Sorghum (Fodder): Kanpuri, UP Chari 1,2/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284			
	Un irrigated upland	Maize/ Sorghum/ Pigeonpea (UPAS 120, ICPL 151)			
	Un irrigated lowland	Pigeonpea: UPAS 120, ICPL 151/ Pearl millet: Local Merut pili			

Condition			**Suggested Contingency measures**		
	Major Farming situation[a]	**Normal Crop/cropping system[b]**	**Crop management**	**Rabi crop planning**	**Remarks on Implementation**
Terminal drought (Early withdrawal of monsoon)	Irrigated upland	Rice: PS 4, 5, PB 1, PRH 10 /Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284/Maize: Kanchan, Sweta, Navin, Surya, Azad uttam, Navjyoti, Jaunpuri, Meerut pili/Greengram: Pant mung 2,4 & Local/Blackgram: T 9, PU 19,30,35	1.Life saving irrigation 2. Picking/harvesting of pods/ear 3.Harvest at physiological maturity stage 4.Harvest for fodder	• Toria/mustard • Potato • Pea/gram • Berseem/Oat • Land levelling	• Farm ponds through IWSM programme • Supply of seed through ISOPM • Harvesting and threshing implements through RKVY • Supply of land lazer labeler through CLDP or RKVY
	Irrigated lowland	Rice: PS 2,3, PB 1, Sarju 52, Pant 4, Narendra 359, Saket 4/Sorghum (Fodder): Kanpuri, UP Chari 1,2/Sugarcane: 64, 88230, 92254, 95255, COS 767, 8432, 97284			
	Un irrigated upland	Maize/Sorghum: Local Merut pili/ Pigeonpea: UPAS 120, ICPL 151			
	Un irrigated lowland	Pigeonpea: UPAS 120, ICPL 151/Pearl millet: Local Merut pili			

1.1.2. 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 water in canals due to low rainfall	Upland sandy loam soils	Rice (Basmati)-Wheat	Replace rice with maize or aerobic rice	• Use short duration varieties Rice: PS 4, 5, PB 1, PRH 10 Maize: Kanchan, Sweta, Navin, Surya Pearl millet:WCC-75,Raj-171,Pusa-23,Pusa-322 • Light irrigation with tube well water • Follow alternate wetting and drying schedule of irrigation in rice • Alternate Furrow irrigation • Mulching in sugarcane / maize	• Seed through KSSC and NFSM • Adequate supply of electricity/diesel should be ensured by the Govt. agencies.
		Sorghum (Fodder)/Maize-Potato/ Wheat	Pearl millet/ Greengram Blackgram - Potato/ Wheat		
		Sugarcane +cucurbits – Ratoon-Wheat	No change		
	Lowland clay loam soils	Rice-wheat	Basmati rice -Wheat	• Use short duration varieties e.g. Rice: PS 4, 5, PB1, PRH 10 Maize:Kanchan, Sweta, Navin, Surya Pearl millet (Fodder): WCC-75,Raj-171,Pusa-23,Pusa-322 • Light irrigation with tube well water • Follow alternate wetting and drying schedule of irrigation in rice • Alternate Furrow irrigation • Mulching in sugarcane	• Seed through KSSC and NFSM • Adequate supply of electricity/diesel should be ensured by the Govt. agencies.
		Sorghum Fodder-Wheat	Pearl millet-Wheat		
		Sugarcane-Ratoon-Wheat	No change		

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Limited release of water in canals due to low rainfall	Up land sandy loam soils	Rice (Basmati)-Wheat	No change	• Light irrigation with tube well water at critical stages only e.g CRI, Tillering &.Flowering stage • Follow alternate wetting and	• Adequate supply of electricity/diesel should be ensured by the Govt. agencies.
		Sorghum (Fodder)/Maize-Potato/ Wheat	No change		
		Sugarcane +cucurbits –Ratoon-Wheat	No change		

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
				drying schedule of irrigation in rice • Alternate Furrow irrigation • Mulching in sugarcane/ maize	
	Low land clay loam soils	Rice-wheat	No change	• Light irrigation with tube well water at critical stages only e.g CRI, Tillering &.Flowering stage • Follow alternate wetting and drying schedule of irrigation in rice • Alternate Furrow irrigation • Mulching in sugarcane	• Supply of inter cultural implements through RKV • Adequate supply of electricity/diesel should be ensured by the Govt. agencies.
		Sorghum Fodder-Wheat	No change		
		Sugarcane-Ratoon-Wheat	No change		

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Non release of water in canals under delayed onset of monsoon in catchment	Upland tube well irrigated canal sandy loam soil	Basmati rice	Maize/Arabic Rice	• Limited irrigation • Alternate Furrow irrigation • Drip irrigation • Mulching	• Seed through KSSC and NFSM • Supply of inter cultural implements through RKVY •
		Sorghum/Maize	Pearl millet /Pigeonpea/Blackgram		
		Sugarcane +cucurbits	Sugarcane		
	Lowland tube well irrigated canal clay loam soil	Rice	Pearl millet/Blackgram/Greengram	• Limited irrigation • Alternate Furrow irrigation • Drip irrigation • Mulching • Alternate furrow irrigation	• Seed through KSSC and NFSM • Harvesting and threshing implements through RKVY
		Sorghum Fodder	Pearl millet/Sorghum Fodder		
		Sugarcane + cucurbits	Sugarcane		

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**

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	1) Farming situation: :	**Cropping system 1:**	NA	NA	NA

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	Up land tube well irrigated canal sandy loam soil	Basmati rice	Maize/Arabic Rice /Vegetable (Tomato, Brinjal, cucrbits etc)	• Limited irrigation • Alternate Furrow irrigation • Drip irrigation • Mulching	• Seed through KSSC and NFSM • Harvesting and threshing implements through RKVY
		Sorghum/Maize	Pearl millet /Pigeonpea/Blackgram		
		Sugarcane +cucurbits	Sugarcane		
	Low land tube well irrigated canal clay loam soil	Rice	Pearl millet/Blackgram/Mung	• Limited irrigation • Alternate Furrow irrigation • Drip irrigation • Mulching • Alternate furrow irrigation	• Seed through KSSC and NFSM • Micro/drip/sprinkler irrigation under govt. schemes • Supply of inter cultural implements through RKVY
		Sorghum Fodder	Pearl millet/Sorghum Fodder		
		Sugarcane + cucurbits	Sugarcane		

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**
Maize + Blackgram /Greengram/cucurbits	Provide drainage	Provide drainage	Drain out &Harvesting at physiological maturity stage	Shift to safer place
Pigeonpea	Provide drainage	Provide drainage	Drain out &Harvesting at physiological maturity stage	Shift to safer place

Blackgram / Greengram/ Maize	Provide drainage	Provide drainage	Drain out &Harvesting at physiological maturity stage.	Safe storage against storage pest and disease
Horticulture				
Okra	Provide drainage	Provide drainage	Picking of vegetables at physiological maturity stage	Shift to safer place
Cucurbits	Provide drainage	Provide drainage	Drain out & Harvesting at physiological maturity stage and picking of cucurbits crop.	Shift to safer place
Brinjal	Provide drainage	Provide drainage	Picking at physiological maturity stage	Shift to safer place
Tomato	Provide drainage	Provide drainage	Picking at physiological maturity stage	Shift to safer place
Mango	-	-	Spray of 2% urea+fungicide	-
Guava	-	-	Spray of 2% urea+fungicide	-
Heavy rainfall with high speed winds in a short span				
Sugarcane	• Earthing • Tying • Use Wind breaks	Provide drainage Use Wind breaks	Drain out &Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Maize/Sorghum	Provide drainage Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Blackgram / Greengram	Provide drainage Use Wind breaks	Provide drainage Use Wind breaks	Drain out& Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Rice basmati	Provide drainage Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Pigeonpea	• Provide drainage • Sowing on raised bed • Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Horticulture				
Okra	• Provide drainage • Sowing on raised bed • Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Brinjal	• Provide drainage	Provide drainage	Drain out & Harvesting at	Shift to safer place

	• Sowing on raised bed • Use Wind breaks	Use Wind breaks	physiological maturity stage Use Wind breaks	
Tomato	• Provide drainage • Sowing on raised bed • Use Wind breaks	Provide drainage Use Wind breaks	Drain out Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Cauliflower	• Provide drainage • Sowing on raised bed • Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Cucurbits	• Provide drainage • Sowing on raised bed • Use Wind breaks	Provide drainage Use Wind breaks	Drain out & Harvesting at physiological maturity stage Use Wind breaks	Shift to safer place
Mango	Use Wind breaks	Use of NAA spray Use Wind breaks	Use of NAA spray Use Wind breaks	-
Guava	Use Wind breaks	Use of NAA spray Use Wind breaks	Use of NAA spray Use Wind breaks	-
Outbreak of pests and diseases due to unseasonal rains				
Rice basmati	Need based plant protection IPDM for Rice/pluses	Need based plant protection IPDM for Rice/pluses	Do not use Hazardous pesticide at maturity stage	Shift to safer place
Pigeonpea				
Sorghum fodder				
Blackgram/Greengram/maize				
Sugarcane				
Horticulture				
Okra	Need based plant protection IPDM for Rice/pluses	Need based plant protection IPDM for Rice/pluses	Do not use Hazardous pesticide at maturity stage	Shift to safer place
Brinjal				
Tomato				
Cucurbits				
Cauliflower				

2.3 Floods

Condition	**Suggested contingency measure**			
Transient water logging/	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**

partial inundation[1]				
Rice basmati	• Re sowing of nursery • Direct sowing of rice • Sowing of nursery on raised bed	• Provide drainage	• Provide drainage	Shift to safer place
Pigeonpea	• Direct sowing	• Provide drainage	• Provide drainage •	Shift to safer place
Sorghum fodder	• Direct sowing	• Provide drainage	• Provide drainage •	Shift to safer place
Blackgram	• Direct sowing	• Provide drainage	• Provide drainage •	Shift to safer place
Maize	• Direct sowing	• Provide drainage	• Provide drainage	Shift to safer place
Horticulture				
Okra	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Brinjal	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Tomato	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Continuous submergence for more than 2 days				
Rice	• Re sowing of nursery • Direct sowing of rice • Sowing of nursery on raised bed	• Provide drainage	• Provide drainage	Shift to safer place
Horticulture	NA	NA	NA	NA
Okra	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Brinjal	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Tomato	• Re sowing of nursery	• Provide drainage	• Provide drainage	Shift to safer place

	• Sowing of nursery on raised bed • Re transplanting			
Mango	• Re sowing of nursery • Sowing of nursery on raised bed • Re transplanting	• Provide drainage	• Provide drainage	Shift to safer place
Sea water intrusion[3]	NA	NA	NA	NA

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

Extreme event type	**Suggested contingency measure**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat Wave				
Rice basmati	• Re sowing of nursery • Light and frequent irrigation during night	• Irrigation interval should be decreased	• Irrigation interval should be decreased	Light and frequent irrigation
Pigeonpea	• Mulching	• Irrigation interval should be decreased	• Irrigation interval should be decreased	Light and frequent irrigation
Sorghum fodder	• Re sowing	• Irrigation interval should be decreased	• Irrigation interval should be decreased	Make silage
Blackgram /Greengram	• Re sowing • Mulching	• Light irrigation for survival	• Light irrigation for survival	• Pod picking
Maize	• Re sowing	• Light irrigation for survival	• Light irrigation for survival	• Pod picking
Horticulture				
Okra	• Re sowing of nursery • Re transplanting • Mulching • Light watering during night	• Light irrigation for survival	• Light irrigation for survival	• Harvesting of fruits
Brinjal	• Re sowing of nursery • Re transplanting • Mulching • Light watering during night	• Light irrigation for survival	• Light irrigation for survival	• Harvesting of fruits
Tomato	• Re sowing of nursery • Re transplanting	• Light irrigation for survival	• Light irrigation for survival	• Harvesting of fruits

	• Mulching of nursery beds • Light irrigation during night			
Mango	• Spray of water	• Spray of water	• Spray of water	• -
Guava	• Spray of water	• Spray of water	• Spray of water	• -
Cold wave				
Wheat	Light irrigation	Light irrigation	Light irrigation	Light irrigation
Pigeonpea	• Mulching	• Light irrigation for survival	• Light irrigation for survival	• Harvesting
Horticulture				
Tomato	Grow some inter crop	• Light Sprinkler irrigation	--	• Harvesting of fruits
Pea	Grow some inter crop	• Light Sprinkler irrigation	--	• Harvesting of fruits
Potato	Grow some inter crop	• Light Sprinkler irrigation	--	• Harvesting
Frost				
Wheat	• Light irrigation	• Light irrigation for survival	• Light irrigation for survival	Light irrigation
Pigeonpea	• Grow as inter crop • Smoke at night	• Light Sprinkler irrigation • Smoke at night	• Light irrigation for survival • Smoke at night	Smoke at night
Horticulture				
Potato	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	• Harvesting
Tomato	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	• De helming
Pea	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	•Light irrigation for survival •Smoke at night	• Harvesting
Mango	• Irrigation &Smoking during night	•Irrigation &Smoking during night	•Irrigation &Smoking during night	•
Guava	•Irrigation &Smoking during night	•Irrigation &Smoking during night	•Irrigation &Smoking during night	•
Hailstorm				
All the crops	Re sowing	Re sowing of Catch crop	Harvest for fodder	Pre Harvesting
Horticulture				

All the Vegetable crops	Re sowing	Re sowing of Catch crop	Harvest for fodder	Pre Harvesting
All the Fruit crops	• Use anti hail net • Spray of fungicide with 2% urea solution	• Use anti hail net • Spray of fungicide with 2% urea solution	• Use anti hail net • Spray of fungicide with 2% urea solution	• Harvest the damaged fruits • Spray of fungicide with 2% urea solution
Fog				

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			
Feed and fodder availability	• Fodder crop Insurance • Making of feed blocks • Encourage farmers to allocate some lands for cultivating perennial fodder (Napier grass, Subabul), specially on bunds and wasteland • Establishing fodder banks, encouraging fodder crops in irrigated area • Making silage or hay of excess fodder. • Statistics regarding feed/fodder availability and requirement should be updated by the concerned department. • Seed production and development of drought resistant crops and their varieties of fodder crops. • Encourage farmers to adopt sprinkler irrigation system. • Training to the farmers and extension functionaries for production and long term storage of feed and fodder.	• Utilizing fodder from perennial trees/shrubs/fodder bank reserves for small ruminant. • Utilizing stored fodder as silage, hay, feed blocks & mixture etc. • Migration of herd /flock to other places. • Establishment of communication and linkage with other state agencies.	• Availing crop insurance • Cultivation of fast growing green fodder crops. • Development of drought resistance fodder. • Increase the no. of Fodder Banks for future use.

Drinking water	• Preserving water in the pond/tank for drinking purpose. • Excavation of bore well/creation of tanks or ponds. • De-silting of village ponds on regular basis and adopt water harvesting techniques through water shed approach. • Filling of the ponds with canal/tube well water during lean period.	• Using preserved water in the tanks for drinking • Available ground water should be used for drinking on priority basis.	• Recharge of well/ Tanks etc.
Health and disease management	• Farmers should be encouraged to avail Livestock insurance • Training to livestock owners regarding natural calamities. • Veterinary preparedness with medicines and vaccines. • Vaccination	• Conduction mass animal health camp and treating the effected animals. • Mass campaigning though different media regarding possible outbreak of diseases and their management.	• Availing insurance benefits. • Followed standard Livestock management practices. • Proper health care & treatment.
Floods			
Feed and fodder availability	• Fodder crop Insurance • Making of feed blocks • Encourage farmers to allocate some lands for cultivating perennial fodder (Napier grass, Subabul), specially on bunds and wasteland • Establishing fodder banks, encouraging fodder crops. • Making silage or hay of excess fodder and that should be stored on up land. • Statistics regarding feed/fodder availability and requirement should be updated by the concerned deptt. • Seed production and development of crops and their varieties of fodder crops for water logged conditions. • Training to the farmers and extension functionaries for production and long term storage of feed and fodder.	• Utilizing fodder from perennial tress/shrubs/fodder bank reserves. • Use of feed mixture/block hay etc • Migration of flock /herds • Establishment of communication and linkage with other state agencies	• Availing crop insurance • Cultivation of fast growing green fodder crops

Drinking water	• Making suitable provision for safe drinking surface water including excavation of bore well/hand pump (India mark—II) at community level. • Make farmers aware not to use contaminated/ flood water for drinking purpose.	• Contaminated flood water should not be used for drinking.	• Open sources of drinking water (tank/well) should be further treated with potassium per magnate.
Health and disease management	• Live stock Insurance • Training to livestock owners regarding natural calamities. • Veterinary preparedness with medicines and vaccines. • Vaccination •	• Conduction mass animal health camp and treating the effected animals. • Training to livestock owners regarding natural calamities. • Establishment of Co-ordination with other Agencies. • Use of mass media to spread expat advice • .	• Culling sick animals • Availing insurance benefits. • Culling unproductive livestock • Proper disposal of corpse of dead bodies to prevent the spread of contagious diseases.
Cyclone	**NA**	**NA**	**NA**
Heat wave and cold wave			
Shelter/environment management	• Avoid use of GI sheet for roofing in the animal shed • Create adequate sources for additional supply of water to protect the animals from heat waves. • Establishment of modern shelter sheds. • As far as possible grow shade trees such as Neem, Pilkhan, Karanj etc near the animal sheds. • Make provision for adequate no. of fans/coolers /heaters according to the situation, if possible	• Provide the thatches/ tarpaulins/ rags in the animal sheds to protect against direct entry of hot/ cold waves • Provide proper bedding to prevent from cold and proper ventilation to prevent from heat. • Provide drinking water to animal frequently during heat wave • Watch the forecast of weather department. • As for as possible the animal should be allowed to wallow in pounds/ canals/ river or give bath once or twice in a day during heat waves	• Repair and maintenance of additional facilities

Health and disease management	• Insure the animals • Training to livestock owners/ para-vets regarding preventive measure against extreme weather conditions • Veterinary preparedness with medicines and vaccines etc. • Vaccination against FMD &Cold	• Organize village level animal health camps • Consult veterinary officer immediately if any adverse symptoms are noticed • Use of ITKs for food supplements	• Proper after care of animals. • Availing insurance benefits. • Proper disposal of corpse of dead bodies to prevent the spread of contagious diseases.

[s] based on forewarning wherever available

2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event	**During the event**	**After the event**	
Drought				
Shortage of feed ingredients	• Making and storage of feed concentrates • Awareness regarding traditional feed banks. • Feed requirement data should be generated • Prepare the feed requirement data base of poultry farm. • Store the feed ingredients	• Use of feed concentrates/ mixture/blocks etc • Establishment of communication with other state agencies. • Use of locally available feed recourses. • Import the feed recourse form other states.	• Availing insurance • Increase the no. of feed banks for future use	
Drinking water	• Making extra facility for drinking water. • Repair & maintenance of water resources	• Frequent supply of drinking water		
Health and disease management	• Veterinary preparedness with medicines and vaccines. • Vaccination	• Treatment of affected poultry birds	• Culling of flock • Availing insurance benefits • Proper disposal of corpse of	

	• Training to poultry Growers regarding natural calamities.		dead bodies to prevent the pared of contagious diseases	
Floods				
Shortage of feed ingredients	• Sufficient quantity of feed ingredients should be stored	• Use of stored feed in balanced form • Prevent the feed from moisture.	• Cleaning of feed store & repair if any. • Moist feed should be dried &treated as per requirement	
Drinking water	• Make provision of ground water for drinking	• Use only Ground water obtained from India Mrka II or Tubewell	• Repair, maintenance and cleaning of water recourse • Sanitation of open Wells	
Health and disease management	• Veterinary preparedness with medicines and vaccines • Vaccination	• Migration of flock if required • Treatment	• Availing insurance benefits. • Culling of unproductive flock	
Cyclone	NA	NA	NA	
Shortage of feed ingredients	• Storage and making of feed concentrates • Proper feed requirement data base	• Establishment of communication with other state agencies • Use of stored feed ingredient • Import of feed from other areas	• Repair and maintenance of feed store	
Drinking water	• Make provision of ground water for drinking	• Use only Ground water obtained from India Mrka II or Tubewell	• Repair and maintenance of water recourse	
Health and disease management	• Training to poultry growers regarding natural calamities. • Veterinary preparedness with medicines and vaccines.	• Treatment of injured poultry birds.	• Culling of flock • Availing insurance benefits. • Proper disposal of corpse of dead bodies to prevent the pared of contagious diseases.	
Heat wave and cold wave				

Shelter/environment management	• Making sufficient provision of shelter to protect live stock from heat and cold waves • Establishment of alternate resource for water supply. • Modern shelter sheds.	• Keep the birds in appropriate shelter • Provide proper bedding to prevent from cold and proper ventilated to prevent from heat • Provide drinking water to birds frequently. • Adopted proper management practices. • Watch the fore cast of weather department.	• Making of modern shelter sheds • Increase the plantation of trees	
Health and disease management	• Insurance • Veterinary preparedness with medicines and vaccines • Training to poultry growers regarding natural calamities	• Provide proper treatment as per requirement • Treatment of injured poultry	• Availing insurance benefits • Culling of unproductive flock • Proper disposal of corpse of dead bodies to prevent the pared of contagious diseases	•

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture			
Marine	_	_	_
Inland			
(i) Shallow water depth due to insufficient rains/inflow	• Adopt appropriate measures to reduce water seepage or infiltration	• Harvest the crop partially	• Re stock
(ii) Changes in water quality	• Regular observation to check the water quality and remove the pollutants if any.	• Add oxy-flow to improve oxygen • Churning of pond water	• Maintain appropriate level of water if possible • Check the water quality and remove the pollutants if any.
(iii) Any other	_	_	_
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	• Adopt appropriate measures to reduce water seepage or infiltration	• Ensure the Oxygen availability into ponds for the survival of	• Maintain appropriate level of water in ponds

	from ponds • Avoid any kinds of water pollution and maintain water pH	fish • Avoid any kind of water pollution • Add oxy-flow to improve oxygen into ponds. • Churning of pond water	• Check the water quality and remove the pollutants if any.
(ii) Impact of salt load build up in ponds / change in water quality	• Add some fresh water from other source like cannel etc	• Add oxy-flow to improve oxygen into ponds. • Churning of pond water • Add fresh water into pond for life saving and to reduce salt load	• Add fresh water into pond for life saving and to reduce salt load • Maintain appropriate level of water in ponds • Check the water quality and remove the pollutants if any.
(iii) Any other	_	_	--
2) Floods			
A. Capture			
Marine	--	--	--
Inland			
(i) No. of boats / nets/damaged	• Boats, nets etc should be taken out from water bodies	• Close supervision of flood condition	• Damaged boat or nets should be repaired
(ii) No. of houses damaged	_	_	• Repair the damaged house.
(iii) Loss of stock	_	_	• Sanitation and proper disposal of corpse
(iv) Changes in water quality	• Increase the hight of bunds.	--	--
(v) Health and diseases	--	• Treatment if possible	--
B. Aquaculture			

(i) Inundation with flood water	• Repair the bunds to prevent the inflow of water • If inflow water is not polluted then place the net at inlet and outlet • Raise the height of bunds • Plan a proper drainage system at farm • Plantation of soil binding plants at bund	• Avoid inflow of flood water from outside. • If inflow water is not polluted that can be permitted to flow through net placed at inlet and outlet of pond. • Fencing of net required in case of overflow to avoid the migration of fish	• Repair the damaged bunds • Check water quality • Change the water if it is polluted
(ii) Water contamination and changes in water quality	• Liming @300 kg/ha	• Stop inflow of contaminated water	• Maintain appropriate level of water in ponds • Check the water quality and remove the pollutants if any.
(iii) Health and diseases	• Liming @300 kg/ha • Vaccination	• Diagnostic measures and provide appropriate medicines	• Liming and medication as per requirement • Use Cifex to control ulcerative syndromes
(iv) Loss of stock and inputs (feed, chemicals etc) (v)	• Marketable stock should be sold	• Immediately remove the dead fishes from ponds and do sanitation	• After sanitation add new stock
(v) Infrastructure damage (pumps, aerators, huts etc)	• Damageable infrastructures should be secured	• Do not supply Electricity in flood éd area	• Repaire and service the damage infrastructure
(vi) Any other			
3. Cyclone / Tsunami	NA	NA	NA
4. Heat wave and cold wave			
A. Capture			
Marine	--	--	--
Inland			
B. Aquaculture			

(i) Changes in pond environment (water quality)	• Maintain appropriate level of water in ponds *i.e.* 1.75m in 2m deep ponds • Check the water quality and remove the pollutants if any	• Maintain appropriate level of water in ponds *i.e.* 1.75m in 2m deep ponds • Check the water quality and remove the pollutants if any	• Maintain appropriate level of water in ponds *i.e.* 1.75m in 2m deep ponds • Check the water quality and remove the pollutants if any
i) Health and Disease management	• Liming@300kg/ha	• Medication as per requirement	• Remove the dead fishes from ponds and add new stocks to compensate • the production

based on forewarning wherever available