

State: PUNJAB

Agriculture Contingency Plan for District: PATIALA

1.0 District Agriculture profile				
1.1	Agro-Climatic/Ecological Zone			
	Agro Ecological Sub Region (ICAR)	Northern Plain, Hot Sub humid (Dry) Eco-Region (9.1); Northern Plain (And Central Highlands) Including Aravallis, Hot Semi-Arid Eco-Region (4.1)		
	Agro-Climatic Zone (Planning Commission)	West Himalayan Region (I); Trans Gangetic Plain Region (VI)		
	Agro Climatic Zone (NARP)	Undulating Plain Zone (PB-2); Central Plain Zone (PB-3); Western Plain Zone (PB-4)		
	List all the districts falling under the NARP Zone* (*>50% area falling in the zone)	Fathehgarhsahib, Nawanshahr, Patiala, Amritsar and Taran		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		30°19'49.59" N	76°23'41.23" E	280 M
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Fruit Research Sub-Station, Bahadurgarh, Distt: Patiala – 147001		
	Mention the KVK located in the district with address	Krishi Vigyan Kendra, P.B.No.22, Rauni, Patiala, Pin -147001		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	Punjab Agricultural University, Ludhiana, Punjab -141004		

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-September):	627.9	26	1 st week of July	2 nd week of September
	NE Monsoon(October-December):	40.2	3	-	-
	Winter (January-February)	81.2	6		
	Summer (March-May)	39	4		
	Annual	788.3	39		

1.3	Land use pattern of the district (latest statistics) (2008-09)	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 (000ha)	332.4	270.6	12.6	37.3	0.01	-	-	3.5	4.2	3.1

1.4	Major Soils (common names like red sandy loam deep soils (etc.,))	Area ('000 ha)	Percent (%) of total geographical area
	Coarse loamy soils	33.2	10
	Coarse loamy and fine loamy soils	116.2	35
	Fine loamy soils	182.5	55

1.5	Agricultural land use	Area (000ha)	Cropping intensity %
	Net sown area	270.6	198
	Area sown more than once	264.9	
	Gross cropped area	535.5	

1.6	Irrigation	Area (000ha)		
	Net irrigated area	267.6		
	Gross irrigated area	531.5		
	Rainfed area	4.0		
	Sources of Irrigation	Number	Area ('000 ha)	Percentage of total irrigated area
	Canals (5% is under Canal irrigation)			
	Tanks			
	Open wells			
	Bore wells (Tubewells)	79323		
	Lift irrigation schemes			
	Micro-irrigation			
	Other sources (please specify)			
	Total Irrigated Area			
	Pump sets	79300		
	No. of Tractors	25400		
	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 (as per latest figures) (Specify year _____ e.g. 2008-09)

1.7	Major field crops cultivated	Area (ha)							
		<i>Kharif</i>			<i>Rabi</i>			Summer	Grand total
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total		
Paddy	240.2	-	-	-	-	-	-	240.2	
Maize	1.4	-	-	-	-	-	-	1.4	
Sugarcane	1.4	-	-	-	-	-	-	1.4	
Arhar (Redgram)	0.1	-	-	-	-	-	-	0.1	
American cotton	0.4	-	-	-	-	-	-	0.4	
Desi Cotton	0.2	-	-	-	-	-	-	0.2	
Wheat	-	-	-	235.0	-	-	-	235.0	
Barley	-	-	-	0.6	-	-	-	0.6	
Oil seed Sarson	-	-	-	0.4	-	-	-	0.4	
Gram	-	-	-	0.01	-	-	-	0.01	
Lentil	-	-	-	0.04	-	-	-	0.04	
	-	-	-		-	-	-	-	

	Horticulture crops – Fruits	Area ('000 ha)
		Total
	<i>Kharif</i> 2008	0.7
	<i>Rabi</i> 2008	0.6
	Flower/nursery	0.04
	Horticulture crops – Vegetables	Total
	<i>Kharif</i> 2008	1.8
	<i>Rabi</i> 2008	
	Vegetables	1.6
	Potato	3.3
		-
	Medicinal and Aromatic crops	-
		-
	Plantation crops	-
	e.g., industrial pulpwood crops etc.	-
	Fodder crops	Total

	Kharif 2008	18.0
	Rabi 2008-09	15.2
		-
	Total fodder crop area	33.2
	Grazing land	-
	Sericulture etc	-
	Others (specify)	-

1.8	Livestock (in number)	Male ('000)	Female ('000)	Total ('000)
	Non descriptive Cattle (local low yielding)	11.9	18.7	30.6
	Crossbred cattle	12.0	50.3	62.3
	Non descriptive Buffaloes (local low yielding)	3.2	18.01	21.2
	Graded Buffaloes	30.6	285.5	316.1
	Goat	2.9	10.8	13.8
	Sheep	2.6	11.08	13.7
	Others Equine (Horse &Pony)	0.5	0.7	1.2
	Commercial dairy farms (Number)			0.1
1.9	Poultry	No. of farms	Total No. of birds ('000)	
	Commercial	134	720.8	
	Backyard	-	5.8	
1.10	Fisheries (Data source: Chief Planning Officer of district)			
	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	
	167		-		311	
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)						
		661.2		6.1		4.0

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

1.11	Name of crop	Kharif		Rabi			Summer		Total		Crop residue as fodder ('000 tons)
		Production ('000 t)	Productivity (kg/ha)	Name of the crop	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)											
1	Paddy (Rice)	1009	4240	-	-	-	-	-	1009	4240	-
2	Maize	6	2990	-	-	-	-	-	6	2990	-
3	Sugarcane (Gur)	20	6564	-	-	-	-	-	20	6564	-

4	Wheat	-	-	-	1137	4699	-	-	1137	4699	-
5	Barley	-	-	-	4	3682	-	-	4	3682	-
6	Peas	-	-	-	1.5	1201	-	-	1.5	1201	-
7	Sunflower	-	-	-	3.5	1604	-	-	3.5	1604	-
Others	-	-	-	-			-	-			-

Major Horticultural crops											
1	Kinnow	1.491	19114								
2	Orange and Malta	0.198	7610								
3	Lemon	0.533	7504								
4	Mangoes	5.224	14120								
5	Guava	18.229	21172								
6	Pear	2.239	22844								

1.12	Sowing window for 5 major field crops (start and end of normal sowing period)	Cotton (A)	Paddy	Wheat	Rapeseed-Mustard
	<i>Kharif</i> - Rainfed	-	-	-	-
	<i>Kharif</i> -Irrigated	April 1 st to Mid May	15 th May to 30 th May	-	-
	<i>Rabi</i> - Rainfed	-	-	-	-
	<i>Rabi</i> -Irrigated	-	-	4 th week of October to End of November	10 th October to Mid 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 (specify)	√		
	Others (specify)			

1.14	Include Digital maps of the district for	Location map of district within State as Annexure I	Enclosed: No
		Mean annual rainfall as Annexure 2	Enclosed: No
		Soil map as Annexure 3	Enclosed: No

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation (NA)

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 (Specify month)	NA				

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 (Specify month)	NA				

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 (Specify month)	NA				

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 (Specify month)	NA				

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/crop stand etc.	NA				

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	NA				

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	NA				

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
	NA				

2.1.2 Drought - Irrigated situation

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed release of water in canals due to low rainfall		Rice/Wheat	Coarse rice should be replaced with short duration varieties (PR-115) and Basmati rice (Pusa Basmati-1, Pusa -1121, Punjab Basmati-2, Punjab Mehak	Direct seeding of paddy and laser land leveling should be done. Direct seeding of rice saves about 20% of irrigation water. Laser leveling of field saves 20-25 % of irrigation water	Punseed, NSC, PAU and Progressive farmer

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Limited release of water in canals due to low rainfall		Paddy - Wheat	Paddy should be replaced with basmati rice, maize. Wheat can be replaced with oilseeds	Direct seeding of paddy and laser land leveling should be done Direct seeding of rice saves about 20% of irrigation water. Laser leveling of field also saves 20-25 % of irrigation water	Punseed, NSC, P A U and Progressive farmer

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Non release of water in canals under delayed onset of monsoon in catchment		Paddy - Wheat	Paddy may be replaced by maize, Soybean and mungbean	Bed planting of soybean and maize laser land leveling should be done.	Bed planting saves 20-25 % irrigation water. Laser leveling of field also saves 20-25 % of irrigation water
			Wheat can be sown in zero tillage conditions	zero tillage drill can be used	Less irrigation water is required

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

Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Insufficient groundwater recharge due to low rainfall		Rice -Wheat	Increase area under pulses	Laser land leveling should be done Wheat: Wheat can be sown with Happy seeder technology immediately after harvesting of paddy. Paired row trench planting of sugarcane	Pulses require less irrigation water. Laser leveling of field saves 20-25 % of irrigation water. Sowing of wheat with happy seeder immediately after harvest of paddy saves pre sowing irrigation Paired row trench planting of sugarcane saves about 10-15% irrigation water

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				
Cotton	Drain out the Excess water	Cotton crop is highly sensitive to standing water during early growth stages. Hence, drain out the excess water from the cotton fields	-	-
Maize	-	Do not allow the rain water to stand in the main crop as this crop is highly sensitive to standing water and promotes bacterial stalk rot	-	-
Wheat	-	-	-	Store new grains in clean godowns or receptacles. Plug all cracks, crevices and holes in the godowns thoroughly. Disinfest old gunny bags by dipping them in emulsion of 6 ml Sumicidin 20EC or 5 ml Cymbush 25 EC in 10 litres of water for 10 minutes and dry them in shade before filling with grains or use new gunny bags.
Sugarcane	-	Earthing up of the sugarcane crop may be done if not done earlier during	-	-

		the first week of July. If sugarcane fields get flooded with water, excess water may be drained out.		
Horticulture crops		Drain out excess water		
Crop1 (specify)				
Heavy rainfall with high speed winds in a short span				
Wheat				
Sugarcane	If dry weather conditions prevails mite may also cause severe damage to this crop. For its control spray the crop with 400 ml of malathion 50 EC in 100 litres of water/ acre. Remove Baru weed growing around the sugarcane field.		To prevent lodging prop up the crop by end of August using trash twist method.	
Rice	Avoid early planting of rice to keep the incidence of BLB under check.			
Horticulture				
Crop1 (specify)	The excess rain water when stagnates for several days is harmful to the orchard trees. Adopt prompt measures to drain out excess water			

Outbreak of pests and diseases due to unseasonal rains				
Rice		Blight develops more in high humid conditions. Farmers should not allow stagnation of water in the fields.	If high humidity and cloudy weather prevails the crop may be sprayed with Blitox/ Copper oxychloride 50 WP @ 500 g in 200 litres of water/acre to control False smut and after 10 days of its application spray Tilt @ 200 ml/acre in 200 litres of water. Start the spray at the boot stage.	
Wheat				
Cotton				
Sugarcane				
Horticulture				
Crop1	In case of occurrence of root damage due to water stagnation in Pear, Peach etc. apply 10 g Bavistin 50 WP + 5 g Vitavax 75 WP in 10 litres of water along the trunk after draining out the excess water and drying of soil. Prune the dried ends of the branches alongwith 5-8 cm of the live wood.			

2.3 Floods

Condition	Suggested contingency measure			
Transient water logging/ partial inundation	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Cotton	<ul style="list-style-type: none"> The alternate crops can be grown when flooded areas will reach the wattar condition, the Mash varieties Mash 114, Mash 338 and Mash 1-1 can be sown using 15-20 kg seed rate/ha. This gives us 7.5-8.8 q/ha yield of mash. Fields reaching wattar condition in first week of September can be sown with Toria varieties PBT 37 and TL 15 using 3.75 kg/ha seed and maintaining a line to line distance of 30 cm. 			
Rice	<ul style="list-style-type: none"> In addition to combat the demand of green fodder, green cobs from maize crops can provide good profit to farmers. This crop can be followed with late wheat or sunflower. 			
	<ul style="list-style-type: none"> The farmers can also grow toria+gobhi sarson in the middle of September. 			
	<ul style="list-style-type: none"> Farmers may grow vegetable : August is suitable for growing Radish, Cucurbits like Bottlegourd, Bittergourd and Lufa, etc. Lobia (Cowpeas) can also be grown for vegetables. 			
	<ul style="list-style-type: none"> Arkel and Matar Ageta-6 can 			

	be sown in end September which can yield green pods after 60-65 days. For early peas crop seed treatment with Bavistin 1 g per kg seed is must. The crop of chilli growing in the field need protection against fruit rots, anthracnose and wilt diseases which become serious during rainy days.			
Crop 6	<ul style="list-style-type: none"> The farmers may obtain nursery of Brinjal and Tomato from areas unaffected by floods. 			
Horticulture				
Continuous submergence for more than 2 days				
Sea water intrusion	NA			

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

Extreme event type	Suggested contingency measures			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Heat Wave				
Rice	Correct Iron deficiency with 0.5 % iron sulphate spray, light and frequent irrigation	Pounding of water for fifteen days after transplanting to check iron deficiency and for crop establishment	Apply irrigations at 8-10 days interval for good growth of field crop. The crop should not be under stress at flowering, soft dough and hard dough stages.	-
Wheat			Apply light irrigation	-

Horticulture			
Citrus	Light and frequent irrigation and shelter from western side to check sun scald and burning injury, application of white wash paint on main stems,	Apply light and frequent irrigation to check Dropping of flowers and fruit with growth regulator like 2-4-D/GA	NA
Cold wave			
Horticulture			
Frost			
Horticulture			
Citrus	In case of New plantation cover the plants with grass or sarkanda etc	Installation of wind breaks, smoking etc.	NA
Potato	-	Apply light irrigation or use sprinkler irrigation mid night	-
Hailstorm			
Horticulture			
Citrus	Protection of nursery with sarkanda etc/ growing of nursery under protected structures.	Removal of broken limbs Apply light irrigation and spary fungicide to check fungal infection with Blitox, Bordeaux mixture etc.	NA
Cucurbit	Re sowing or re transplanting	Apply light irrigation and spray fungicide(Ridomil MZ @500 g/ acre)	Apply light irrigation and Spray fungicide (Ridomil MZ @500 g/ acre)
Cyclone	NA		

2.5 Contingent strategies for Livestock, Poultry & Fisheries for District: PATIALA

2.5.1 Livestock

	Suggested contingency measures		
	Before the event	During the event	After the event
Drought	Not Applicable		
Floods			
Feed and fodder availability	<p>In case of early forewarning (EFW), harvest all the crops (Paddy, Maize, Sugar cane Wheat, Barley, Gram, Lentil etc.) that can be useful as feed/fodder in future (store properly)</p> <p>Keeping sufficient of dry fodder to transport to the flood affected villages</p> <p>Don't allow the animals for grazing if severe floods are forewarned</p> <p>Keep stock of bleaching powder and lime</p> <p>Carry out Butax spray for control of external parasites</p> <p>Identify the Clinical staff and trained paravets and indent for their services as per schedules</p> <p>Identify the volunteers who can serve in need of emergency</p> <p>Arrangement for transportation of animals from low lying area to safer places and also for rescue animal health workers to get involve in rescue operations</p>	<p>Transportation of animals to elevated areas</p> <p>Proper hygiene and sanitation of the animal shed</p> <p>In severe storms, un-tether or let loose the animals</p> <p>Use of unconventional and locally available cheap feed ingredients for feeding of livestock.</p> <p>Avoid soaked and mould infected feeds / fodders to livestock</p> <p>Emergency outlet establishment for required medicines or feed in each village</p> <p>Spraying of fly repellants in animal sheds</p>	<p>Repair of animal shed</p> <p>Bring back the animals to the shed</p> <p>Cleaning and disinfection of the shed</p> <p>Bleach (0.1%) drinking water / water sources</p> <p>Encouraging farmers to cultivate short-term fodder crops like sunhemp, Lucerne, berseem, maize etc.,.</p> <p>Deworming with broad spectrum dewormers</p> <p>Proper disposable of the dead animals / carcasses by burning / deep burying (4-8 feet) with lime powder (1kg for small ruminants and 5kg for large ruminants) in pit</p> <p>Drying the harvested crop material and proper storage</p>

			for use as fodder.
Cyclone	Not applicable		
Cold wave	Covering all the wire meshed walls / open area with gunny bags/ polyethylene sheets (with a mechanism for lifting during the day time and putting down during night time)	<p>Allow for late grazing between 10AM to 3PM during cold waves</p> <p>Add 25-50 ml of edible oil in concentrates and fed to the animal during cold waves</p> <p>In severe cases, put on the heaters at night times</p> <p>Apply / sprinkle lime powder in the animal shed during cold waves to neutralize ammonia accumulation</p>	<p>Feed the animals as per routine schedule</p> <p>Allow the animals for grazing (normal timings)</p>
Heat wave	<p>Arrangement for protection from heat wave</p> <p>i) Plantation around the shed</p> <p>ii) H₂O sprinklers / foggers in the shed</p> <p>iii) Application of white reflector paint on the roof</p> <p>iv) Thatched sheds should be provided as a shelter to animal to minimize heat stress</p>	<p>Allow the animals early in the morning or late in the evening for grazing during heat waves</p> <p>Feed green fodder/silage / concentrates during day time and roughages / hay during night time in case of heat waves</p> <p>Put on the foggers / sprinklers/fans during heat waves in case of high yielders (Jersey/HF crosses)</p> <p>In severe cases, vitamin 'C' and electrolytes should be added in H₂O during heat waves.</p>	<p>Feed the animals as per routine schedule</p> <p>Allow the animals for grazing (normal timings)</p>
Insurance	Encouraging insurance of livestock	Listing out the details of the dead animals	<p>Submission for insurance claim and availing insurance benefit</p> <p>Purchase of new productive animals</p>

2.5.2 Poultry

	Suggested contingency measures			Convergence/ linkages with ongoing programs, if any
	Before the event	During the event	After the event	
Drought	Not applicable			
Floods				
Shortage of feed ingredients	In case of EFW, shift the birds to safer place Storing of house hold grain like maize, broken rice, bajra etc, Culling of weak birds	Use stored feed as supplement Don't allow for scavenging	Routine practices are followed	
Drinking water	Provide clean drinking water	Sanitation of drinking water	Sanitation of drinking water	
Health and disease management	In case of EFW, add antibiotic powder in drinking water to prevent any disease outbreak	Sanitation of poultry house Treatment of affected birds Prevent water logging surrounding the sheds Assure supply of electricity Sprinkle lime powder to prevent ammonia accumulation due to dampness	Disposal of dead birds by burning / burying with lime powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against RD	

<i>Cyclone</i>	Not applicable			
Heat wave and cold wave				
<i>Shelter/environment management</i>	Heat wave: Provision of proper shelter with good ventilation	In severe cases, foggers/water sprinklers/wetting of hanged gunny bags should be arranged Don't allow for scavenging during mid day	Routine practices are followed	
	Cold wave: Provision of proper shelter Arrangement for brooding Assure supply of continuous electricity	Close all openings with polythene sheets In severe cases, arrange heaters Don't allow for scavenging during early morning and late evening	Routine practices are followed	
<i>Health and disease management</i>	Deworming and vaccination against RD and fowl pox	Supplementation of house hold grain Provide cool and clean drinking water with electrolytes and vit. C In hot summer, add anti-stress probiotics in drinking water or feed	Routine practices are followed	

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	<ul style="list-style-type: none"> i) Critical analysis of long range forecast data. ii) Storage of water. iii) Afforestation program iv) Conservation of rivers, wetlands/village ponds. v) Re-excavation of local canals/ponds. 	<ul style="list-style-type: none"> i) Use stored water. ii) Make judicious use of available water sources. iii) Divert water from unutilized areas. iv) Utilize canal water. v)Aeration of fish ponds. 	<ul style="list-style-type: none"> i) Need based monitoring through research plan. ii) Intensive afforestation program. iii) Augmentation of surface water flow. iv) Construction of water reservoir. v) Adoption of rain harvesting methods. vii) Prepare vulnerability map.
(ii) Changes in water quality	<ul style="list-style-type: none"> i) Dumping of solid, liquid and waste should be stopped. ii)Store chemicals, disinfectants and therapeutic drugs. 	<ul style="list-style-type: none"> i) Use disinfectants and therapeutic drugs. ii) Adoption of bio remedial measures 	<ul style="list-style-type: none"> i) To maintain water quality, need based research data should be generated. ii) Dumping of solid, liquid and waste should be stopped through enactment of legislation.
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	<ul style="list-style-type: none"> i) Critical evaluation of long range forecast data. ii) Storage of water. iii) Afforestation program. iv) Installation of tube wells. v) Conservation of rivers/wetlands/dams. vi) Re-excavation of local canals and ponds 	<ul style="list-style-type: none"> i) Use stored water. ii) Make judicious use of available water sources. iii) Divert water from unutilized areas. iv) Utilize canal water. v)Aeration of fish ponds. 	<ul style="list-style-type: none"> i) Need based monitoring through research plan. ii) Intensive afforestation program. iii) Augmentation of surface water flow. iv) Construction of water reservoir.

			v) Adoption of rain harvesting methods. vii) Prepare vulnerability map.
(ii) Impact of salt load build up in ponds/Changes in water quality	i) Store chemicals, disinfectants and therapeutic drugs.	i) Immediate examination of water samples. ii) Use appropriate disinfectants and therapeutic drugs. iii) Adoption of bio-remedial measures. iv) Reduce salinity to moderate levels for increasing survival rate of fish/prawn/other organisms with the application of scientific techniques.	i) Need based research data should be generated. ii) Cleaning of water bodies. iii) Regular water monitoring and bio-monitoring of water bodies.
2. Flood			
A. Capture			
Marine	-	-	-
Inland			
(i) Average compensation paid due to loss of human life	i) Be prepared to evacuate at a short notice. ii) Preparation of flood control action plan. iii) Warning dissemination and precautionary response. iv) Formation of flood management committee. v) Mobilize local committees for protection. vi) Enhancement in coping capabilities of common people.	i) Human evacuation from the area. ii) Coordination of assistance. iii) Damage and need assessment. iv) Immediate management of relief supplies. v) Immediate help and compensation delivery during emergency.	i) Arrangement for rescue and casualty care. ii) Arrangement for burial control room. iii) Restoration of essential services, security and protection of property iv) Support to rehabilitation, logistics, training and awareness

	vii) Insurance for the life of people/fishermen.		build up & testing and updating the plan v) Insurance claim.
(ii) No. of boats/nets damaged	i) Annual repair of boats/nets and gears. ii) Insurance of boats/nets/gears.	i) Coordination of assistance. iii) Immediate management of relief supplies. iv) Govt. support and compensation.	i) Education/ training for technical knowledge for the repair of boats/nets and gears. ii) Provision for evacuation. iii) Loss assessment & insurance claim.
(iii) No. of houses damaged	i) Educate and provide training for the repair of houses. ii) Store raw materials for repairing of houses. iii) House insurance.	i) Damaged house enumeration and loss assessment. ii) Coordination of assistance. iii) Immediate management of relief supplies. iv) Immediate support and compensation.	i) Repair of damaged houses. ii) Loss assessment & insurance claim.
(iv) Loss of stock	i) Keep boats, nets/gears ready for emergency use. ii) Store fuels, food/other item. iii) Develop flood control management plans. iv) Stock material insurance.	i) Mobilize local people for protection ii) Hire stock/inputs from areas/company/farmers who are not affected by flood.	i) Locate backup stocks and verify its usability. ii) Follow flood control management plan. iii) Notify utilities of the critical demand about loss of stock and inputs. iv) Loss assessment & insurance claim.

<p>(v) Changes in water quality</p>	<ul style="list-style-type: none"> i) Provision to stop/close the effluent/sewage discharge point in to water bodies. ii) Store chemicals, disinfectants and therapeutic drugs. iii) Develop flood control management plan. 	<ul style="list-style-type: none"> i) Do not use contaminated water. ii) Proper preparation and management through emergency aeration. iii) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. iv) Immediate support of govt./industrial organization for maintaining the purity and quality of water bodies. v) Need based bioremediation. 	<ul style="list-style-type: none"> i) Need based research data should be generated to maintain water quality, ii) Dumping of solid, liquid and waste should be stopped through enactment of legislation. iii) Contact govt. and industrial organization for immediate remedy and cleaning of the water bodies. iv) Regular water monitoring and bio-monitoring of water bodies for formulation of management plan.
<p>(vi) Health and disease</p>	<ul style="list-style-type: none"> i) Advance planning and preparedness. ii) Store chemicals, disinfectants and therapeutic drugs. iii) Stock sufficient stock of medicines. 	<ul style="list-style-type: none"> i) Prompt action or immediate removal of disease causing agents/ dead fish. ii) Proper disposal of dead fish. iii) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. iv) Emergency aeration or splashing in water bodies. 	<ul style="list-style-type: none"> i) Laboratory diagnosis of disease fish, generation of data about type or kind of disease spread. ii) Eradicating the disease where possible. iii) Follow up surveillance and monitoring after disease outbreak. iv) Bio-monitoring and maintaining water quality. v) Need based research data should be generated. vi) Loss assessment & insurance claim.

B. Aquaculture			
(i) Inundation with flood water	<ul style="list-style-type: none"> i) Proper facility construction /strengthening for ponds and its stock safety. ii) Development of flood control management plan. iii) Arrangement of emergency backup equipment on site. iv) Insurance of stocks. v) Prevention from entry of alien/wild organisms through flood water. 	<ul style="list-style-type: none"> i) Arrangement for evacuation ii) Arrangement for rescue and casualty care iii) Arrangement for burial control room. iv) Restoration of essential services, security and protection of property. v) Coordination of assistance. vi) Damage and need assessment. vii) Immediate management of relief supplies. viii) Release excess water from height of T. ix) Lower the water level in culture facilities. 	<ul style="list-style-type: none"> i) Support to rehabilitation, logistics, training and awareness build up & testing and updating the plan. ii) Reallocate fish to maintain appropriate biomass so that waste assimilation capacity of pond is not exceeded. iii) Reduce or cease feeding because uneaten food and fish wastes causes decrease in dissolved oxygen level. iv) Strengthening of water bodies/ponds. v) Loss assessment & insurance claim.
(ii) Water contamination and changes in water quality	<ul style="list-style-type: none"> i) Provision to stop/close the effluent/sewage discharge into water bodies. ii) Store chemicals, disinfectants and therapeutic drugs. iii) Develop flood control management plan. 	<ul style="list-style-type: none"> i) Do not use contaminated water. ii) Proper preparation and management through emergency aeration. iii) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. iv) Immediate support of govt./industrial organization for maintaining the purity 	<ul style="list-style-type: none"> i) Need based research data should be generated to maintain water quality, ii) Dumping of solid, liquid and waste should be stopped through enactment of legislation. iii) Contact govt. and industrial organization for immediate remedy and cleaning of water bodies.

		and quality of water bodies. iv) Need based bioremediation.	iv) Regular water monitoring and bio-monitoring of water bodies for formulation of management plan.
(iii) Health and diseases	i) Advance planning and preparedness. ii) Store chemicals, disinfectants and therapeutic drugs. iii) Stock sufficient emergency medicines.	i) Identification of type of disease outbreak, prompt action or immediate removal of disease causing agents/ dead fish. ii) Proper disposal of dead fish. iii) Use appropriate amount of disinfectants, chemicals and therapeutic drugs. iv) Determination of nature and speed of transmission of diseases. v) Proper preparation and management through emergency aeration.	i) laboratory diagnosis of disease fish, generation of data about type or kind of disease occurrence. ii) Eradicating the disease. iii) Follow up surveillance and monitoring after disease outbreak. iv) Proper disposal of dead fish. vii) Loss assessment & insurance claim.
(iv) Loss of stock and input (feed, chemicals)	i) Keep the stock/input in safer place for emergency purpose. ii) Store fuels, food/other items. iii) Develop flood control management plan. iv) Stock material insurance.	i) Search/locate the stock/input, if the condition is good can be used for the purpose otherwise discard it. ii) Mobilize local people for protection. iii) Purchase/hire valuable stock/inputs from areas/company/ farmers who are not affected by flood	i) Strengthening of stock. ii) Assessment of total loss. iii) Insurance claims.
(v) Infrastructure damage (pumps, aerators, huts etc)	i) Training for emergency the repair of infrastructure. ii) Store raw materials for repairing of pumps aerators, huts etc.	i) Damaged infrastructure enumeration and need assessment. ii) Locate backup equipment and verify its operation.	i) Locate backup equipment and verify its operation. ii) Notify utilities of the critical demand.

	iii) Infrastructure insurance.	iii)Coordination of assistance. iv)Immediate management of relief supplies.	iii) Repair of damaged infrastructure. iv) Loss assessment & insurance claim.
(vi) Any other			
3. Cyclone / Tsunami	NA		
4. Heat wave and cold wave			
A. Capture			
Marine	-	-	-
Inland	<ul style="list-style-type: none"> i) Listen to local weather forecasts and stay aware of upcoming temperature changes. ii) Arrange the aerators. iii) Ensure sufficient water quantity in water bodies. iv) Formulate strategic fishing management during the heat waves or cold waves. v) Tree plantation around fish ponds 	<ul style="list-style-type: none"> i) Monitor fishing sites frequently to ensure that they are not affected by heat or cold waves. ii) Use dark materials to cover the water bodies during excessive heat waves. iii) Adopt proper care and management during the fishing period of cold/ heat waves like keeping stock of drinking water and extra cloths. iv) Educating the farmers through electronic / print media 	<ul style="list-style-type: none"> i) Intensive afforestation program. ii) Collect basic weather data on incidence of extreme as well as physical data of water bodies, water chemistry and seasonal changes, plankton profile and seasonal blooms, topography and soil composition. iii) Gather information about history of catch per unit effort as well as fish yield rate during heat wave and cold wave and accordingly simulate future plan for sustainable fishing. iv) Loss assessment & insurance claim.

B. Aquaculture			
(i) Changes in pond environment (water quality)	<ul style="list-style-type: none"> i) Listen to local weather forecasts and stay aware of upcoming temperature changes. ii) Arrange the aerators. iii) Ensure sufficient water quantity in water bodies. iv) Formulate strategic fishing management during heat/cold waves. v) Tree plantation around fish ponds. 	<ul style="list-style-type: none"> i) Avoid extreme temperature changes as well as low temperature changes for the safety of fishermen life. ii) Monitor fishing sites frequently to ensure that they are not affected by heat or cold waves. iii) Use dark materials to cover the water bodies during excessive heat waves. iv) Adopt proper care and management during the fishing period of cold/ heat waves like keeping stock of drinking water and extra cloths. v) Educating the farmers through electronic/ print media 	<ul style="list-style-type: none"> i) Intensive afforestation program for reducing heat waves. ii) Collect basic weather data on incidence of extremes as well as physical data of water bodies, water chemistry and seasonal changes, plankton profile and seasonal blooms, topography and soil composition. iii) Gather information about history of catch per unit effort as well as fish yield rate during heat wave and cold wave and accordingly simulate future plan for sustainable fishing. v) Loss assessment & insurance claim.
(ii) Health and disease management	<ul style="list-style-type: none"> i) Advance planning and preparedness. ii) Store chemicals, disinfectants and therapeutic drugs. iii) Develop heat/cold wave control management plan. iv) Stock sufficient quantities of emergency medicines. 	<ul style="list-style-type: none"> i) Identification of type of disease outbreak, prompt action or immediate removal of disease causing agents/ dead fish. ii) Proper disposal of dead fish. iii) Use appropriate amount of disinfectants, chemicals and therapeutic 	<ul style="list-style-type: none"> i) laboratory diagnosis of disease agents, generation of data about type or kind of disease spread. ii) Eradicating the disease where possible. iii) Follow up surveillance and monitoring after disease outbreak.

		drugs. iv)Determination of nature and speed of disease transmission. v)Proper preparation and management through emergency aeration or splashing in water bodies.	iv)Loss assessment and insurance claim.
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