State: HARYANA

Agriculture Contingency Plan District: REWARI

1.0 District Agriculture profile					
1.1	**Agro-Climatic/Ecological Zone**				
	Agro Ecological Sub Region (ICAR)	Northern plain and central Highlands (4.1)			
	Agro-Climatic Region (Planning Commission)	Trans Gangetic Plain region (VI)			
	Agro Climatic Zone (NARP)*	Western Zone (HR-2)			
	List all the districts falling under the NARP Zone	Sirsa, Fatehabad, Hisar, Bhiwani, Mahendragarh, Rewari			
	Geographical coordinates of district	Latitude	Longitude	Altitude	
		28º 11'39.42" N	76º35'29. 43" E	272 m MSL	
	Name and Address of the concerned ZRS/ZARS/RARS/RRTTS	CCSHAU, RRS, Bawal-123 501			
	Mention the KVK located in the district	Krishi Vigyan Kendra, Rewari (Bawal)- 123501			
1.2	**Rainfall**	Average (mm)	Number of rainy days	Normal Onset	Normal Cessation
	SW monsoon (June-Sep):	472.3		1st week of July	3rd week of September
	NE Monsoon(Oct-Dec):	21.6		NA	NA
	Winter (Jan- March)	36.4		NA	NA
	Summer (Apr-May)	39.3		NA	NA
	Annual:	569.6		NA	NA

* If a district falls in two NARP zone, mention the zone in which more than 50% area falls.

1.3	**Land use pattern of the district** (latest statistics)	Total geographical area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable waste land	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area (lakh ha)	151	1	15	1	16	-	4	2	-

1. 4	**Major Soil types**	Area ('000 ha)	Per cent (%) of total area
	Loamy sand (Alluvial soils)	108	66
	Sandy soils	53	34
	Total	161	

1.5	**Agricultural land use**	Area (‘000 ha)	Cropping intensity %
	Net sown area	112	173
	Area sown more than once	82	
	Gross cropped area	194	

1.6	**Irrigation**	Area (‘000 ha)		
	Net irrigated area	96		
	Gross irrigated area	167		
	Rainfed area	16		
	Sources of Irrigation	Number	Area (‘000 ha)	% area
	Canals		2	2.1

	Tanks		-		-
	Open wells		-		-
	Bore wells		94		97.9
	Lift irrigation		-		
	Other sources		-		
	Total		96		
	Pumpsets	29725			
	Micro-irrigation				
	Groundwater availability and use	No. of blocks	% area	Quality of water	
	Over exploited*	4	80	Sodicity	
	Critical	-	-		
	Semi- critical	1	20		
	Safe	-	-		
	Wastewater availability and use	-	-		
	Ground water quality	Alkaline in nature			

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

1.7	**Major Field Crops cultivate**	**Area ('000 ha)***					
		Kharif		***Rabi***		**Summer**	**Total**
		Irrigated	***Rainfed***	***Irrigated***	***Rainfed***		
	Rapeseed Mustard	-	-	-	-	-	71
	Bajra	-	-	-	-	-	54
	Wheat	-	-	-	-	-	46
	Cotton	5.7	-	-	-	-	5.7
	Barley	-	-	-	-	-	1.3

	Horticulture crops - Fruits	**Total area**
	Ber	0.1
	Aonla	0.1
	Citrus	0.1
	Horticultural crops - Vegetables	**Total area**
	Carrot	0.6
	Cauliflower	0.5
	Medicinal and Aromatic crops	**-**
	Plantation crops	**-**
	Fodder crops	**-**
	Total fodder crop area	-
	Grazing land	-
	Sericulture etc	-
	Others (Specify)	-

* If break-up data (irrigated, rainfed) is not available, give total area

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	-	-	29
	Crossbred cattle	-	-	
	Non descriptive Buffaloes (local low yielding)	-	-	189
	Graded Buffaloes	-	-	
	Goat	-	-	31
	Sheep	-	-	12
	Others (Camel, Pig, Yak etc.)	-	-	11
1.9	**Poultry**	**No. of Farms**	**Total no. of birds ('000)**	
	Commercial	NA	310	
	Backyard	NA	9	

1.10	**Fisheries**				
	A. Capture				
	i) Marine (Data Source:	**No. of fishermen**	**Boats**	**Nets**	**Storage facilities**

	Fisheries Dept.)		Mechanised	Non-mechanized	Mechanized (Trawl nets, Grill nets)	Non-mechanized (Shore seines, stake & trap nets)	**(Ice plants etc.)**
		-	-	-	-	-	NA
	ii) Inland (Data Source: Fisheries Dept.)	**No. Farmer owned ponds**		**No. of Reservoirs**		**No. of village tanks**	
		NA		NA		NA	
	B. Culture						
		Water Spread Area (ha)		**Yield (t/ha)**		**Production ('000 tons)**	
	i) Brackish water (Data source: MPEDA/Fisheries Dept.)	NA		NA		NA	
	ii) Fresh water (Data source: Fisheries Dept.)						
	Others						

1.11	**Production and Productivity of major crops** (Average of 2004-05, 2005-06, 2006-07)	**Kharif**		**Rabi**		**Summer**		**Total**	
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)
	Rapeseed Mustard			103.9	1464	-	-	103.9	1464
	Bajra	69.8	1293			-	-	69.8	1293
	Wheat			192.4	4183	-	-	192.4	4183
	Cotton	15.3	423			-	-	15.3	423
	Barley			3.8	2910	-	-	3.8	2910
	Major Horticultural crops								
	Ber	-	-	-	-	-	-	-	1075
	Aonla	-	-	-	-	-	-	-	565
	Citrus	-	-	-	-	-	-	-	415

(Source: Deputy Director Agriculture, Rewari)

1.12	**Sowing window for 5 major crops** (start and end of sowing period)	Rapeseed & Mustard	Bajra	Wheat	Cotton	Barley
	Kharif- Rainfed	-	Onset of rain	-	-	-

	Kharif-Irrigated	-	1-15 July	-	15 April – 7 July	-
	Rabi- Rainfed	September end	-	October end – November end	-	15 October – 15 Nov
	Rabi-Irrigated	September end – 20 Oct	-	October end – 15 November	-	15 November -30 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 inundation	-	-	√
	Pests and diseases (specify)	-	√	-
	Others (Specify)	-	-	-

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

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**	**Crop/cropping system**	**Change in crop/ cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks (July 3rd week)	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	No change	-	-
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)	-do-	-	
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	-do-	-	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/ cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks (Aug 1st week)	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	Avoid clusterbean beyond mid July.	-	_
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)		-	
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.		-	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/ cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks	Light textured sandy soils	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	Avoid sesame beyond mid	-	_
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean:		-	

(Aug 3rd week)	susceptible to wind erosion	RMO 40 (Intercropping 8:4/6:3) Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	August.	- -	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Crop/cropping system**	**Change in crop/ cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks (Sept. 1st week)	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	Fallow	Conserve soil moisture for *rabi* sowing.	-
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)	-do-	-do-	
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	-do-	-do-	

Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**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.	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	i) In case of poor plant population (<two-third), go for re-sowing as and when rains resume. ii) Gap filling by transplanting under rainy conditions.	-	In case of such situation: i) State Agriculture Department should make arrangement for seeds to meet the exigency at block level. ii) Release of
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO- 40	In case of poor plant population (<two-third), go	-	

		(Intercropping 8:4/6:3)	for re-sowing as and when rains resume.		irrigation water in canals and proper power supply may be insured by concerned departments iii) Subsidy on sprinkler, drip irrigation systems and laser leveler
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	-do-	-	

Condition			**Suggested Contingency measures**		
Mid season drought **(long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)**	**Major Farming situation**	**Crop /cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At vegetative stage	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	i) Weeding and hoeing with *wheel hand hoe/ kasola* as and when required. ii) Thinning to reduce 1/3rd population.	*In-situ/ex-situ* moisture conservation: i) Apply life saving irrigation of 4-5 cm, if possible. ii) Foliar spray of urea (2.5 % at 30-35 DAS).	i) Release of irrigation water in canals and proper power supply may be insured by concerned departments ii) subsidy on sprinkler, drip irrigation systems and laser leveler
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)	i) Don't use chemicals for weed management under stress. ii) Weeding and hoeing with wheel hand hoe/ kasola as and when required. ii) Straw mulching in between rows.	Apply life saving irrigation of 4-5 cm, if possible.	
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1			

		Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.			

Condition			**Suggested Contingency measures**		
Mid season drought **(long dry spell)**	**Major Farming situation**	**Crop /cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
At reproductive stage	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	i) Remove every third row for green fodder. ii) Make ridge and furrow for rain water harvesting. iii) Life saving irrigation if available.	-	None
		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)	-do-	-do-	-do-
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	-do-	-do-	-do-

Condition			**Suggested Contingency measures**		
Terminal drought (Early withdrawal of monsoon)	**Major Farming situation**	**Crop/cropping system**	**Crop management**	**Rabi crop planning**	**Remarks on Implementation**
	Light textured sandy soils susceptible to wind erosion	Pearl millet: HHB-94, HHB-197, HHB-67 (Improved)	Remove every third row for green fodder. Make ridge and furrow for rain water harvesting. Life saving irrigation if available. Foliar spray of urea 2% solution under rainfed condition.	Field preparation for rabi crop sowing during first fortnight of Oct. Sowing of Mustard (RH-30, RH -819, RB-24, RB 50 RH- 781 and Varuna) and Chickpea (C-235, H-208 and HC-1) during second fortnight of Oct.	The State Agriculture Department should have advance arrangements for timely supply of seed, fertilizer and other agro-inputs to farmers at block

		Pearl millet + Greengram- Satya, Muskan, Bharpai / Mothbean: RMO 40 (Intercropping 8:4/6:3)	-do-	-do-	level. Breeder seed: Dept of Plant Breeding, CCSHAU, Hisar
		Clusterbean: HG-563, HG-365 Cowpea: Charodi for grain and CS-88 for fodder Castor: CH-1 Sesame: HT-1 Note- Clusterbean can also intercropped with pearlmillet as above.	-do-	-do-	

2.1.2 Irrigated situation

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed/ limited release of water in canals due to low rainfall	Sandy soils/sandy loam soils tubewell irrigated	Pearlmillet-Wheat	Pearlmillet-Raya	10-15% higher seed rate Sprinkler irrigation Planting on beds, planting with ridger seeder Laser land leveling, Conjunctive use of canal and ground waters. Intercropping with moong in pearlmillet and harvesting of intercrop Split application of fertilizers Straw mulching Limited ground water use, prefer life saving irrigation Short duration cultivars Soaking of wheat seeds before sowing Seed treatment with azotobactor/rhizobium Deep ploughing during kharif season Shallow irrigation of 4-5 cm depth Weed free environment	Seeds from State, national seed and private seed agencies. The schemes of NREGS, RKRY, NFSM, NHM are in operation. Govt. subsidy on sprinkler, drip irrigation systems and laser leveler
		Pearlmillet-Chickpea	Clusterbean-Barley	Same as above	
		Fallow -Raya	Summer moong-Raya	Same as above	
		Sorghum-Barley	Cucurbits-Raya	Same as above	
	Well drained,	Clusterbean-	Cotton-Wheat	Same as above	Shallow ground

	medium alluvial soils, canal and tubewell irrigated	Wheat		Drip/furrow irrigation in cotton, paired row planting Sprinkler in wheat Planting on beds Straw mulching in cotton	water use alone or in combination. Seeds from State, national and private seed agencies seed agencies, The schemes of NREGS, RKRY, NFSM, NHM are in operation. Govt. subsidy on sprinkler and drip irrigation systems, on laser land leveling
		Pearlmillet-Wheat	Pearlmillet-raya/chickpea	Same as above Paired row planting	
		Pearlmillet/fallow-raya	Vegetables	Same as above Furrow irrigation in pearlmillet/raya, paired row planting Sowing of vegetable seeds in polythene bags and replanting them in holes.	

Condition			**Suggested Contingency measures**		
	Major Farming situation	**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	Sandy soils, tubewell irrigated	Pearlmillet-Raya	Pulses-Raya	Planting on beds Sprinkler irrigation Marginal ground waters for life saving irrigation Laser land leveling Straw mulching Paired row planting Split application of fertilizer Straw mulching Limited ground water use, prefer life saving irrigation Conjunctive use of brackish ground waters with canal waters Short duration cultivars Seed treatment with azotobactor/rhizobium Deep ploughing during *kharif* season Shallow irrigation of 4-5 cm depth Weed free environment	Short duration cultivars of crops Shallow ground water use alone or in combination. Conservation of rain water, mulching, rain water harvesting.

		Pearlmillet-Chickpea	Clusterbean-Barley	-do-	
		Fallow – Raya/Barley	Vegetables-Raya	-do- Sowing of vegetable seeds in polythene bags and replanting them in holes. Drip irrigation in vegetables	
	Well drained, medium alluvial soils, canal and tubewell irrigated	Clusterbean-Barley	Cotton-Wheat	-do- Drip/furrow irrigation in cotton Sprinkler in wheat Planting on beds	Short duration cultivars of crops Shallow ground water use alone or in combination. Conservation of rain water, mulching, rain water harvesting.
		Pearlmillet/fallow-Wheat	Pearlmillet-Raya/Chickpea	-do-	
		Pearlmillet/fallow-Raya	Sugarcane– Greengram intercropping	-do- Drip/furrow irrigation in sugarcane	
		Sorghum -Wheat	Vegetables	-do- Sowing of vegetable seeds in polythene bags and replanting them in holes. Drip irrigation in vegetables	

Condition	**Suggested Contingency measures**				
	Major Farming situation	**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	Sandy soils, tubewell irrigated	Pearlmillet-Wheat	Clusterbean-Wheat	Planting on beds, sprinkler irrigation, Drip irrigation Limited ground water use, prefer life saving irrigation	Short duration cultivars of crops Shallow ground water use alone or in combination. Conservation of rain water, mulching, rain water harvesting.
		Sorghum-Wheat	Sugarcane-Wheat/raya		
		Pearlmillet-Chickpea	Fallow-raya		
	Well drained, medium alluvial soils, canal and tubewell irrigated	Rice-Wheat	Pearlmillet-Chickpea	Drip/furrow irrigation in cotton, sprinkler in wheat, planting on beds Sprinkler irrigation, Planting on beds, planting with ridger seeder, laser land leveling Limited ground water use, prefer life saving irrigation	Short duration cultivars of crops Shallow ground water use alone or in combination. Conservation of rain water, mulching, rain water harvesting.
		Sugarcane-Wheat	Pigeonpea-Wheat		
		Rice-Berseem(fodder)	Cotton-Wheat		

				Drip irrigation, paired row Planting	

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient groundwater recharge due to low rainfall	Sandy soils, tubewell irrigated	Pearlmillet-Barley	Clusterbean-Wheat	Adoption of efficient methods of irrigation viz., drip in wide spaced, vegetables and horticultural crops Sprinkler irrigation in other crops	Artificial ground water recharge
		Fallow-Raya	Sugarcane-Wheat/raya		
		Pearlmillet-Chickpea	Fallow-Raya		
	Well drained, medium alluvial soils, canal and tube well irrigated	Rice-Wheat	Pearlmillet-Chickpea		
		Sugarcane-Wheat	Pigeonpea-Wheat		
		Rice-Berseem(fodder)	Cotton-Wheat		

2.2 Unusual rains (untimely, unseasonal etc)

Condition	**Suggested contingency measure**			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Rice	Drainage, if depth of standing water is > 5-6 cm	Drainage	Drainage	Shifting to dry place
Cotton	Drainage	Drainage	Drainage	Shifting to dry place
Pearlmillet	-do-	-do-	-do-	-do-
Sorghum (fodder)	-do-	-do-	-do-	-do-
Horticulture				

All crops	1. No adverse effect 2. Removal of unwanted sprouts 3. Spray insecticides & pesticides to control the insect & pest 4. Drain out water if heavy rains	1. Drain out the excess water to avoid flower and fruit drop 2. To control the fruit drop apply foliar application of nutrients and growth regulators 3. Apply insecticide & pesticides to control the insect & pest and diseases on young developing fruits 4. Plough the field to increase the root aeration.	Harvest the fruit crops timely and send to the market immediately.	1. Apply fungicide to avoid post harvest diseases. 2. Proper covering of the produce. 3. Proper grading and cleaning of fruits immediately after harvest. 4. Use the damaged fruits for processing 5. Use water proof packaging
Heavy rainfall with high speed winds in a short span				
Rice	Drainage, if stagnant water	Drainage	Drainage	Shifting to dry place
Cotton	-do-	-do-	-do-	-do-
Pearlmillet	-do-	-do-	-do-	-do-
Sorghum (fodder)	-do-	-do-	-do-	-do-
Horticulture				
All crops	Same as in previous situation			
Outbreak of pests and diseases due to unseasonal rains				
Wheat : Yellow and brown rust of wheat become severe Karnal bunt infection increases under moist conditions	Spray 600 – 800 gm Mancozeb 200 lt. of water/acre at the appearance of disease and repeat after 15-20 days			Treat wheat seed with Raxil 2DS @ 1 gm/kg before sowing to control Karnal bunt
Bajra : Downy mildew incidence increases	There is no control measure except resistant varieties			
Indian Mustard: White rust and Alternaria leaf blight increase, stem rot increases due to rain and cold weather	Spray Mancozeb 0.2% 3-4 times at an interval of 15 days to control white rust and Alternaria leaf blight.	To control stem rot spray 0.2% Carbendazim.		
Cotton : Bacterial leaf blight increases due to rainfall from traces to moderate intensity whereas cotton leaf curl virus decreases	Soak 5 -6 kg delimited and limited cotton seed in 10 lt. of water suspension containing 5 g Emisan + 1 gm Streptocycline sulphate for 2 hrs. and 6-8 hrs respectively before sowing..			

Horticulture				
Potato: Early blight of potato increases with rainfall	Spray Mancozeb @ 0.25% 4-5 times at an interval of 15 days			

2.3 Floods

Condition	**Suggested contingency measure**			
Transient water logging/ partial inundation	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Cotton	Surface drainage	Drainage	Drainage	Shifting to dry place
Pearlmillet	-do-	-do-	-do-	-do-
Sorghum	-do-	-do-	-do-	-do-
Horticulture				
All crops	➢ Drain out the flood water ➢ Spray of nutrients/supplementation ➢ Prefer plantation of water logging resistant crop like Jamun. ➢ Mount planting of fruit trees			Drain out the flood water
Continuous submergence for more than 2 days				
Cotton	Surface drainage	Drainage	Drainage	Shifting to dry place
Pearlmillet	-do-	-do-	-do-	-do-
Sorghum	-do-	-do-	-do-	-do-
Horticulture				
All crops	➢ Drain out the flood water ➢ Spray of nutrients/supplementation ➢ Prefer plantation of water logging resistant crop like Jamun. ➢ Mount planting of fruit trees			Drain out the flood water
Sea water inundation	NA			

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				
Cotton	Micro-drip irrigation	Deep irrigation	Deep irrigation	
Pearlmillet	Micro-sprinkler irrigation, avoid irrigation during hot hours with poor quality waters	Micro- sprinkler irrigation, avoid irrigation during hot hours with poor quality waters	Micro-irrigation, avoid irrigation during hot hours with poor quality waters	
Sorghum	-do-	-do-	-do-	
Clusterbean	-do-	-do-	-do-	

Extreme event type	Suggested contingency measure			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Pigeonpea	-do-	-do-	-do-	
Horticulture				
All crops	Micro-irrigation, avoid irrigation during hot hours with poor quality waters	As above	As above	
Cold wave[q]				
Wheat	Irrigation, balanced fertilizer application, Foliar spray of nutrients	Irrigation, fertilizer application	Irrigation, fertilizer application	
Raya	-do-	-do-	-do-	
Chickpea	-do-	-do-	-do-	
Barley	-do-	-do-	-do-	
Fodder	-do-	-do-	-do-	
Horticulture				
All crops	Apply frequent irrigation, shelterbelt and windbreaks	Apply frequent irrigation, windbreaks	Apply frequent irrigation	-
Frost				
Wheat	No adverse effect			
Raya	Irrigate the crop Create smoke during late evening	Irrigate the crop Create smoke during late evening	Irrigate the crop Create smoke during late evening	
Chickpea	-do-	-do-	-do-	
Barley	-do-	-do-	-do-	
Fodder	-do-	-do-	-do-	
Horticulture				
All crops	1. Apply light irrigation frequently 2. Creating smoke in the orchard during late evening. 3. Thatching of young plants during severe cold months. 4. Use of sprinkler irrigation. 5. Use of mulching under plant canopy			
Hailstorm				
	-			
Horticulture				
	i. Plantation of wind breakers ii. Use of hailstorm nets iii. Supplementation of nutrients to the trees			
Cyclone				

Extreme event type	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
	-			
Horticulture				
All crops	Seedling covers should be used			

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	1. All Districts should be asked to locate their feed and fodder banks in view of submergence situation arising due to draught. Sufficient care must be taken to sensitize the farmers to protect their feed and fodder much ahead of onset of monsoon. The sources for procurement of feed / rice bran (Kunda) within the district and nearest locations should be identified, and the suppliers kept informed about the emergency situation, which might require action at their level for production and supply to the identified areas within the shortest possible time. 2. Complete feed blocks should be prepared and stored in the feed banks for scarcity periods. 3. The livestock holders of small ruminants should be educated/ informed to collect sufficient amount of green leaves from edible plants for use during the period of submergence at the earliest, after receipt of draught warning. The district authorities of Animal Husbandry Department should chalk out a complete programme to cater the feed & fodder needs of livestock. 4. Increase the sown area under fodder crops 5. Looking to scarcity of crop residues, burning of paddy straw and stubbles should not be allowed in Haryana. This can be properly harvested, baled,	1. The best option is to open fodder depots for milch animals which farmers will never deposit into the cattle camps and establish cattle camps for dry and scrub animals. These camps should be established along assured source of water or canals for drinking and growing fodder. 2. Facilities like storing densified roughages transported from other districts should also be established adjacent to these camps. 3. Complete feed blocks stored in the feed banks should be provided to productive, lactating and pregnant animals for scarcity periods 4. Since stall feeding adversely affects the breeding efficiency in case of sheep, therefore, sheep should always be resorted to natural grazing. 5. Special care is required for productive, lactating and pregnant animals. These animals must be supplemented with additional concentrates and fodders. 6. Most of such animals will be retained by the farmers and arrangements for fodder, feed and drinking water should be made accordingly.	1. Immediate efforts are needed to grow short duration fodder crops like oats, barley, *kasni* and *lucern* etc. in the canal command areas. 2. Farmers might have to be compensated for abandoning food or commercial cash crop to meet contingent fodder requirements.

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
	densified and fortified using 4% urea with molasses and transported to areas of fodder scarcity. Standardized machinery for harvesting, bailing, densification and fortification is available with Punjab Agro Federation and in the market.		
Drinking water	Prior to the onset of summer all the water ponds/lakes in the villages/cities should be filled up with canal water/tube wells.	1. All the affected livestock should have an access to clean drinking water. Arrangements are required to be made in this regard with the help of concerned Government functionaries of the Districts. 2. Resorting to alternate day watering to camel, sheep and goats. Experimental evidences show that even watering twice a week did not have much adverse effect on body weight of the sheep. 3. Avoiding long distance grazing, as tired animals need more and frequent watering and feeding.	Normal supply of water should be restored.
Health and disease management	Constitution of task force at district and sub division level which will formulate guidelines for action should have a mobile veterinary unit at their disposal. Procurement of mineral and feed supplements, life saving drugs, electrolytes, vaccines etc.	Disbursement of supplements, treatment of affected animals in camps, proper disposal of dead animals, deworming and vaccinations.	Rehabilitation of affected animals, provision of veterinary aid and follow up, provide supplements etc to make up losses for deficiencies.
Floods			
Feed and fodder availability	1. All Districts should be asked to locate their feed and fodder banks in view of submergence situation arising due to floods. Sufficient care must be taken to sensitize the farmers to protect their feed and fodder much ahead of onset of monsoon. The sources for procurement of feed / rice bran (Kunda) within the district and nearest locations should be identified, and the suppliers kept informed about the emergency situation, which might require action at their level for production and supply to the identified areas within the shortest possible time. 2. Complete feed blocks should be prepared and stored in the feed banks for scarcity periods 3. The livestock holders of small ruminants should be educated/ informed to collect sufficient amount of	1. The best option is to open fodder depots for milch animals which farmers will never deposit into the cattle camps and establish cattle camps for dry and scrub animals. These camps should be established along assured source of water or canals for drinking and growing fodder. 2. Facilities like storing densified roughages transported from other parts of the country should also be established adjacent to these camps. 3. Immediate efforts are needed to grow fodder crops like oats, barley, *kasni* and *lucern* etc. in the canal command areas. 4. Farmers might have to be compensated for abandoning food or commercial cash crops to meet contingent fodder requirements.	1. Immediate efforts are needed to grow fodder crops like oats, barley, *kasni* and *lucern* etc. in the canal command areas. 2. Farmers might have to be compensated for abandoning food or commercial cash crops to meet contingent fodder requirements. 3. After the sheds have dried, these should be disinfected and regular feed of the animals should be introduced gradually.

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
	green leaves from edible plants for use during the period of submergence at the earliest, after receipt of draught warning. The district authorities of Animal Husbandry Department chalk out a complete programme to cater the feed & fodder needs of cattle, buffalo, sheep, goat, pig, dog, poultry birds etc. 4. The livestock holders of livestockare trained regarding shifting of animals before flooding. The farmers are instructed to let loose their animals instead of tieing much before flood. 5. Increase the sown area under fodder crops 6. Looking to scarcity of crop residues, burning of paddy straw and stubbles should not be allowed in Haryana. This can be properly harvested, bailed, densified and fortified using 4% urea with molasses and transported to areas of fodder scarcity. Standardized machinery for harvesting, bailing, densification and fortification is available with Punjab Agro Federation and in the market.	5. Since stall feeding adversely affects the breeding efficiency in case of sheep, therefore, sheep should always be resorted to natural grazing. 6. Special care is required for productive, lactating and pregnant animals. These animals must be supplemented with additional concentrates and fodders. 7. Most of such animals will be retained by the farmers and arrangements for fodder, feed and drinking water should be made accordingly.	
Drinking water	Tube wells should be installed before monsoon to provide underground water to the livestock during flood period.	All the affected livestock and poultry should have an access to clean drinking water. Arrangements are required to be made in this regard with the help of concerned Government functionaries of the Districts. The available water may be chlorinated if required with help of Halogen Tablet prior to drinking by livestock and poultry.	Normal supply of water should be restored.
Health and disease management	Constitution of task force at district and sub division level which will formulate guidelines for action. Procurement of mineral and feed supplements, life saving drugs, electrolytes, vaccines etc. Workout places for evacuation.	Evacuate to safe places, provide veterinary aid to affected animals, proper disposal of dead animals, disainfection of drinking water. If not already done, carry out deworming and vaccinations for HS, FMD, BQ in cattle, PPR, sheep pox, ET in sheep and goats, swine fever in pigs..	Rehabilitation of affected animals, provision of veterinary aid and follow up, provide supplements etc. Disinfection of area, control of vectors, prevention of spread of disease/outbreaks. Treatment of affected animals.
Cyclone	-NA-		

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Feed and fodder availability			
Drinking water			
Health and disease management			
Heat wave and cold wave			
Shelter/environment management	Necessary arrangement of tatties, gunny bags and tirpal should be made available so as to cover the sheds during heat and cold waves	1. Window of the sheds should be covered with gunny bags, tatties, and tirpal. Electric fans should be provided in the sheds and if possible desert cooler should be provided during heat period. 2. High energy and readily available sources of energy nutrients may be provided in the ration.	Normal shelter should be restored
Health and disease management	Provision of shelter/roof/covered and open area to animals, procurement of life saving drugs and vaccines.	Cold waves: Cover the animal with old blanket/gunny bag etc. Heat wave: Sprinkle water/take buffaloes to ponds. Treat affected animals, vaccinate if not done earlier.	Treatment of affected animals, provide veterinary aid and follow up.

2.5.2 Poultry

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
Drought			
Shortage of feed ingredients	I. All Districts should be asked to locate their feed banks in view of submergence situation arising due to draught. Sufficient care must be taken to sensitize the farmers to protect their feed and fodder much ahead of onset of monsoon. The sources for procurement of feed / rice bran (Kunda) within the district and nearest locations should be identified, and the suppliers kept informed about the emergency situation, which might require action at their level for production and supply to the identified areas within the shortest possible time. II. The district authorities of Animal Husbandry Department should chalk out a complete programme to cater to feed the poultry birds. III.	Poultry farmers should be provided with sufficient amount of feed ingredients and complete feed during draught situation from the feed banks.	Normal feeding should be restored

Drinking water	Necessary arrangement for water storage should be made. Hand pumps should be installed around the sheds. Sufficient quantity of electrolytes should be ensured.	All the affected poultry should have an access to clean drinking water. Arrangements are required to be made in this regard with the help of concerned Government functionaries of the Districts.	Normal drinking water restored
Health and disease management	Constitution of task force at district and sub division level which will formulate guidelines for action should have a mobile veterinary unit at their disposal. Commercial poultry farms can procure grain/feed in advance.	In backyard birds, put some grains and sufficient water inside the enclosure, provide some vitamin supplement.	In backyard poultry, carry out de-worming and vaccination for Ranikhet disease and Gumboro. Provide vitamins and mineral supplement.
Floods			
Shortage of feed ingredients	I. All Districts should be asked to locate their feed banks in view of submergence situation arising due to flood. Sufficient care must be taken to sensitize the farmers to protect their feed much ahead of onset of monsoon. The sources for procurement of feed / rice bran (Kunda) within the district and nearest locations should be identified, and the suppliers kept informed about the emergency situation, which might require action at their level for production and supply to the identified areas within the shortest possible time. II. The poultry farmers should be trained regarding shifting of birds before flood. For shifting of poultry birds to safer places, the farmer should be educated to make suitable cages from bamboos.	Sufficient quantity of feeds stored in the feed banks should be made available to the poultry farmers.	Normal feeding should be restored
Drinking water	I. Prior to the onset of monsoon tube wells should be installed in the villages and near to the poultry farms so as to provide underground water during flood.	All the affected poultry should have an access to clean drinking water. Arrangements are required to be made in this regard with the help of concerned Government functionaries of the Districts. The available water may be chlorinated if required with help of Halogen Tablet prior to drinking by livestock and poultry.	Normal drinking water restored
Health and disease management	Constitution of task force at district and sub division level which will formulate guidelines for action should have a mobile veterinary unit at their disposal. Make provision of shelter for evacuation and arrangement around farm so that flood water does	Evacuate the birds to safer places. Carry out deworming and vaccinations. May dispose off/sell birds for meat purpose. Proper disposal of dead birds.	Make shed dry, sprinkle lime & spray insecticides, disinfectant before

	not enter poultry farm/shed. Provision or facilities for disposal of dead birds.		placement of birds, use of coccidiostat in feed or water, proper disposal of dead birds.
Cyclone	-NA-		
Shortage of feed ingredients			
Drinking water			
Health and disease management	Keep arrangements in place in shed for heating during winter/cold waves and for cooling by use of sprinklers/foggers. Procure electrolytes and supplements.	Avoid too much fluctuation below the temperature of 70 ºF and above 100 ºF. Use bukharies, gas burner, secure curtains during winter. Provide a course of antibiotics in feed or water for 3-5 days to combat respiratory problems. Provide vitamin C, electrolyte in drinking water during heat waves and use of foggers, wetting of curtains, sprinkling of water etc. during heat waves. May dispose off/sell birds if heavy mortality occurring.	Treatment of affected birds, vaccination if delayed may be carried out as per schedule.
Heat wave and cold wave			
Shelter/environment management	Necessary arrangement of *tatties*, gunny bags and *tirpal* should be made available so as to cover the sheds during heat and cold waves	Window of sheds should be covered with gunny bags, tatties, & tirpal. Electric fans should be provided in the sheds and if possible desert cooler should be provided during heat period. High energy & readily available sources of energy nutrients may be provided in ration.	Normal shelter should be restored
Health and disease management			

2.5.3 Fisheries

	Suggested contingency measures		
	Before the event	**During the event**	**After the event**
1) Drought			
A. Capture	NA		
Marine			
Inland			
(i) Shallow water depth due to insufficient rains/inflow			
(ii) Changes in water quality			

B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	Further increase the depth of ponds, store the fish stock in 1 & 2 ponds only.	Sell the big fishes and keep the smaller fishes in one tank.	Stock the young fishes in different tanks, species wise.
(ii) Impact of salt load build up in ponds / change in water quality	Continuously add some water from tube well/water source in fish ponds	Do not allow the water level to go below 3.5 feet in fish ponds.	Stock the young fishes in different tanks and keep the water between 3.5 and 6.0 feet.
2) Floods	NA		
A. Capture			
Marine			
Inland			
(i) No. of boats / nets/damaged			
(ii) No.of houses damaged			
(iii) Loss of stock			
(iv) Changes in water quality			
(v) Health and diseases			
B. Aquaculture			
(i) Inundation with flood water	Boundaries/bunds with height >6 feet may be made around fish ponds, will restrict, escape of fishes from ponds	Net-out and stock the fishes in one big tanks and make the bund >6 feet height around the ponds.	Remove the bund separately and release the fishes, species-wise in tanks.
(ii) Water contamination and changes in water quality	Add more fresh water in each tank (tube well/canal), grow aquatic weeds.	Repeatedly filter and re-circulate water from stocking tanks	Filter, re-circulate and add new fresh water every week, will decrease fish mortality.
(iii) Health and diseases	Treat the pond water with $KmNO_4$ @ 10 ppm in each fish tanks. Add new fresh water periodically.	Disinfect fish ponds with $KmNO_4$ @ 10g/10,000 liter water fortnightly.	Treatment with $KmNO_4$ must continue for one month even after flood situation is out. Remove the highly infected fishes from ponds.
(iv) Loss of stock and inputs (feed, chemicals etc)	Store the inputs at safer places.	Move stock and inputs to safer places and acquire fresh stock in shortage.	Retain the normal arrangements.
(v) Infrastructure damage (pumps, aerators, huts etc)	Make alternate arrangements according to the anticipated conditions	Proper maintenance/repairing of damaged infrastructure or make new arrangements.	Proper maintenance/repairing of damaged infrastructure.
3. Cyclone / Tsunami	NA		
A. Capture			
Marine			
(i) Average compensation paid due to loss of fishermen lives			
(ii) Avg. no. of boats / nets/damaged			

(iii) Avg. no. of houses damaged			
Inland			
B. Aquaculture			
(i) Overflow / flooding of ponds			
(ii) Changes in water quality (fresh water / brackish water ratio)			
(iii) Health and diseases			
(iv) Loss of stock and inputs (feed, chemicals etc)			
(v) Infrastructure damage (pumps, aerators, shelters/huts etc)			
4. Heat wave and cold wave			
A. Capture	NA		
Marine			
Inland			
B. Aquaculture			
(i) Changes in pond environment (water quality)	Keep the ponds water fresh by adding fresh tubewell water, regularly.	Showering the water in air and add fresh tube-well water, periodically.	During heat waves, showering is must and also tubewell water. In winter continue adding of tubewell water with $KmNO_4$.
(ii) Health and Disease management	Treatment of KmNO4 @ 10 ppm. Sale out the bigger fishes.	Treatment of KmNO4 @ 10 ppm. Dump the fishes which were heavily infected	Disinfection with $KmNO_4$ continues. Sale out all the fishes except, infected ones. Dump the infected fishes in a ditch in the ground.

Annexure1: Location map of district in the state of Haryana

Annexure 2: Rainfall map