

State: MAHARASHTRA
Agriculture Contingency Plan for District: NANDED

1.0 District Agriculture profile				
1.1	Agro-Climatic/ Ecological Zone			
	Agro Ecological Sub Region (ICAR)	Deccan Plateau, Hot Semi-Arid Eco-Region (6.2)		
	Agro-Climatic Region (Planning Commission)	Western Plateau and Hills Region (IX)		
	Agro Climatic Zone (NARP)	Central Maharashtra plateau Zone (MH-7) Central Vidarbha Zone (MH-8)		
	List all the districts or part thereof falling under the NARP Zone	Aurangabad, Jalana, Parbhani, Hingoli, Beed, Osmanabad, Latur, Nanded, Dhule, Buldhana, Amravathi, Jalgaon, Akola, Yeotmal		
	Geographic coordinates of district	Latitude	Longitude	Altitude
		19° 09' 11.02" N	77° 18' 21.05"	360
	Name and address of the concerned ZRS / <u>ZARS</u> / RARA / RRA / RRTTS	National Agricultural Research Project, Paithan Road, Aurangabad- 431 005 NARP, Yeotmal, Dr PDKV, Akola		
	Mention the KVK located in the district	Krishi Vigyan Kendra(NGO) Pokharni, Purna road PO. Limbgaon, Tehsil & District, Nanded 431 602 Krishi Vigyan Kendra (NGO), Village Sagroli, Tehsil Biloli District Nanded 431 731		
Nearest AMFU	AMFU, Parbhani 431 402			

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) :	862.5	39	June 2 nd week (MW 23)	October 1 st week(MW 40)
	NE monsoon (Oct - Dec) :	76.4	5	-	-
	Winter (Jan - Feb) :	18.1	1	-	-
	Summer (Mar - May) :	36.1	1	-	-
	Annual	993.1	46	-	-
(Source: Meteorology Department, MAU, Parbhani)					

1.3	Land use pattern of the district (latest statistics)	Geographical area (000 ha)	Cultivable 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
		1033.1	808.7	85.3	35.8	50.6	35.9	6.3	19.0	73.4	24.3

Source: Agriculture Statistical Information Maharashtra State 2006 (Part – II)

1.4	Major Soils	Area ('000 ha)	Percent (%) of total
	1.Deep black soils	394.65	36.81
	2.Medium deep black soils	101.12	9.43
	3.Shallow black soils	576.26	53.75

(Source: NBSS and LUP, Nagpur)

1.5	Agricultural land use	Area ('000 ha)	Cropping intensity %
	Net sown area	711.0	114
	Area sown more than once	100.1.0	
	Gross cropped area	811.1	

1.6	Irrigation	Area ('000 ha)	Percent (%)	
	Net cultivated area	711.0		
	Net Irrigated area	112.0		12.16
	Gross irrigated area	125.64		-
	Rainfed area	--		88
	Sources of Irrigation	Number	Area ('000 ha)	(%)
	Canals (Upper Penganga, Purna and Manar projects)	1	34.40	-
	Tanks	8	11.92	-
	Open wells	342	37.85	-
	Bore wells	70000	22.00	-
	Lift irrigation scheme (Vishnupuri)	25000	-	-
	Other sources (Kolhapuri bandhara) (Farm ponds)	40	14.70	-
	Total	97	4.76	-
	No. of tractors	-	125.64	-
	Pump sets	-	-	-
	Micro-irrigation (2009-10) (Spriklar-7.02) and drip- (5.21)	-	12.23	-
	Groundwater availability and use	No. of blocks	% area	Quality of water
	Over exploited	-	-	Safe
	Critical	-	-	Safe
	Semi-critical	-	-	Safe
	Safe	-	-	Safe
	Waste water availability and use	-	-	Safe

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

Source: Perspective plan of agriculture and horticulture 2007-08 to 2016-17 dist. Nanded

Area under major field crops & horticulture etc.

1.7	Major Field Crops cultivated	Area ('000 ha)								
		Average of five years (2005-06 to 2009-10)			Rabi 2007-08			Summer		
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total
	Cotton	-	235.1	235.1	-	-	-	-	-	-
	Sorghum	-	148.6	148.6	-	-	-	-	-	-
	Soybean	-	166.0	166.0	-	-	-	-	-	-
	Black Gram	-	51.3	51.3	-	-	-	-	-	-
	Pigeon pea	-	57.5	57.5	-	-	-	-	-	-
	Rabi sorghum	-	-	-	-	29.0	29.0	-	-	-
	Wheat	-	-	-	29.2	-	29.2	-	-	-
	Gram	-	-	-	-	29.4	29.4	-	-	-
	Safflower	-	-	-	-	7.8	7.8	-	-	-
	Sunflower	-	-	-	10.2	-	10.2	1.2	-	1.2
	Groundnut	-	-	-	-	-	-	9.8	-	9.8
	Sugarcane	-	-	-	19.4	-	19.4	-	-	19.4

(Source: ZREAC report of Joint Director of Agril. Latur, Kharif 2011 & Perspective plan of agriculture and horticulture 2007-08 to 2016-17 dist. Nanded)

	Horticulture crops – Fruits	Total area (000 ha)
	Banana	9.50
	Sweet orange	10.45
	Mango	7.81
	Sapota	1.45
	Orange	1.22
	Horticulture crops – Vegetables	Total area
	Chilli	4.27
	Onion	1.87
	Tomato	2.25
	Brinjal	2.00
	Okra	1.30
	Medicinal and Aromatic crops	Total area
	Turmeric	1.22
	Ginger	1.15
	Garlic	1.73
	Plantation Crops	Total area
	Not Applicable	
	Fodder crops	Total area

	Sorghum	NA
	Maize	NA
	Lucern	NA
	Berseem	NA
	Gajraj	NA
	Total fodder crop area	NA
	Grazing land	NA
	Sericulture etc	NA
	Others (Specify)	NA

1.8	Livestock	Number ('000)		
	Cattle	348.687		
	Buffaloes total	248.192		
	Commercial dairy farms	-		
	Goat	379.501		
	Sheep	52.758		
	Others (Camel, pig, Yak etc.)	-		
1.9	Poultry			
	Commercial	126.123		
	Backyard	431.145		
1.10	Fisheries	Area (000 ha)	Yield (t/ha)	Production (tones)
	Brackish water	NA	NA	NA
	Fresh water	8.731	0.411	3597
	Others	NA	NA	NA

Source: Maharashtra Animal and Fishery Sciences University, Nagpur

1.11	Production and Productivity of major crops (Average of last 5 years: 2003 to 2008)	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)	
		Cotton	203.2	147	-	-	-	-	203.2	147
		Sorghum	138.3	931	-	-	-	-	138.3	931
		Soybean	130.0	783	-	-	-	-	130.0	783
		Black Gram	14.6	284	-	-	-	-	14.6	284
		Pigeon pea	37.3	649	-	-	-	-	37.3	649
		Rabi sorghum	-	-	23.80	821	-	-	23.80	821

Wheat	-	-	36.88	1263	-	-	36.88	1263
Gram	-	-	17.11	582	-	-	17.11	582
Safflower	-	-	4.03	517	-	-	4.03	517
Sunflower	-	-	5.6	549	0.83	698	6.43	623.5
Groundnut	-	-	-	-	13.85	1414	13.85	1414
Sugarcane							12222	63.0
Major Horticultural crops								
Banana	-	-	-	-	-	-	237.50	25.0
Sweet orange	-	-	-	-	-	-	125.424	12.0
Mango	-	-	-	-	-	-	39.06	5.0
Sapota	-	-	-	-	-	-	14.58	10.0
Orange	-	-	-	-	-	-	8.57	7.0
	-	-	-	-	-	-	-	-

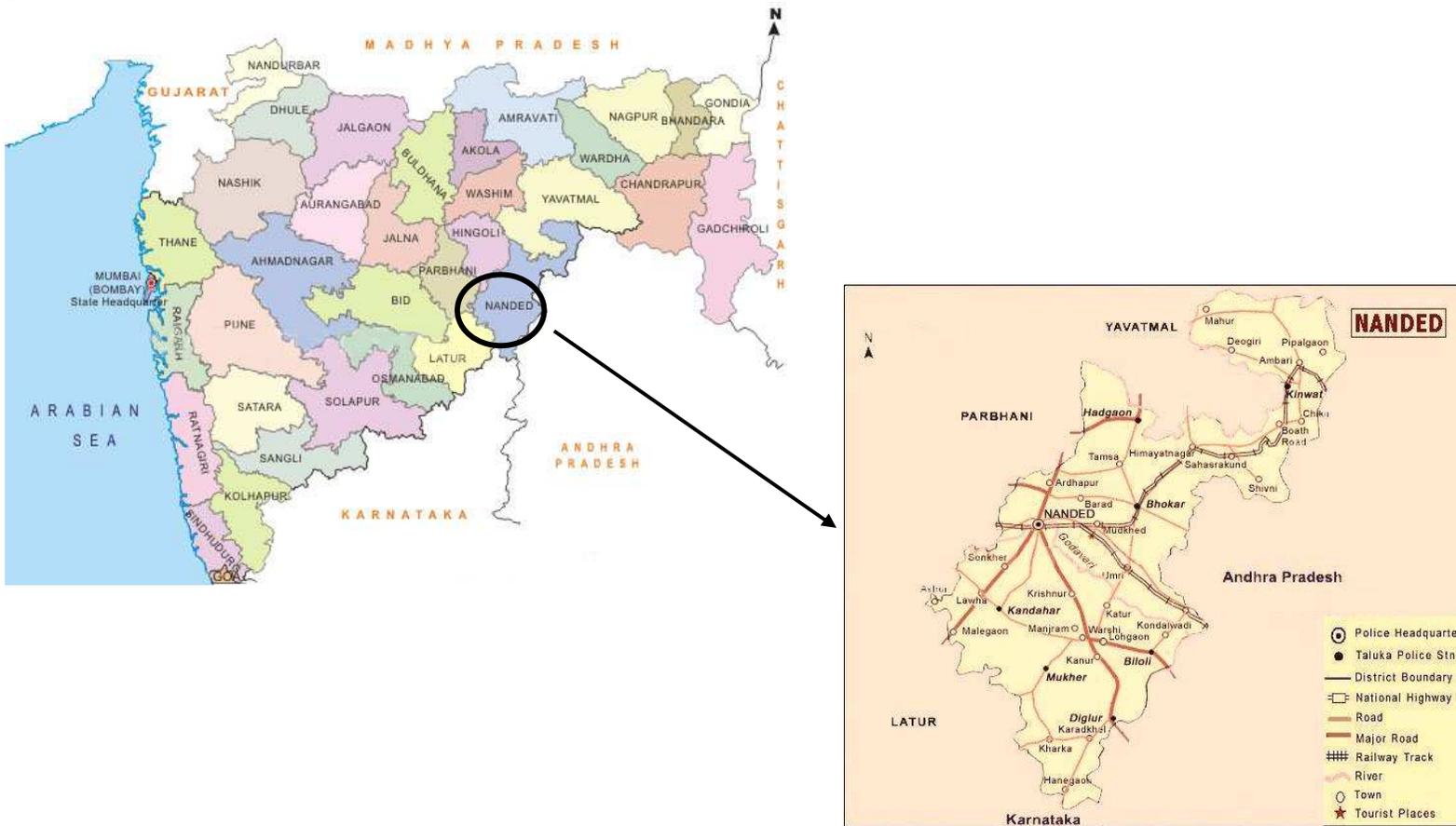
1.12	Sowing window for 5 major crops (start and end of sowing period)	Cotton	Sorghum	Soybean	Black gram / Green gram	Pigeonpea
	Kharif - Rainfed	June 15 to July 15	June 15 to July 15	June 15 to July 15	June 15 to July 7	June 15 to July 30
	Kharif - Irrigated	May 15 to June 15	-	-	-	-
		Wheat	Rabi sorghum	Gram	Safflower	
	Rabi - Rainfed	15-30 Oct	1-15 Oct	1- 15 Oct	Sep 15 to Oct 15	-
	Rabi - Irrigated	15 Nov – 15 Dec	15 Oct – 15 Nov	15oct to Nov 15	-	-

1.13	What is the major contingency the district is prone to? (Tick mark and mention years if known during the last 10 years period)	Regular	Occasional	None
	Drought	-	√	-
	Flood	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	√	-
	Cold wave	-	√	-
	Frost	-	-	√
	Sea water inundation	-	-	√
	Pests and diseases (specify)	√1.Heliothis (pigeonpea , gram) 2.Spodoptera (Soybean) 3.Sphingid (Moong and Urd) 4.Jassids&whitefly (cotton)		-

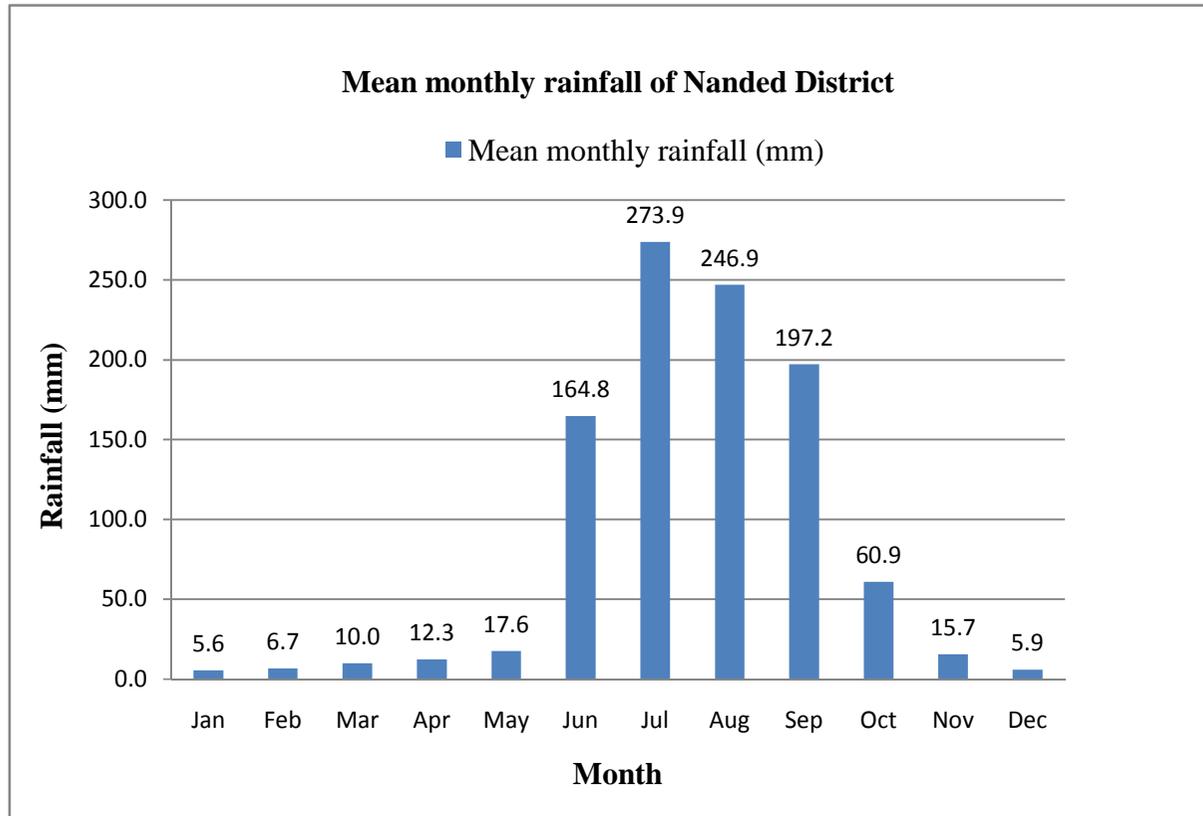
Source: Maharashtra Animal and Fishery Sciences University, Nagpur

1.14	Include Digital maps of the district for	Location map of district within States as Annexure 1	Enclosed : Yes
		Mean annual rainfall as Annexure 2	Enclosed : Yes
		Soil map as Annexure 3	Enclosed : Yes

Annexure 1
Location map of Nanded district



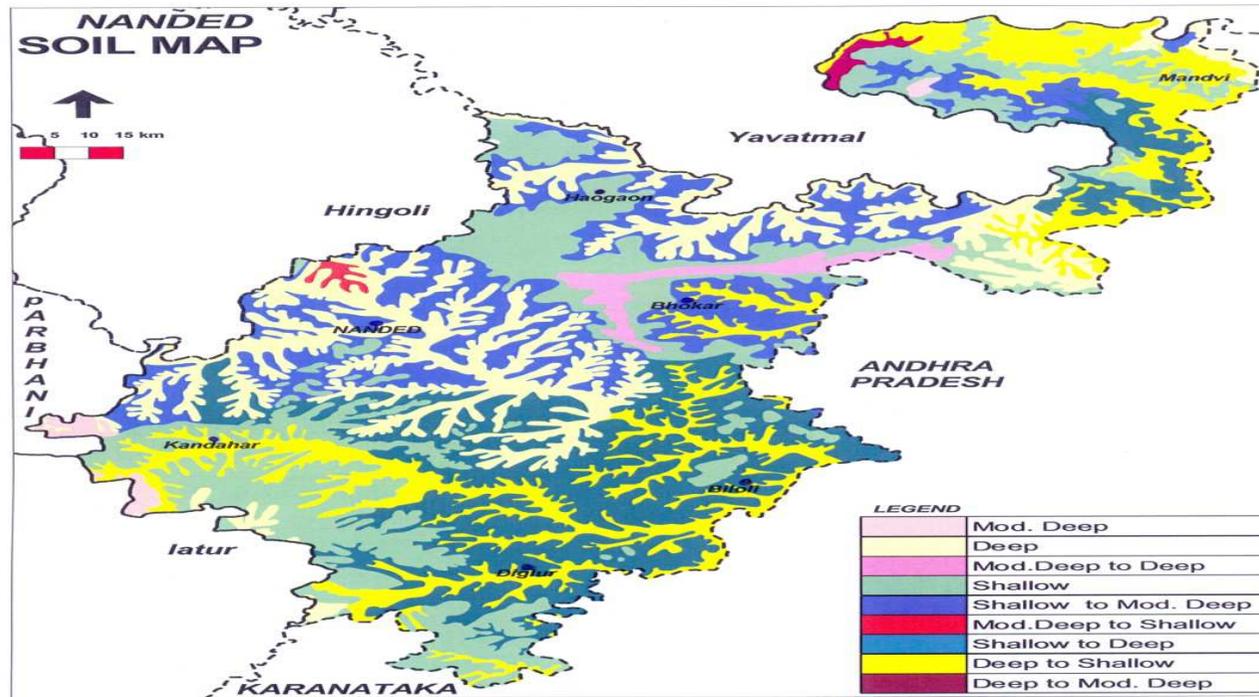
Annexure 2
Mean monthly rainfall of Nanded district



(Source: IMD) (1941–1990)

Annexure 3

Soil map of Nanded district



Source: NBSS & LUP Regional Centre, Nagpur

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures			
			Change in Crop/Cropping system	Agronomic measures	Remarks on Implementation	
Early season drought (delayed onset) Delay by 2 week (Specify month) * June 4th week	Medium deep to deep and black soils with assured and high rainfall	Cotton	No change	No change	Linkage with MAU, MSSC and NSC for seed.	
		Sorghum	No change	No change		
		Soybean	No change	No change		
		Black gram	No change	No change		
		Pigeon pea	No change	No change		Linkage with MAIDC for implements.
		Green gram	No change	No change		
	Shallow black soils with assured and high rainfall	Cotton	No change	No change	Linkage with MAU, KVK for agro techniques	
		Sorghum	No change	No change		
		Soybean	No change	No change		
		Black gram	No change	No change		
		Pigeon pea	No change	No change		
		Green gram	No change	No change		

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Change in Crop/Cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset) Delay by 4 week (Specify month) * July 2nd week	Medium deep to deep black soils with assured and high rainfall	Cotton	Cotton + Pigeonpea 6:2 (BSMR 736, 853)	Normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent.	Linkage with MAU, MSSC and NSC for seed. Linkage with MAIDC for implements.
		Sorghum	Sorghum + Pigeonpea 4 : 2 (CSH-9, 11, 14, 16 PVK-401, 809) + (BSMR 736, 853)	-----do-----	
		Soybean	No change / Soybean+ pigeon pea 4:2 row proportion (MAUS 71,81) + (BSMR 736, 853)	Normal package of practices recommended by MAU, Parbhani	Linkage with MAU, KVK for agro techniques

		Black gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853)	-----do-----		
		Pigeon pea	NO change / Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853)	-----do-----		
		Green gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853)	-----do-----		
	Shallow black soils with assured and high rainfall	Cotton	Cotton + Pigeonpea 6:2 (BSMR 736, 853, BDN 708, 711)	Normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent.		
		Sorghum	Sorghum + Pigeonpea 4 : 2 (CSH-9, 11, 14, 16 PVK-401, 809) + (BSMR 736, 853, BDN 708, 711)	-----do-----		
		Soybean	Soybean+ pigeon pea 4:2 row proportion (MAUS 71,81) + (BSMR 736, 853, BDN 708, 711)	Normal package of practices recommended by MAU, Parbhani		
		Black gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	-----do-----		
		Pigeon pea	NO change / Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	-----do-----		
		Green gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	-----do-----		

Condition			Suggested Contingency measures		
			Change in Crop/Cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)	Major Farming situation	Normal Crop/Cropping system			
Delay by 6 week (Specify month) * July 4th week	Medium deep to deep black soils with assured and high rainfall	Cotton	Cotton + Pigeonpea 6:2 (BSMR 736, 853, BDN 708, 711)	Normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent.	Linkage with MAU, MSSC and NSC for seed. Linkage with MAIDC for implements. Linkage with MAU, KVK for agro techniques
		Sorghum	Sorghum + Pigeonpea 4 : 2 (CSH-9, 11, 14, 16 PVK-401, 809) + (BSMR 736, 853, BDN 708, 711) /Maize/Sunflower	-----do-----	
		Soybean	No change / Soybean+ pigeon pea 4:2 row proportion (MAUS 71,81) + (BSMR 736, 853, BDN 708, 711)	Opening of furrows in alternate rows with Balram plough	
		Black gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	Interculture for in-situ moisture conservation	
		Pigeon pea	NO change / Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	Seed Hardening Adopt closer spacing (60X30cm) Frequent interculture for in-situ moisture conservation and for weed free condition	
		Green gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BSMR 736, 853, BDN 708, 711)	Interculture for in-situ moisture conservation	
	Shallow black soils with assured and high rainfall	Cotton	Cotton + Pigeonpea 6:2 (BDN 708, 711)	Normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent.	
		Sorghum	Sorghum + Pigeonpea 4 : 2 (CSH-9, 11, 14, 16 PVK-401, 809) + (BDN 708, 711) /maize/fodder maize (African tall)	-----do-----	
		Soybean	Soybean+ pigeon pea 4:2 row	Opening of furrows in alternate	

			proportion (MAUS 71,81) + (BDN 708, 711)	rows with Balram plough	
		Black gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BDN 708, 711)	Interculture for in-situ moisture conservation	
		Pigeon pea	NO change / Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BDN 708, 711)	Seed Hardening Adopt closer spacing (60X30cm) Frequent interculture for in-situ moisture conservation and for weed free condition	
		Green gram	Soybean + Pigeonpea 4 : 2 (JS-335, MAUS-71,81) + (BDN 708, 711) / Sunflower (Morden, EC-68414, SS-56, LSH-35)	Interculture for in-situ moisture conservation	

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Change in Crop/Cropping system	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset) Delay by 8 week (Specify month) * August 2nd week	Medium deep to deep black soils with assured and high rainfall	Cotton	Pigeonpea (BDN 708, 711)	Seed Hardening Adopt closer spacing (60X30cm) and 15-20% more seed rate than recommended. Frequent interculture for in-situ moisture conservation and for weed free condition	Linkage with MAU, MSSC and NSC for seed. Linkage with MAIDC for implements. Linkage with MAU, KVK for agro techniques
		Sorghum	Pearlmillet + Pigeonpea 4 : 2 (Shradha, Saburi, Shanti, AIMP-92901) + (BDN 708, 711) /Maize/Sunflower	-----do-----	
		Soybean	Pigeon pea/Sunflower/Sesamum	-	
		Black gram	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Prepare land for rabi Season	
		Pigeon pea	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Seed Hardening Adopt closer spacing (60X30cm) Frequent interculture for in-situ moisture conservation and for weed free condition	

		Green gram	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Interculture for in-situ moisture conservation	
	Shallow black soils with assured and high rainfall	Cotton	Pigeonpea (BDN 708, 711)	Normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent.	
		Sorghum	Pearl millet + Pigeonpea 4 : 2 (Shradha, Saburi, Shanti, AIMP-92901) + (BDN 708, 711) /Maize/Sunflower	-----do-----	
		Soybean	Pigeon pea/Sunflower/Sesamum/Castor	-	
		Black gram	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Interculture for in-situ moisture conservation	
		Pigeon pea	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Seed Hardening Adopt closer spacing (60X30cm) Frequent interculture for in-situ moisture conservation and for weed free condition	
		Green gram	Pigeonpea/ Maize/ pearl millet / Sunflower OR Plan for early rabi crops like sorghum, Chickpea and Safflower	Interculture for in-situ moisture conservation	

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient and moisture conservation practices	Remarks on Implementation
Early season drought (Normal onset)					
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination / crop stand etc.	Medium deep to deep black soils with assured and high rainfall	Cotton	Gap filling 7-10 days after sowing by pot watering within the rows with same cultivar or pigeonpea to maintain at least 75% plant population. Raise cotton seedlings in polythene bags and transplant when sufficient soil moisture is available. Give protective irrigation wherever possible	Making of conservation furrows for moisture conservation When the crop is 2 weeks old take up Interculture with harrow. Spray 2 % urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition	Linkage with MAU, MSSC and NSC for seed. Linkage with MAIDC for implements. Linkage with MAU, KVK for agro techniques Linkage with DSAO for

		Sorghum	Gap filling with pigeonpea	When the crop is 2 weeks old take up Interculture with hoe	farm ponds and micro irrigation system through RKVY
		Soybean	Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population or if the plant population is less than 50% re sow the crop	Avoid applying fertilizers till sufficient soil. moisture is available	
		Black gram	If the plant population is less than 75% of optimum, go for re sowing of the alternate crops like sunflower / pigeonpea . If possible give protective irrigation with sprinkler.	--do--	
		Pigeon pea	Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population	When the crop is 2 weeks old take up Interculture with hoe	
		Green gram	If the plant population is less than 75% of optimum, go for resowing of the alternate crops like sunflower / pigeonpea . If possible give protective irrigation with sprinkler.	When the crop is 2 weeks old take up Interculture with hoe	
		Cotton	Gap filling within the rows with same cultivar or pigeonpea to maintain at least 75% plant population. Raise cotton seedlings in polythene bags and transplant when sufficient soil moisture is available. Give protective irrigation wherever possible	Avoid applying fertilizers till sufficient soil. moisture is available Making of conservation furrows for moisture conservation Interculture with harrows	
	Shallow black soils with assured and high rainfall	Sorghum	Gap filling with pigeonpea	Interculture with hoe	
		Soybean	Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population	Interculture with hoe	
		Black gram	If the plant population is less than 75% of optimum, go for resowing of the alternate crops like sunflower / pigeonpea .	--do--	

			If possible give protective irrigation with sprinkler.		
		Pigeon pea	Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population	When the crop is 2 weeks old take up Interculture with hoe	
		Green gram	If the plant population is less than 75% of optimum, go for resowing of the alternate crops like sunflower / pigeonpea . If possible give protective irrigation with sprinkler.	When the crop is 2 weeks old take up Interculture with hoe	

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient and moisture conservation practices	Remarks on Implementation
Early season drought (Normal onset)					
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period) At vegetative stage	Medium deep to deep black soils with assured and high rainfall	Cotton	Give protective irrigation wherever possible Maintain weed free conditions	Avoid applying fertilizers till sufficient soil moisture is available Making of conservation furrows for moisture conservation Interculture with harrows Two sprays of 2% MgSO ₄ , Zn, Boron at weekly interval when the crop is encountered reddening symptoms Spray 2 % urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition.	Linkage with MAU, MSSC and NSC for seed. Linkage with MAIDC for implements. Linkage with MAU, KVK for agro techniques Linkage with DSAO for farm ponds and micro irrigation system through RKVY
		Sorghum	Avoid top dressing of fertilizers till sufficient soil moisture is available. Intra row thinning	Opening of alternate furrows with Balaram plough. Interculture with harrows for weeding	

			Protective irrigation if possible	
		Soybean	Interculture for weeding and to create soil mulch. Give protective irrigation wherever possible	Opening of alternate furrows with Balaram plough. Spraying of 2% urea and DAP
		Black gram	Inter culture for weeding Protective irrigation if possible	Spraying of 2% urea and DAP
		Pigeon pea	Inter culture for weeding Protective irrigation if possible	-----do-----
		Green gram	Inter culture for weeding Protective irrigation if possible	-----do-----
	Shallow black soils with assured and high rainfall	Cotton	Give protective irrigation wherever possible Maintain weed free conditions	Avoid applying fertilizers till sufficient soil moisture is available Making of conservation furrows for moisture conservation Interculture with harrows Two sprays of 2% MgSO ₄ , Zn, Boron at weekly interval when the crop is encountered reddening symptoms Spray 2 % urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition.
		Sorghum	Avoid top dressing of fertilizers till sufficient soil moisture is available. Protective irrigation if possible Intra row thinning	Interculture for weeding and to create soil mulch to conserve moisture.
		Soybean	Give protective irrigation wherever possible	Spraying of 2% urea and DAP
		Black gram	Inter culture for weeding Protective irrigation if possible	-----do-----
		Pigeon pea	Inter culture for weeding	-----do-----

			Protective irrigation if possible	
		Green gram	Inter culture for weeding Protective irrigation if possible	-----do-----

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	Major Farming situation	Normal Crop/Cropping system	Crop management	Soil nutrient and moisture conservation practices	Remarks on Implementation
At flowering / fruiting stage or At reproductive stage	Medium deep to deep black soils with assured and high rainfall	Cotton	Give protective irrigation wherever possible	Avoid applying fertilizers till sufficient soil moisture is available. Making of conservation furrows for moisture conservation Interculture with harrows Two sprays of 2% MgSO ₄ , Zn, Boron at weekly interval when the crop is encountered reddening symptoms Spray 2 % urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition.	Linkage with ongoing govt. scheme to encourage adoption of micro irrigation for better water use efficiency (WUE) Linkage with MAU and KVK for agro techniques Linkage with DSAO for farm ponds and micro irrigation system through RKVY
		Sorghum	Protective irrigation if possible	--	
		Soybean	Give protective irrigation wherever possible	Opening of alternate furrows with Balaram plough. Spraying of 2% urea and DAP	
		Black gram	Protective irrigation if possible	--	
		Pigeon pea	Protective irrigation if possible	Opening of furrows with Balaram plough. Spraying of 2% urea and DAP	
		Green gram	Protective irrigation if possible	--	
	Shallow black soils with assured and high rainfall	Cotton	Give protective irrigation wherever possible	Avoid applying fertilizers till sufficient soil moisture is available Making of conservation furrows for moisture conservation	

				Interculture with harrows Two sprays of 2% MgSO ₄ , Zn, Boron at weekly interval when the crop is encountered reddening symptoms Spray 2 % urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition.	
		Sorghum	Protective irrigation if possible	--	
		Soybean	Give protective irrigation wherever possible	Opening of alternate furrows with Balaram plough. Spraying of 2% urea and DAP	
		Black gram	Protective irrigation if possible or in case of sever moisture stress use as fodder / green manuring	--	
		Pigeon pea	Protective irrigation if possible	Opening of furrows with Balaram plough. Spraying of 2% urea and DAP	
		Green gram	Protective irrigation if possible or in case of sever moisture stress use as fodder / green manuring	--	

Condition	Major Farming situation	Normal Crop/Cropping system	Suggested Contingency measures		
			Crop management	Rabi crop planning	Remarks on Implementation
Early season drought (Normal onset)					
Terminal drought	Medium deep to deep black soils with assured and high rainfall	Cotton	Give protective irrigation with drip Picking	If possible, adopt relay cropping of chickpea, safflower, rabi sorghum	Linkage with MAIDC / DSAO for harvesting implements (thresher, harvester).
		Sorghum	Life saving irrigation or harvest at physiological maturity or use as fodder	Plan for rabi crops like chickpea and safflower	
		Soybean	Give life saving irrigation or harvest at physiological maturity	Sowing of rabi crops like sorghum, chickpea, safflower immediately after harvest of soybean with minimum tillage	Linkage with DSAO for farm ponds and micro irrigation

Shallow black soils with assured and high rainfall	Black gram	Harvest at physiological maturity or in case of severe drought use as fodder/ green manuring	Plan for rabi crops chickpea / safflower / rabi sorghum / sunflower	system through RKVY Linkage with MAU, MSSC and NSC for seed. Linkage with MAU, KVK for agro techniques
	Pigeon pea	Life saving irrigation Foliar spray of 2% KNO ₃ , urea and DAP	---	
	Green gram	Harvest at physiological maturity or in case of severe drought use as fodder/ green manuring	Plan for rabi crops chickpea / safflower / rabi sorghum / sunflower	
	Cotton	Give protective irrigation with drip Picking	If possible, adopt relay cropping of chickpea, safflower, rabi sorghum	
	Sorghum	Life saving irrigation or harvest at physiological maturity or if no grain setting use as green fodder.	Plan for rabi crops like chickpea and safflower	
	Soybean	Give life saving irrigation or harvest at physiological maturity	Sowing of rabi crops like sorghum, chickpea, safflower immediately after harvest of soybean with minimum tillage	
	Black gram	Harvest at physiological maturity or in case of severe drought use as fodder/ green manuring	Plan for rabi crops chickpea / safflower / rabi sorghum / sunflower	
	Pigeon pea	Life saving irrigation	Foliar spray of 2% KNO ₃ , urea and DAP	
	Green gram	Harvest at physiological maturity or in case of severe drought use as fodder/ green manuring	Plan for rabi crops chickpea / safflower / rabi sorghum / sunflower	

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

Condition	Suggested contingency measure			
	Vegetative stage	Flowering stage	Crop maturity Stage	Post harvest
Continuous high rainfall in a short span leading to water logging				
Cotton, Sorghum	<ul style="list-style-type: none"> Drain excess water Interculture at optimum soil moisture Apply 25KgN/Ha to cotton 	Drain excess water	Drain out excess water Timely harvest	Protect picked cotton from drenching and soiling Dry wet cotton and market
Soybean, Pigeonpea	Drain out excess water	-do-	-do-	Shift to safer place

and short duration pulses				Dry the produce
Horticulture				
Mango	Opening of field channels to drain out excess water and avoid surface ponding, Interculture at optimum soil moisture	Opening of field channels to drain out excess water and avoid surface ponding, Interculture at optimum soil moisture	Collect fallen fruits, grade and market if feasible	Grading, cleaning and marketing of fruits
Sweet orange	-do-	-do-	-do-	-do-
Banana	-do-	-do-	-do-	-do-
Sapota	-do-	-do-	-do-	-do-
Heavy rainfall with high speed winds in a short span				
Cotton, Sorghum	<ul style="list-style-type: none"> • Drain excess water • Interculture at optimum soil moisture • Apply 25KgN/Ha to cotton 	Drain excess water	Drain out excess water Timely harvest	Protect picked cotton from drenching and soiling Dry wet cotton and marketing
Soybean, Pigeonpea and short duration pulses	Drain out excess water	-do-	-do-	Shift to safer place Dry the produce
Horticulture				
Mango	-	Provide support to prevent lodging and uprooting in young orchards	Apply multinutrient and hormonal spray to promote flowering	Shift produce to safer place
Sweet orange	-do-	-do-	-do-	-do-
Banana	-do-	Provide propping and staking	Propping and staking	-do-
Sapota	-do-	-do-	-do-	-do-
Outbreak of pests and diseases due to unseasonal rains				
Cotton	Apply soil drench of carbendazim 0.1% or COC @ 3g/litre at base of plants to prevent wilt in low lying patches	<p>Apply foliar spray of streptomycin sulphate @ 6g/60 litre + COC @ 25g/10 litre to prevent bacterial leaf blight</p> <p>Apply Sulphur 25g/10 litre (300 mesh) to prevent grey mildew Apply MgSO₄ 25 kg/ha soil application or 1% MgSO₄ foliar spray to prevent leaf reddening</p>	Foliar spray of carbendazim 0.1% or Dithane M45 0.2% to prevent boll rot	-
Sorghum			Apply Dithane M 45 0.2% on	

			ear heads immediately after cessation of rains	
Soybean	Manually remove infested plants or plant parts from below the girdles Protect against semilooper when density reaches >4 larvae per meter row with foliar spray of NSKE 5% or dimethoate 30 EC 1 ml/litre	-		
Horticulture				
Mango	Spray imidacloprid 0.3 ml or dimethoate 1 ml/liter to control hopper Drench the seedlings with COC 0.25% against root rot	Protect against hopper	Spray Dithane M 45 3g/litre or carbendazim 1g/liter against anthracnose Spray sulphur 0.5% to control powdery mildew	Maintain aeration in storage to prevent fungal infection and blackening of fruits
Banana	Soil drenching with COC 3g/litre to avoid rhizome rot	Spray Dithane M 45 3g/liter or propiconazole 1 ml/liter 2-3 times against Cercospora leaf spot		
Sweet orange	Protect against Citrus Psylla with foliar spray of malathion 50 EC 10 ml or quinalphos 25 EC 10 ml or cypermethrin 25EC 4 ml per 10 liters	Protect against Citrus Psylla with foliar spray of malathion 50 EC 10 ml or quinalphos 25 EC 10 ml or cypermethrin 25EC 4 ml per 10 liters	-	-

2.3 Floods

Condition	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging / partial inundation				
Cotton	<ul style="list-style-type: none"> Drain excess water Interculture at optimum soil moisture Apply 25KgN/Ha to cotton after receding of flood waters 	Drain excess water	Drain out excess water	Protect picked cotton from wetting Dry wet cotton and market
Horticulture				
Sweet orange	Re-transplanting	Drainage of stagnated water	Drainage of Stagnated	

			water	
Mango	Transplanting in new areas	Strengthening of field bunds	Strengthening of field bunds	
Banana	Open deep trenches between plant rows to improve drainage	Spray Dithane M 45 3g/liter or propiconazole 1 ml/liter 2-3 times against Cercospora leaf spot	Spray Dithane M 45 3g/liter or propiconazole 1 ml/liter 2-3 times against Cercospora leaf spot	
Continuous submergence for more than 2 days				
Cotton	Drain excess water	Drain out excess water Early rabi crop planning in case of crop failure	Rabi crop planning	
Horticulture				
Sweet orange	-do-	Drain out excess water Making of basin, interculture and fungicide spray to prevent fungal diseases		
Mango	-do-	-do-		
Banana	-do-	-do-		
Sea water inundation	Not applicable			

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

Extreme event type	Suggested contingency measure			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Heat Wave				
Horticulture				
Banana	Frequent irrigation Plant wind break trees	Frequent irrigation	Frequent irrigation	-
Sweet orange	Frequent irrigation Shade temporary shade net Mulching	Irrigation and pruning of affected branches / twigs	Irrigation and pruning of affected branches / twigs Apply 1% Bordeaux paste to cut ends	Immediate harvesting, grading and marketing
Cold wave				
Sweet orange	Protect with polythene sheet	Smoking, frequent and light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizers	Smoking, frequent and light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizers	-

Banana	-do-	-do-	-do-	-
Frost	Not applicable			
Hailstorm	Not applicable			
Cyclone	Not applicable			

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event ^s	During the event	After the event
Drought			
Feed and fodder availability	<p>Sowing of cereals (Sorghum/Bajra) and leguminous crops (Lucerne, Berseem, Horse gram, Cowpea) during North-East monsoon under dry land system for fodder production</p> <p>Collection of soya meal waste and sunflower/safflower/ groundnut seed cake for use as feed supplement during drought</p> <p>Motivating the sugarcane farmers to convert green sugarcane tops in to silage by the end of February</p> <p>Preserving the green maize fodder as silage</p> <p>Development of hortipastoral systems in existing orchards</p> <p>Establishment of fodder bank at village level with available dry fodder (wheat straw, Sorghum/ Bajra stover, groundnut haulms, sugarcane tops)</p> <p>Development of silvopastoral models with Leucaena, Glyricidia, Prosopis as fodder trees and Marvel, Madras Anjan, Stylo, Desmanthus, etc., as under storey grass</p> <p>Encourage fodder production with Sorghum – stylo- Sorghum on rotation basis and also to cultivate short-term fodder crops like sunhemp</p> <p>Promote Azola cultivation at backyard</p> <p>Formation of village Disaster Management Committee</p> <p>Capacity building and preparedness of the stakeholders and official staff for the drought/floods/cyclones</p>	<p>Harvest and use biomass of dried up crops (Pearlmillet, Pigeon pea, Sorghum, maize, Wheat, Green gram, Black gram, Soybean, cluster bean) material as fodder</p> <p>Use of unconventional and locally available cheap feed ingredients especially soya meal waste and sunflower/safflower/ groundnut seed cake for feeding of livestock during drought</p> <p>Harvest all the top fodder available (Subabul, Glyricidia, Pipol, Prosopis etc) and feed the LS during drought</p> <p>Concentrate ingredients such as Grains, brans, chunnies & oilseed cakes, low grade grains etc. unfit for human consumption should be procured from Govt. Godowns for feeding high productive animals during drought</p> <p>Promotion of Horse gram as contingent crop and harvesting it at vegetative stage as fodder</p> <p>All the hay should be enriched with 2% Urea molasses solution or 1% common salt solution and fed to LS.</p> <p>Continuous supplementation of minerals to prevent infertility.</p> <p>Encourage mixing available kitchen waste with dry fodder while feeding to the milch animals</p>	<p>Encourage progressive farmers to grow multi cut fodder crops of sorghum/bajra/maize(UP chari, MP chari, HC-136, HD-2, GAIN BAJRA, L-74, K-677, Ananad/African Tall, Kisan composite, Moti, Manjari, B1-7 on their own lands with input subsidy</p> <p>Supply of quality seeds of COFS 29, Stylo and fodder slips of Marvel, Yaswant, Jaywant, Napier, guinea grass well before monsoon</p> <p>Flushing the stock to recoup</p> <p>Replenish the feed and fodder banks</p>

		<p>Arrangements should be made for mobilization of small ruminants across the districts where no drought exits</p> <p>Unproductive livestock should be culled during severe drought</p> <p>Create transportation and marketing facilities for the culled and unproductive animals (10000-20000 animals)</p> <p>Subsidized loans (5-10 crores) should be provided to the livestock keepers</p>	
Drinking water	<p>Make available wholesome clean drinking water throughout the year for livestock</p> <p>Adopt various water conservation methods at village level to improve the ground water level for adequate water supply.</p> <p>Identification of water resources</p> <p>Rain water harvesting and create water bodies/watering points (when water is scarce use only as drinking water for animals)</p> <p>Construction of drinking water tanks in herding places/village junctions/relief camp locations</p> <p><u>Drinking</u> water troughs should be provided in shandies /community grazing areas</p>	<p>Provide wholesome clean drinking water throughout the day</p> <p>Restrict wallowing of animals in water bodies/resources</p> <p>Add alum in stagnated water bodies</p>	<p>Watershed management practices should be promoted to conserve the rainwater.</p> <p>Bleach (0.1%) drinking water / water sources</p> <p>Desilting of ponds</p> <p>Sensitize the farming community about importance of clean drinking water for livestock</p>
Health and disease management	<p>Procure and stock emergency medicines and vaccines for important endemic diseases of the area</p> <p>All the stock must be immunized for endemic diseases of the area before the onset of monsoon</p> <p>Surveillance and disease monitoring network to be established at Joint Director (Animal Husbandry) office in the district</p> <p>Adequate refreshment training on disaster management to be given to animal husbandry department staff</p> <p>Procure and stock multivitamins & area specific mineral mixture</p>	<p>Conduct mass animal health camps in every village</p> <p>Keep close watch on health of different livestock species</p> <p>Identification and quarantine of sick animals</p> <p>Performing ring vaccination (8 km radius) in case of any outbreak</p> <p>Tick control measures should be implemented to prevent tick borne diseases in productive animals</p> <p>Keep the animal houses clean and spray disinfectants</p> <p>Safe and hygienic disposal of dead animal carcasses</p>	<p>Keep close surveillance on disease outbreak.</p> <p>Undertake the vaccination depending on need</p> <p>Restricting movement of livestock in case of any epidemic</p> <p>Farmers should be advised to breed their milch animals during July-September so that the peak milk production does not coincide with mid summer</p>

<p>Cyclone/ Floods</p>	<p>Harvest all the possible immature and or wetted grain (Pearl millet, Pigeon pea, Sorghum, Wheat, Green gram, Black gram, maize, Soybean, cluster bean etc) and store properly for use as animal feed. Protect the stored dry roughage feed (wheat straw/sorghum stover etc.,) from wetting and inundation of stagnated water Procure and stock vaccines for important endemic diseases Make available emergency medicines, anti-diarrheal drugs and electrolytes for transport to the needy areas Keep stock of bleaching powder and lime</p> <p>Don't allow the animals for grazing in case of early forewarning (EFW) In case of EFW of severe cyclone/floods, shift the animals to safer places Surveillance and disease monitoring network to be established at Animal Husbandry Department in each district Arrange transportation facilities for animals to shift from low lying areas to safer places and also for animal health workers for rescue operations</p>	<p>Arrange relief camps to save productive and high valued animals Shift productive and high valued animals from affected areas to relief camps Carryout deworming to all the animals entering into relief camps Proper hygiene and sanitation of the relief camps, animal sheds and surroundings Avoid feeding soaked and mould infected feeds / fodders to livestock Treatment of the sick, injured and affected animals through arrangement of mobile emergency veterinary hospitals / rescue animal health workers.</p> <p>Spray fly repellants like neem oil, Butax etc., in animal sheds and relief camps Identification and quarantine of sick animals Perform ring vaccination (8 km radius) in case of any disease outbreak Sprinkle lime in relief camps and animal sheds Proper disposal of dung from relief camps and animal sheds</p>	<p>Restrict movement of animals in case of epidemic Repair of animal shed Cleaning and disinfection of the shed Bleach (0.1%) drinking water / water sources Deworm all the animals through mass camps Vaccinate against possible disease outbreaks like HS, BQ, FMD and PPR Proper dispose 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 Bleach / chlorinate (0.1%) drinking water or water resources Collect drowned crop material, dry it and store for future use Sowing of short duration fodder crops in unsown and water logged areas when crops are damaged and no chance to replant Application of urea (20-25kg/ha) in the inundated areas and CPR's to enhance the bio mass production.</p>
<p>Heat & Cold wave</p>	<p>Arrangement for protection from heat wave</p> <ol style="list-style-type: none"> i) Plantation around the shed ii) Arrangement of H₂O sprinklers / foggers in the shed iii) Application of white reflector paint on the roof iv) Thatched sheds should be provided as a shelter to minimize heat stress <p>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>	<p>Heat wave: Allow the animals early in the morning or late in the evening for grazing Feed green fodder/silage / concentrates during day time and roughages / hay during night time Put on the foggers / sprinklers during day time In severe cases, vitamin 'C' and electrolytes should be added in H₂O during day time</p> <p>Cold wave : Allow for grazing between 10AM to 3PM Add 25-50 ml of edible oil in concentrates and fed to the animals Put on the heaters during night time Apply / sprinkle lime powder in the animal</p>	<p>Feed the animals as per routine schedule Allow the animals for grazing (normal timings)</p>

		shed to neutralize ammonia accumulation	
Insurance	Encouraging insurance of livestock	Listing out the details of the dead animals	Submission for insurance claim and availing insurance benefit Purchase of new productive animals

2.5.2 Poultry

	Suggested contingency measures		
	Before the event^a	During the event	After the event
Drought			
Shortage of feed ingredients	Storing of grain like maize, bajra, jowar, broken wheat/ rice etc, to use as supplemental feed during drought	Feed with house hold grain to all the birds in the noon i.e., after morning scavenging Supplementation of shell grit (calcium) for laying birds Culling of weak birds	Feed supplementation to all the survival birds
Drinking water	Store adequate good quality water	Use water sanitizers and offer cool hygienic drinking water	Provide clean and hygienic drinking water
Health and disease management	Culling of sick birds. Deworming and vaccination against RD and IBD	Supplementation of Vit. A,D,E, K and B-complex including vit C in drinking water (5ml in one litre water)	Hygienic and sanitation of poultry house Disposal of dead birds by burning / burying with lime powder in pit
Floods			
Shortage of feed ingredients	In case of early forewarning of floods, shift the birds to safer place Storing of grain like maize, bajra, jowar, broken wheat/ rice etc	Use stored feed as supplement Don't allow for scavenging Culling of weak birds	Routine practices are followed Deworming and vaccination against RD
Drinking water	Protect the stored water from contamination	Use water sanitizers Offer hygienic drinking water	Provide clean and hygienic drinking water
Health and disease management	In case of EFW, add antibiotic powder (Terramycin/Ampicilline/ Ampiclox etc., 10g in one litre) in drinking water to prevent any disease outbreak	Prevent water logging around the sheds Provide proper drainage facility to clear stagnated water Assure supply of electricity by generator or solar energy or biogas Sprinkle lime powder to prevent ammonia accumulation due to dampness Sanitation of poultry house	Sanitation of poultry house Treatment of affected birds 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

Cyclone			
Shortage of feed ingredients	In case of EFW, shift the birds to safer place Storing of grain like maize, bajra, jowar, broken wheat/ rice etc Culling of weak birds	Use stored feed as supplement Don't allow for scavenging Protect from thunder storms	Routine practices are followed
Drinking water	Protect the stored water from contamination	Use water sanitizers Offer hygienic drinking water	Provide clean and hygienic 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 around the sheds Assure supply of electricity Sprinkle lime powder (5-10g per square feet) to prevent ammonia accumulation due to dampness	Disposal of dead birds by burning / deep burying with lime powder in pit Disposal of poultry manure to prevent protozoal problem Supplementation of coccidiostats in feed Vaccination against Ranikhet Disease
Heat wave			
Shelter/environment management	Provision of proper shelter with good ventilation	In severe cases, foggers/water sprinklers/wetting of hanged gunny bags should be arranged in the shed Don't allow for scavenging during mid day	Routine practices are followed
Health and disease management	Deworming and vaccination against RD and fowl pox	Supplementation with 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
Cold wave			
Shelter/environment management	Provision of proper shelter Arrangement for brooding Assure supply of continuous electricity	Close all openings with polythene sheets In severe cases, arrange heaters in the shed Don't allow for scavenging during early morning and late evening	Routine practices are followed
Health and disease management	Deworming and vaccination against IBD	Supplementation with house hold grain Sanitation of poultry house Sprinkle lime powder (5-10g per square feet) to prevent ammonia accumulation due to dampness	Routine practices are followed

^a based on forewarning wherever available

2.5.3 Fisheries: Not applicable

