CONTINGENCY PLANS FOR RABI AND SUMMER CROPS

District: Jamnagar Gujarat State

1. Rainfall Information(Average of 10 year-2004-05 to 2014-15)

No.	Particulars		Oct – Dec	Jan – Mar
(a)	Normal rainfall during *Rabi*Season	:	15.75 mm	0.55 mm
(b)	Number of rainy days	:	0.9	0.00

Source: PMRS,JAU,Jamnagar

2. Rabi crops cultivated

2aArea Production statistics(2010-11 to 2014-15)

Sr. No.	Cropping System	Crop name	Area '000 ha	Production '000 t	Productivity t/ha
1	Groundnut- based cropping system	Wheat	7.979	28.07	3.518
		Chickpea	5.124	6.148	1.199
		Cumin	0.811	0.689	0.850
		Coriander	0.862	1250	1.450
		Onion	0.268	5.467	20.40
		Brinjal	0.595	11.008	18.50
		Tomato	0.832	24.794	29.80
		Okra	1.058	7.618	7.20
2	Groundnut/wheat-based cropping system	Summer Groundnut	4.500	8.361	1.858
		Summer Sesame	2.342	1.166	0.498
		Summer Pearl Millet	1.000	2.359	2.359
		Cluster bean (vege.)	0.560	5.404	9.65
3	Cotton- based cropping system	Cotton	159.6	115.71	0.725
4	Horticulture fruit crops	Mango	0.409	2.495	6.10
		Pomegranate	0.484	4.310	8.90
		Sapota	0.148	1.712	11.57
		Lemon	0.209	1.545	7.41

Source: Reports of Department of Agriculture, Govt. of Gujarat. Horticulture crops, spices and vegetables data are for the year 2015-16.

2b Source wise (Water) cultivated area

Sr. No.	Crop Name	Cultivated area under ('000 ha)			
		Residual moisture condition/rainfed	**Ground water irrigated**	**Tank irrigated/*Check dams/others***	**Canal irrigated**
Field crops					
1	Wheat	-	3.970	0.509	3.500
2	Chickpea	-	3.624	-	1.500
3	Summer Groundnut	-	2.410	1.2	0.890
4	Summer Sesame	-	2.342	-	-
5	Summer Pearl Millet	-	1.000	-	-
Vegetable crops					
6	Brinjal	-	0.595	-	-
7	Tomato	-	0.832	-	-
8	Okra	-	1.058	-	-
9	Cluster bean (Vege.)	-	0.560	-	-
Spices crops					
10	Cumin	-	0.511	0.300	-
11	Coriander	-	0.862	0.300	-
12	Onion	-	0.268	-	-
Fruit crops					
13	Mango	-	0.401	-	-
14	Pomegranate	-	0.484	-	-
15	Sapota	-	0.148	-	-
16	Lemon		0.209	-	-

Source: PMKSY District Irrigation plan (2016-2020), GGRCL, Vadodara Report-2016,Jamnagar, Gujarat

2. Sowing window information

Sr.No.	Soil type	Cropping system	Crop name	Optimum sowing window
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week
			Chickpea	Oct. 2nd week to Nov. 2nd week
			Cumin	Nov.2nd week to Nov.4th week
			Coriander	Nov.2nd week to Nov.4th week
			Onion	Nov. 2nd week to Nov. 4th week
			Brinjal	Aug. 2nd week to Sept. 2nd week
			Tomato	Aug. 2nd week to Sept. 2nd week
			Okra summer	Feb. 2nd week to Feb. 4thweek
		Groundnut/wheat- based cropping system	Summer Groundnut	Feb. 2nd week to Feb. 4thweek
			Summer Sesame	Feb.3rd week to Feb.4th week
			Summer Pearl Millet	Feb 2nd week to March 1st week
			Cluster bean (Vege.)	Jan. 2nd week to Feb. 2nd week
			Okra (Summer)	Feb. 2nd week to Feb. 4thweek
2	Coastal alluvial soils (Jodia, Jamnagar)	Groundnut-based cropping system	Semi-rabi Pearl Millet	Oct.1st week to Oct.2ndweek

4.Contingency Measures Field Crops

4.1 For crops grown with residual moisture i.e., under rainfed condition

(a) Excess residual moisture

Sr. No.	Soil type	Cropping system	Crop name	Sowing Window	Variety	Management practices
1	Medium & shallow black soils (All six talukas)	NA	-	-	-	-
2	Coastal Alluvial soils	NA	-	-	-	-

(b) Less than optimum moisture i.e., 25% less than normal, which can happen due to insufficient rainfall during September/October months. Deficit of 20-40% rainfall

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium & shallow black soils	NA	-	-	-	-
2	Coastal Alluvial soils	NA	-	-	-	-

(c) Severe limitation in moisture. Deficit of rainfall during September/October months by more than 40%.

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium & shallow black soils	NA	-	-	-	-
2	Coastal Alluvial soils	NA	-	-	-	-

4.2 For crops grown with groundwater

(a) Above normal rainfall in *Kharif* coupled with good distribution

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety (Govt. Approved private varieties /hybrids)	Management practices
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week	GW 496, GJW 463, GW 366, Lok 1, GW 451	• Adopt recommended agronomic and irrigation practices. • Immediate after last irrigation spray 2 % urea and mencozeb 75 % WP (27 g/10 litre water) for better quality of grain.
			Chickpea	Oct. 2nd week to Nov. 2nd week	GG 1, GJG 3, GJG 5	• Adopt recommended agronomic practices • Monitor the crop for heliothis and prodenia infestation, if infestation observed above ETL spray spinosad 45 % SC (3 ml/10 lit. water).
			Cumin	Nov.2nd week to Nov.4th week	GC 3, GC 4	• Adopt recommended agronomic and irrigation practices • Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease • After germination make alternative spray of mencozeb 75 % WP (27 g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval. • Under cloudy weather and fog condition make extra spray of mencozeb 75 % WP (27 g/10 litre water) for prevention of blight.

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety (Govt. Approved private varieties /hybrids)	Management practices
			Coriander	Nov.2nd week to Nov.4th week	GC 2,3	• Adopt recommended agronomic and irrigation practices • Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease • After germination make alternative spray of mencozeb 75 % WP (27 g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval.
		Groundnut/wheat based cropping system	Summer Groundnut	Jan. 2nd week to Feb. 2nd week	GG 2,6, TG 37 A, TPG 41, TG-26, GJG 31	• Adopt recommended package of practices.
			Summer Sesame	Feb.3rd week to Feb.4th week	GT 3, GT 5	• Adopt recommended package of practices.
			Summer Pearl Millet	Feb 2nd week to March 1st week	GHB 538 GHB 558	• Adopt recommended package of practices.
2	Coastal alluvial soils(Jodia, Jamnagar)	-	Semi-rabi Pearl Millet	Oct 1st week to Oct. 2nd week	GHB 538	• Adopt recommended package of practices.

Note: Harvesting of excess rainfall water should be carried out during monsoon for rabi season.

(b) Normal rainfall

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety (Govt. Approved private varieties /hybrids)	Management practices
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week	GW 496, GJW 463, GW 366, Lok 1, GW 451	• Adopt recommended agronomic and irrigation practices. • Immediate after last irrigation spray 2 % urea and mencozeb 75 % WP (27 g/10 litre water) for better quality of grain.
			Chickpea	Oct. 2nd week to Nov. 2nd week	GG 1, GJG 3, GJG 5	• Adopt recommended agronomic practices • Monitor the crop for heliothis and prodenia infestation, if infestation observed above ETL spray spinosad 45 % SC (3 ml/10 lit. water).

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety (Govt. Approved private varieties /hybrids)	Management practices
			Cumin	Nov.2nd week to Nov.4th week	GC 3, GC 4	• Adopt recommended agronomic and irrigation practices • Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease • After germination make alternative spray of mencozeb 75 % WP (27 g/10 litre water) and hexa conazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval. • Under cloudy weather and fog condition make extra spray of mencozeb 75 % WP (27 g/10 litre water) for prevention of blight.
			Coriander	Nov.2nd week to Nov.4th week	GC 2,3	• Adopt recommended agronomic and irrigation practices • Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease • After germination make alternative spray of mencozeb 75 % WP (27 g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval.
		Groundnut/wheat based cropping system	Summer Groundnut	Jan. 2nd week to Feb. 2nd week	GG 2, 6, TG 37 A, TPG 41, TG 26, GJG 31	• Adopt recommended package of practices.
			Summer Sesame	Feb.3rd week to Feb.4th week	GT 3, GT4,GT 5	• Adopt recommended package of practices.
			Summer Pearl Millet	Feb 2nd week to March 1st week	GHB 538 GHB 558	• Adopt recommended package of practices.
2	Coastal alluvial soils (Jodia, Jamnagar)	-	Semi-rabi Pearl Millet	Oct 1st week to Oct. 2nd week	GHB 538	• Adopt recommended package of practices.

(c) Deficient rainfall in *Kharif* season (25-50% deficient)

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	**Variety** (Govt. Approved private varieties /hybrids)	Management practices
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.3rd week	GW-451,GJW-463, GW-496, GW-366, Lok-1, KRL-19	• Adopt management practices as given in point 4.4(a) plus following practices. • Use MIS irrigation system • Irrigate during critical stages only. • Give irrigation during night time to reduce transpiration
			Chickpea	Nov.2nd week to Nov.3rd week	GG-1, GJG-3, 5	• Adopt management practices as given in point 4.4(a) plus following practices. • Use MIS irrigation system with organic mulch • Irrigate during critical stages only. • Give irrigation during night time to reduce transpiration
			Cumin	Nov.2nd week to Nov.3rd week	GC-3, GC-4	• Adopt management practices as given in point 4.4(a) plus following practices. • Use MIS irrigation system and irrigate upto flowering stage only. • Give irrigation during night time to reduce transpiration
			Coriander	Nov.2nd week to Nov.3rd week	GC-2, 3	• Adopt management practices as given in point 4.4(a) plus following practices. • Adopt MIS with organic mulching • Irrigate during critical stages only. • Give irrigation during night time to reduce transpiration
		Groundnut/wheat based cropping system	Summer Groundnut	Jan. 2nd week to Feb. 2nd week	GG 2, 6, TG 37 A, TPG 41, TG 26, GJG 31	• Avoid summer crop sowing
			Summer Sesame	Feb.3rd week to Feb.4th week	GT 3, GT 4,GT 5	• Avoid summer crop sowing
			Summer Pearl Millet	Feb 2nd week to March 1st week	GHB 538 GHB 558	• Avoid summer crop sowing

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	**Variety** (Govt. Approved private varieties /hybrids)	Management practices
2	Coastal alluvial soils (Jodia, Jamnagar)	-	Semi-rabi Pearl Millet	Oct 1st week to Oct. 2nd week	GHB 538	• Adopt MIS • Irrigate the crop at critical stage • Use side tillers as fodder purpose

(d) Scanty rainfall in *Kharif* season

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week	-	• Avoid wheat sowing
			Chickpea	Nov.2ndweek to Nov.3rd week	GG-1, GJG-3,5	• Adopt management practices as given in point 4.4(a) plus following practices Irrigate at branching stage. • If two irrigations are possible, irrigate during branching and pod development stages only. • Give irrigation during night time to reduce transpiration
			Cumin	Nov.2ndweek to Nov.3rd week	GC-3, GC-4	• Adopt management practices as given in point 4.4(a) plus following practices Use drip irrigation system and irrigate upto flowering stage only. • Give irrigation during night time to reduce transpiration
			Coriander	Nov.2ndweek to Nov.3rd week	GC-2, 3	• Adopt management practices as given in point 4.4(a) plus following practices Thinning of plants and sell as green coriander • Use of Drip irrigation system • Irrigation during critical stages. • Give irrigation during night time to reduce transpiration

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
		Groundnut/wheat-based cropping system	Summer Sesame	-	-	• Avoid summer crop sowing
			Summer Groundnut	-	-	• Avoid summer crop sowing
2	Coastal alluvial soils (Jodia, Jamnagar)	Groundnut- based cropping system	Semi rabiPearl Millet	Oct 1st week to Oct. 2nd week	GHB 538	• Adoption of MIS • Give irrigation during night time to reduce transpiration • Use side tillers as fodder purpose • Use of mulching

(e) Management practices for unseasonal rains

Condition	Management practices to be adopted			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post-harvest**
Wheat	-	-	• Surface drainage (for management of water logging, lodging crop and black point in grain. spray mancozeb 0.2% (27g/ 10 lit. water)	• Protect product with plastic sheet (100µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage etc., • Preparation for quick drying technique • Separate good and bad lot.
Chickpea	-	-	• Provide drainage, harvest immediately after drying	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage etc., • Preparation for quick drying technique • Separate good and bad lot.
Groundnut (summer)	-	-	• Immediately harvest bunch groundnut. • Quick surface drainage, open channel around field.	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage • Preparation for quick drying technique • Separate good and bad lot.

Condition	Management practices to be adopted			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post-harvest**
Sesame (summer)	-	-	• Quick surface drainage, open channel around field.	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage • Preparation for quick drying technique • Separate good and bad lot.
Perl millet (semi rabi)	-	-	• Immediately harvest the crop Surface drainage (for management of water logging)	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage etc. • Preparation for quick drying technique • Separate good and bad lot.
Cumin	Surface drainage (For management of water logging condition)	Surface drainage for management of water logging	• Surface drainage (for management of water logging crop • To control cumin blight)spray mancozeb 0.2%% (27g/ 10 lit. water) • Spray 0.2% % (30g/ 10 lit. water) wettable sulphur for protection against powdery mildew disease	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage etc., • Preparation for quick drying technique • Separate good and bad lot.
Coriander	Surface drainage (For management of water logging condition)	Surface drainage for management of water logging	• Surface drainage (for management of water logging crop • Spray 0.2%% (30g/ 10 lit. water) wettablesulpher for protection against powdery mildew disease	• Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed • Protection against pest/disease damage in storage etc., • Preparation for quick drying technique • Separate good and bad lot.

4.3 For crops grown with Canal Irrigation: The scenario would be based on the storage available in the reservoirs.

a. Limited release of water

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety (Govt. Approved private varieties /hybrids)	Management practices
1	Medium & shallow black soils (All six talukas)	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week	GW 496, GJW 463, GW 366, Lok 1, GW 451	• Avoid wheat sowing
			Coriander	Nov.2ndweek to Nov.4thweek	GC-2, 3	• Thinning of plants and sell as green coriander • Canal water should be released to irrigate during critical stages only • Conjunctive use of canal and groundwater • Or groundwater should be utilized during later stages.
			Cumin	Nov.2ndweek to Nov.4thweek	GC-3, GC-4	• Canal water should be released to irrigate during critical stages only • Conjunctive use of canal and Groundwater • Or Groundwater should be utilized during later stages
			Chickpea	Oct 2nd week to Nov.1st week	GJG-3	• Irrigate at branching stage. • If two irrigations are possible, irrigate during branching and pod development stages only.
		Groundnut/wheat based cropping system	Summer Groundnut	Jan. 2nd week to Feb. 2nd week	GG 2,6, TG- 37A, TPG 41, TG 26, GJG 31	• Avoid summer crop sowing
			Summer Sesame	Feb.3rd week to Feb.4th week	GT 3, GT 4,GT 5	• Avoid summer crop sowing
			Summer Pearl Millet	Feb 2nd week to March 1st week	GHB 538 GHB 558	• Avoid summer crop sowing
2	Coastal alluvial soils (Jodia, Jamnagar)	-	Semi-rabi Pearl Millet	Oct 1st week to Oct. 2nd week	GHB 538	• Adopt MIS • Irrigate the crop at critical stage • Use side tillers as fodder purpose

b. Delayed release of water

For head reach:

Water Distribution management:

- Repair and maintenance of field channel.
- Cleaning and lining of distributaries and main canal.

Water utilization management:

- Delay sowing upto 4th week of November for prevailing cropping patterns
- There after adopt late sowing varieties like GW173 of wheat.
- Adopt short duration crop varieties.
- Change crop according to time of water availability.
- Conjunctive use of groundwater/harvested water and canal water
- Use MIS on community base according to crops.

For Middle reach:

Water Distribution management:

- Repair and maintenance of field channel.
- Cleaning and lining of distributaries and main canal.

Water utilization management:

- Delay sowing upto 4th week of November for prevailing cropping patterns.
- Use groundwater/ harvested water for sowing and continue using till canal water reaches.
- There after adopt late sowing varieties like GW173 of wheat.
- Adopt short duration crop varieties.
- Change crop according to time of water availability.
- Conjunctive use of groundwater/harvested water and canal water
- Use MIS on community base according to crops.

For tail reach:

Water Distribution management:

- Repair and maintenance of field channel.
- Cleaning and lining of distributaries and main canal.

Water utilization management:

- Delay sowing upto 4th week of November for prevailing cropping patterns.
- Use groundwater/ harvested water for sowing of cropand continue using till canal water released.
- There after adopt late sowing varieties like GW-173 of wheat.

- Adopt short duration crop varieties.
- Change crop according to time of water availability.
- Adopt crops with stress resistant and less water requirement like cumin , semi-rabi pearl millet, fodder sorghum and chickpea
- Irrigate upto flowering stage only or critical stage irrigation approach may be adopted.
- Use alternate furrow irrigation where ever possible.
- Conjunctive use of groundwater/harvested water and canal water
- Use MIS on community base according to crops.

5. Contingency Measures for Horticulture Crops (Existing / New plantations)

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
Existing plantations				
1	Mango	**Excess rainfall**		
		• Provide drainage • Add gypsum @ 1-2 kg/plant	June to September June to September	• Adopt surface drainage in case of excess rainfall.
		• Spray 0.2% (30 g/10 litre water) wettable sulphur or 0.005 % (10 ml/10 litre water) hexaconazole for protection against powdery mildew	December to Jan.	
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching • Soil pulverization around the plant base (Forking) • Use of morum • Use of sub surface drip irrigation, if possible	December to May October to May October to May October to November October to May	-
2	Pomegranate	**Excess rainfall**		
		• Provide drainage • Spray ethereal @ 0.5%(5 ml/10 lit.) to reduce flower setting • Add gypsum @ 1-2 kg/plant	June to September December to Jan. June to September	• Adopt surface drainage in case of excess rainfall.
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching • Soil pulverization around the plant base (Forking) • Use of morum	December to May October to May October to May October to November	-

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
3	Sapota	**Excess rainfall**		
		• Provide drainage • Add gypsum @ 1-2 kg/plant	June to September June to September	• Adopt surface drainage in case of excess rainfall
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching • Soil pulverization around the plant base (Forking) • Use of morum	December to May October to May October to May October to November	-
4	Lemon	**Excess rainfall**		
		• Provide drainage • Add gypsum @ 1-2 kg/plant	June to September June to September	• Adopt surface drainage in case of excess rainfall.
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching • Soil pulverization around the plant base (Forking) • Use of morum	December to May October to May October to May October to November	-
New plantations				
1	Mango	**Excess rainfall**		
		• Provide proper drainage, • Provide staking • Earthing up near stem • Add gypsum @ 1-2 kg/plant • Drenching of carbendazim @ 10 g/10 lit.water • Forking the soil	June to September	• Adopt surface drainage in case of excess rainfall.
		Deficient/scanty rainfall		
		• Adopt drip irrigation system for planting, mulching	-	Apply irrigation through drip with mulch or subsurface drip irrigation in case of last monsoon below normal

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
2	Sapota	**Excess rainfall**		
		• Provide drainage	June to September	• Adopt surface drainage in case of excess rainfall.
		Deficient/scanty rainfall		
		• Use of drip irrigation system • Use of mulching • Soil pulverization around the plant base (Forking) • Use of morum	December to May October to May October to May October to November	• Apply irrigation through drip with mulch or subsurface drip irrigation in case of last monsoon below normal

6.Contingency Measures for Horticulture Crops(vegetables)

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
1	Onion Nasik red, Pili Patti, Talaja Red, GSO 1, N 2-4-1, Pusa red	**Excess rainfall**		
		• Provide drainage for nursery • Delay in sowing	June to September	• Raise nursery on raised bed or broad bed and furrow • Manage soil for good drainage
		Deficient/scanty rainfall		
		• Use MIS with plastic mulch	November to February	• Apply irrigation through MIS • Use plastic mulch • Give irrigation during night time to reduce transpiration • Soil amendments, and/or reduced tillage.
2	Brinjal GBH 1,2, Junagadh oblong brinjal-1,Pusa Hyb 5,6 , PLR-1	**Excess rainfall**		
		• Provide drainage for nursery	July to August	• Use surface drainage system
		Deficient/scanty rainfall		
		• Use MIS with plastic mulch	September to March	• Apply irrigation through drip with mulch in case of last monsoon below normal

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
3	Tomato Junagadh rubi, Tomato 1,2, Pusahyb 2,4	**Excess rainfall**		
		• Provide drainage for nursery	June to September	• Use surface drainage system
		Deficient/scanty rainfall		
		• Use MIS with plastic mulch	November 15 to February 15	• Apply irrigation through drip with mulch in case of last monsoon below normal
4	Okra summer Guj Okra-2 GujkHy Okra 1, Parbhanikranti	**Excess rainfall**		
		• Provide drainage • Delay in sowing	June to September	• Use surface drainage system
		• **Deficient/scanty rainfall**		
		• Use MIS with plastic mulch • Use bio-fertilizer instead of chemical fertilizer • Periodic inter culturing		• Apply irrigation through drip with mulch in case of last monsoon below normal
5	Cluster bean PusaNavbahar, PusaSadabahar, PusaSharadbahar	**Excess rainfall**		
		• Provide drainage • Delay in sowing		• Use surface drainage system
		Deficient/scanty rainfall		
		• Use MIS with plastic mulch • Use bio-fertilizer instead of chemical fertilizer • Periodic inter culturing		• Apply irrigation through drip with mulch in case of last monsoon below normal

7. Temperature related stresses for field and horticulture crops : Excess temperatures/ Less than normal temperatures

Sr.No.	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
1	Wheat	Germination	>25 ^{0}C	• Delay sowing up to optimum temp (20-25^{0}C)
		Anthesis	>22 ^{0}C	• Light and frequent irrigation
		Milking stage	>26 ^{0}C	• Light and frequent irrigation
		Dough stage	7-18 ^{0}C suitable 5 to 15 days	• Light and frequent irrigation if temperature is greater than 18 ^{0}C
		Grain filling	>30 ^{0}C not suitable	• Light and frequent irrigation • Use early sowing variety Lok-1 and prefer early maturing variety GW173 and GW 11 in late sowing to avoid of high temp.
		Tillering	< 20 ^{0}C not suitable	• Light and frequent irrigation
2	Chickpea	Germination	>24^{0}C	• Delay sowing to get optimum temp(15-20 ^{0}C)
		Flowering	>30^{0}C	• Give irrigation • External application of ABA* can protect plant against heat stress
		Pod development	>30^{0}C	• Give irrigation • External application of ABA* can protect plant against heat stress
		Seed development	>30^{0}C	• Give irrigation • External application of ABA* can protect plant against heat stress
3	Summer Groundnut	Germination	< 17^{0}C	If temperature is below 17^{0}C • Delay sowing. • Use organic mulch. • Delay second irrigation after sowing. • In case of line sowing harrowing to be followed to loose the soil surface.
		Vegetative	>35^{0}C	• Sprinkler and drip irrigation
		Pegging	>30 ^{0}C	• Sprinkler and drip irrigation
		Pod development	>34 ^{0}C	• Sprinkler and drip irrigation
4	Summer Sesame	Germination	< 15 ^{0}C not suitable for germination	• Delay sowing.
		Growth & develop	>30 ^{0}C	• Light and frequent irrigation.
		Flower dropping and pollination	>35^{0}C	• Light and frequent irrigation

Sr.No.	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
5	Summer Pearl Millet	Germination	<18^{0}C	• Delay sowing (Second/third week of Feb.)
		Crop growth	>33 ^{0}C	• Light and frequent irrigation
6	Semi-rabi Pearl Millet	Crop growth	>33 ^{0}C	• Light and frequent irrigation
7	Cumin	Germination	>33 ^{0}C	• Light and frequent irrigation • Delay sowing
8	Coriander	Germination	>25^{0}C	• Light and frequent Irrigation • Delay sowing.
9	Onion	Bulb development	>25 ^{0}C	• Drip irrigation • Frequent light irrigation
10	Brinjal	Whole crop period	>35^{0}C	• Drip irrigation • Use of straw/ silver plastic mulch
11	Tomato	Flowering	>32 ^{0}C	• Use of mulch and irrigate the crop with sprinkler
		Fruit set	**>**35 °C	• Use of mulch and irrigate the crop with sprinkler
12	Cotton	Flowering and boll formation	>32 ^{0}C	• Drip irrigation • Straw mulching • Give frequent irrigation.
		Boll maturity	>38 ^{0}C	• Drip irrigation • Straw mulching • Give frequent irrigation.
13	Mango	Flowering & fruit setting	< 15 ^{0}C Night & > 25 ^{0}C Day during 5 days	• Smudging technique during low temperature at early morning. • Irrigation during low or high temperature. • Mulching during low or high temperature. • Shelter belts/Wind breaks
		Initial fruit development	> 35 ^{0}C with higher day-night fluctuation during week or more.	• Nutrients & Irrigation. • Spray NAA20 ppm + 2% urea • Mulching • Shelter belts/Wind breaks

Sr.No.	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
14	Pomegranate	Pl. growth	< 18 ^{0}C low & > 35 ^{0}C high	• Smudging technique during low temperature at early morning. • Irrigation during low or high temperature. • Mulching during low or high temperature. • Shelter belts/wind breaks
		Flowering & fruit setting	< 20 ^{0}C low & > 35 ^{0}C high	• Smudging technique during low temperature at early morning. • Irrigation during low or high temperature. • Mulching during low or high temperature. • Shelter belts/wind breaks
		Fruit maturity	> 40 ^{0}C high for one week or more.	• Wrapping of individual fruits • Frequent and light irrigation • Mulching or sod culture • Shelter belts/wind breaks

* Temperature increase or decrease over normal and for number of days. For example, increase of 3 degrees over normal for a period of 5 days.

8. Management practices for livestock (to cover shelter management during cold or heat waves, production/regulation of fodder in rabi season in deficient monsoon years/ excess monsoon rainfall years etc),

For Fodder crops grown with residual moisture i.e., under rainfed condition

(a) Excess (rainfall during September/October months) residual moisture

Sr.No.	Soil type	Cropping system	Fodder name	Variety	Management Practices
1	NA	Groundnut based cropping system	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	• Surface drainage (to control water logging condition)

(b) Normal rainfall (rainfall during September/October months) residual moisture

Sr.No.	Soil type	Cropping system	Crop name	Variety	Management Practices
1		Groundnut based cropping system	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	• Adopt recommended package of agronomic practices

(c)Less than optimum moisture i.e., 25% less than normal, which can happen due to insufficient rainfall during September/October months. Deficit of 20-40% rainfall

Sr.No.	Soil type	Cropping system	Fodder name	Variety	Management Practices
1	NA	Groundnut based cropping system	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	• Thinning and maintain the plant stand • Don't feed as green fodder.

(d) Severe limitation in moisture. Deficit of rainfall during September/October months by more than 40%.

Sr. No.	Soil type	Cropping system	Fodder name	Variety	Management Practices
	NA	-	-	-	-

For fodder crops (mostly perennial fodder varieties as sole fodder crop) grown with groundwater

Sr.No.	Soil type	Fodder name	Variety	• Management practices
1	Medium to shallow black soils	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	• Adopt recommended package of agronomic practices
		Lucerne	Anand-2	• Adopt recommended package of agronomic practices
		Grass	Hybrid Napier- CO-3, Jinjvo	• Adopt recommended package of agronomic practices
2	Coastal alluvial soil	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	• Adopt recommended package of agronomic practices
		Lucerne	Anand-2	• Adopt recommended package of agronomic practices
		Grass	Hybrid Napier- CO-3 Jinjvo	• Adopt recommended package of agronomic practices

Livestock Management during severe cold waves/heat waves

Nutritional Management	Shelter management	Health management	Miscellaneous, if any
Heat wave			
• Feed 25 kg green fodder along with unconventional feed per animal. • Give jiggery water with fenugreek powder. • High energy density and low protein diet are beneficial. • Increasing the grain/ forage ratio.	• Covered the shelter roof with dry grasses. • Provide Fans & sufficient ventilation. • Use fogger/ sprinklers system • Forestry blocks can provide temporary shelter from extreme heat. • Providing good-quality drinking water and shade (natural or artificial).	• Spray them with cool water, especially on the legs and feet, or stand them in water • Lay wet towels over them. • Provide Vitamin C through Syrup for heat stress management. • Vaccinate the animals against infectious diseases.	• Cattle that are heat stressed will show increased respiration rates as they try to cool themselves down. • Don't allowed cattle to walk in extreme heat. • Use sprinklers and shade in holding yards. • Air flow is also important. • Sprinklers have been found to improve milk production, reduce fly irritation and make for more contented cows in the shed with better milk let down. • Cover animal under insurance.

Nutritional Management	Shelter management	Health management	Miscellaneous, if any
Cold wave			
• Feed silage & Hay (Wheat strawtreated withurea) along with concentrate feed. • An increased energy requirement for maintenance as a result of increased resting metabolic rate.	• Operate heaters protect shed by tying gunny bags around shed.	• Add antibiotics in drinking water to protect young calves from Pneumonia. • Cold environment increases the whole body glucose turnover and glucose oxidation thus resulting in less production of ketones.	• Operate heaters, protect shed by tying gunny bags around shed. • Protect animals from direct cold waves. • Cover animal under insurance.