

CONTINGENCY PLANS FOR RABI AND SUMMER CROPS

District: Amreli Gujarat State

1. Rainfall Information(Average of 10 year-2006-07 to 2015-16)

		Oct – Dec	Jan – Mar
(a)	Normal rainfall during <i>Rabi</i> season:(mm)	34.68	1.80
(b)	Number of rainy days :Nos.	2.00	0.40

Source: ARS, JAU,Amreli

2. Rabi and summer crops cultivated

2a Area Production statistics (2010-11 to 2012-13)

Sr. No	Cropping System	Crop name	Area '000 ha	Production '000 t	Productivity Kg/ha
1	Groundnut based cropping system	Wheat	27.88	105.19	3694
		Chickpea	2.68	3.49	1302
		Cumin	1.20	1.56	598
		Onion	4.20	94.56	27312
		Garlic	1.40	13.15	5302
		Cucurbits	1.10	8.51	8303
		Tomato	1.01	24.10	18468
		Groundnut (Summer)	4.00	7.90	2021
		Sesame(Summer)	3.20	3.08	964
2	Cotton based cropping system	Green gram (summer)	1.37	0.91	676
		Pearlmillet (Summer)	1.24	2.91	2388
3	Horticulture fruit crop	Mango	6.89	45.35	6750

(Source: Reports District Panchayat, Director of Agriculture (2010-11 to 2014-15) and Director of Horticulture Department, (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	Canal irrigated
Field crops					
1	Wheat	-	21.25	-	6.63
2	Chickpea	-	2.04	-	0.64
3	Sesame(Summer)	-	3.20	-	-
4	Pearlmillet (Summer)	-	1.24	-	-
5	Green gram (summer)	-	1.37	-	-
6	Groundnut(Summer)	-	4.00	-	-
Vegetables					
1	Onion	-	3.20	-	1.00
2	Garlic	-	1.07	-	0.33
3	Tomato	-	0.77	-	0.24
5	Cucurbits	-	1.10	-	-
Spices					
1	Cumin	-	0.91	-	0.29
Fruit crops					
1	Mango	-	6.89	-	-

(Source: Reports of District Irrigation Plan (PMKSY, 2016) Amreli, Gujarat)

3. Sowing window information

Sr. No.	Soil type	Cropping system	Crop name	Optimum sowing window (Please mention along with week i.e., 2 nd week of Oct-4 th week of Nov/etc.)
1	Medium to shallow black soil	Groundnut based cropping system	Wheat	Nov.2 nd week to Nov.4 th week
			Chickpea	Nov.2 nd week to Nov.4 th week
			Cumin	Nov.2 nd week to Nov.4 th week
			Onion	Nov.2 nd week to Nov.4 th week
			Garlic	Nov.2 nd week to Nov.4 th week
			Tomato	Sept.2 nd week to Oct. 2 th week
			Groundnut(Summer)	Jan. 2 nd week to Feb. 2 nd week
			Sesame (Summer)	Feb.3 rd week to Feb 4 th week

		Cotton based cropping system	Green gram (summer)	Feb. 2 nd week to Feb. 3 rd week
			Pearlmillet (Summer)	Feb.1 st week to Feb 3 rd week
2	Coastal alluvial and saline soil	Groundnut based cropping system	Wheat	Nov.2 nd week to Nov.4 th week
		Cotton based cropping system	Pearlmillet (Summer)	Feb.1 st week to Feb 3 rd week

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 to shallow black soils	NA	NA	NA	NA	NA
2	Coastal alluvial and saline soil	NA	NA	NA	NA	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 to shallow black soils	NA	NA	NA	NA	NA
2	Coastal alluvial and saline soil	NA	NA	NA	NA	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 to shallow black soils	NA	NA	NA	NA	NA
2	Coastal alluvial and saline soil	NA	NA	NA	NA	NA

4.2 For crops grown with groundwater

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

Note: Harvesting of excess rainfall water to be carried out during monsoon for *rabi* season

Sr.No	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium to shallow black soils	Groundnut based cropping system	Wheat	Nov.2 nd week to Nov.4 th week	GW-451, GJW-463, GW-496, GW-366, Lok-1	<ul style="list-style-type: none"> 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.
			Chick pea	Nov.2 nd week to Nov.4 th week	GG-1, GJG-3, 5	<ul style="list-style-type: none"> 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.2 nd week to Nov.4 th week	GC-3, GC-4	<ul style="list-style-type: none"> • Adopt recommended agronomic and irrigation practices • Seed treatment with thirum @ 2-3 gm/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.
			Groundnut (Summer)	Jan. 2 nd week to Feb. 2 nd week	GG 2,6, TG- 37-A, TPG 41	<ul style="list-style-type: none"> • Adopt recommended package of practices.
			Sesame (Summer)	Feb.3 rd week to Feb.4 th week	GT-2, 3, 5	<ul style="list-style-type: none"> • Adopt recommended package of practices.
		Cotton based cropping system	Green gram (summer)	Feb.2 nd week to Feb 3 rd week	Moong- GM 4	<ul style="list-style-type: none"> • Adopt recommended package of practices.
			Pearlmillet (Summer)	Feb.1 st week to Feb.3 rd week	GHB-538 and Govt. approved hybrids	<ul style="list-style-type: none"> • Adopt recommended package of practices.
		2	Coastal alluvial and saline soil	Groundnut based cropping system	Onion	Nov.2 nd week to Nov.4 th week
Wheat	Nov.2 nd week to Nov.4 th week				GW-451, GJW-463, GW-496, GW-366, Lok-1	<ul style="list-style-type: none"> • 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.
Cotton based cropping system	Pearlmillet (Summer)			Feb.1 st week to Feb.3 rd week	GHB-538 and Govt. approved hybrids	<ul style="list-style-type: none"> • Adopt recommended package of practices.

(b) Normal rainfall

Sr. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
1	Medium shallow to black soils	Groundnut & cotton based cropping system	Wheat	Nov.2 nd week to Nov.4 th week	GW-451, GJW-463, GW-496, GW-366,Lok-1	<ul style="list-style-type: none"> 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.
			Chick pea	Nov.2 nd week to Nov.4 th week	GG-1, GJG-3, 5	<ul style="list-style-type: none"> 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.2 nd week to Nov.4 th week	GC-3, GC-4	<ul style="list-style-type: none"> Adopt recommended agronomic and irrigation practices Seed treatment with thirum @ 2-3 gm/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.
		Groundnut (Summer)	Jan. 2 nd week to Feb. 2 nd week	GG 2,6, TG- 37-A, TPG 41	<ul style="list-style-type: none"> Adopt recommended package of practices. 	
		Sesame (Summer)	Feb.3 rd week to Feb.4 th week	G.Til-2, 3, 5	<ul style="list-style-type: none"> Adopt recommended package of practices. 	
		Cotton based cropping system	Green gram (summer)	Feb.2 nd week to Feb 3 rd week	G.M.-4	<ul style="list-style-type: none"> Adopt recommended package of practices.
			Pearlmillet	Feb.1 st week to	GHB-538 and	<ul style="list-style-type: none"> Adopt recommended package of

Sr. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
			(Summer)	Feb.3 rd week	Govt. approved hybrids	practices.
2	Coastal alluvial and saline soil	Groundnut & cotton based cropping system	Onion	Nov.2 nd week to Nov.4 th week	Talaja Red, GJRO 11, Nasik Red, GJWO 3	<ul style="list-style-type: none"> Adopt recommended package of practices.
			Wheat	Nov.2 nd week to Nov.4 th week	GW-451, GJW-463, GW-496, GW-366, Lok-1	<ul style="list-style-type: none"> 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.
		Cotton based cropping system	Pearlmillet (Summer)	Feb.1 st week to Feb.3 rd week	GHB-538 and Govt. approved hybrids	<ul style="list-style-type: none"> 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	Management practices
1	Medium shallow to black soils	Groundnut based cropping system	Wheat	Nov.2 nd week to Nov.4 th week	Lok-1, GW11	<ul style="list-style-type: none"> Adopt management practices as given in point 4.4(a) plus following practices Use organic manure Use MIS irrigation system and irrigate at critical stages only Give irrigation during night time to reduce transpiration
			Chick pea	Nov.2 nd week to Nov.4 th week	GG-1, GJG-3, 5	<ul style="list-style-type: none"> Adopt management practices as given in point 4.4(a) plus following practices Use organic manure Use MIS irrigation Irrigate at critical stages only. Give irrigation during night time to reduce transpiration

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Cumin	Nov.2 nd week to Nov.4 th week	GC-3, GC-4	<ul style="list-style-type: none"> Adopt management practices as given in point 4.4(a) plus following practices Use organic manure Use MIS irrigation system and irrigate upto flowering stage only Give irrigation during night time to reduce transpiration
			Groundnut (Summer)	-	-	<ul style="list-style-type: none"> Avoid summer crop sowing
			Sesame (Summer)	-	-	<ul style="list-style-type: none"> Avoid summer crop sowing
		Cotton based cropping system	Green gram(summer)	-	-	<ul style="list-style-type: none"> Avoid summer crop sowing
			Pearlmillet (Summer)	-	-	<ul style="list-style-type: none"> Adopt management practices as given in point 4.4(a) plus following practices Use organic manure Use MIS irrigation Irrigate at critical stages only.
2	Coastal alluvial and saline soil	Groundnut based cropping system	Onion	Nov.2 nd week to Nov.4 th week	Talaja Red, Nasik Red	<ul style="list-style-type: none"> Use drip irrigation system Irrigate during critical stages only. Give irrigation during night time to reduce transpiration
		Cotton based cropping system	Pearlmillet (Summer)	-	-	<ul style="list-style-type: none"> Adopt management practices as given in point 4.4(a) plus following practices Use organic manure Use MIS irrigation Irrigate at critical stages only.

(d) Scanty rainfall in *Kharif* season

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium shallow to black soils	Groundnut based cropping system	Chickpea	Nov.2 nd week to Nov.4 th week	GG-1, GJG-3, 5	<ul style="list-style-type: none"> • Adopt management practices as given in point 4.4(a) plus following practices • Use organic manure • Use MIS irrigation • Irrigate at critical stages only. • Remove weeds • Irrigate during night to reduce transpiration
			Cumin	Nov.2 nd week to Nov.4 th week	GC-3, GC-4	<ul style="list-style-type: none"> • Adopt management practices as given in point 4.4(a) plus following practices • Use organic manure • Use MIS irrigation system and irrigate up to flowering stage only • Give irrigation during night time to reduce transpiration • Remove weeds • Seed treatment with thirum @ 2-3 gm/kg seed for prevention of wilt disease
			Groundnut (Summer)	-	-	• Avoid summer crop sowing
		Sesame (Summer)	-	-	• Avoid summer crop sowing	
		Cotton based cropping system	Green gram (summer)	-	-	• Avoid summer crop sowing
			Pearlmillet (Summer)	-	-	• Avoid summer crop sowing
2	Coastal alluvial and saline soil	Groundnut based cropping system	Onion	Nov.2 nd week to Nov.4 th week	Talaja Red, Nasik Red	<ul style="list-style-type: none"> • Use drip irrigation system • Irrigate during critical stages only. • Give irrigation during night time to reduce transpiration
		Cotton based cropping system	Pearlmillet (Summer)	-	-	• Avoid summer crop sowing

(e) Management practices for unseasonal rains

Condition	Management practices to be adopted			
	Vegetative stage	Flowering stage	Crop maturity stage	Post-harvest
Continuous high rainfall in a short span leading to water logging				
Wheat	-	-	<ul style="list-style-type: none"> • Surface drainage (for management of water logging, lodging crop) • To control black point in grain, spray mancozeb 0.2%(27 g/10 litre water). 	<ul style="list-style-type: none"> • 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 condition.	<ul style="list-style-type: none"> • Surface drainage (for management of water logging crop) • To control cumin blight) spray mancozeb 0.2%(27 g/10 litre water) • Spray 0.2% (30 g/10 litre water) wettable sulphur for protection against powdery mildew disease 	<ul style="list-style-type: none"> • 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.
Chickpea	-	-	<ul style="list-style-type: none"> • Provide drainage, • harvest immediately after drying 	<ul style="list-style-type: none"> • 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.

Condition	Management practices to be adopted			
	Vegetative stage	Flowering stage	Crop maturity stage	Post-harvest
Continuous high rainfall in a short span leading to water logging				
Groundnut (summer)	-	-	<ul style="list-style-type: none"> • Immediately harvest bunch groundnut. • Quick surface drainage, open channel around field. 	<ul style="list-style-type: none"> • 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.
Sesame (summer)	-	-	<ul style="list-style-type: none"> • Quick surface drainage, open channel around field. 	<ul style="list-style-type: none"> • 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.
Pearlmillet (summer)	-	-	<ul style="list-style-type: none"> • Provide drainage, harvest immediately after drying 	<ul style="list-style-type: none"> • 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 window	Variety	Management practices
1	Medium to shallow black soils	Groundnut based cropping system	Wheat	Nov.2 nd week to Nov.4 th week	Lok-1, GW 11	<ul style="list-style-type: none"> • Canal water should be released to irrigate during critical stages only • Conjunctive use of canal and groundwater • Groundwater should be utilized during later stages.

			Chickpea	Nov.2 nd week to Nov.4 th week	GJG-3, GG 1	<ul style="list-style-type: none"> Irrigate at branching stage. If two irrigations are possible, irrigate during branching and pod development stages only.
			Cumin	Nov.2 nd week to Nov.4 th week	GC-3, GC-4	<ul style="list-style-type: none"> Canal water should be released to irrigate during critical stages only Conjunctive use of canal and Groundwater. Groundwater should be utilized during later stages
2	Coastal alluvial and saline soil	Groundnut based cropping system	Onion	Nov.2 nd week to Nov.4 th week	Talaja Red, Nasik Red	<ul style="list-style-type: none"> Canal water should be released to irrigate during critical stages only Conjunctive use of canal and Groundwater Groundwater should be utilized during later stages

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 crop and 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		
		<ul style="list-style-type: none"> • Adopt surface drainage in case of excess rainfall. • Add gypsum 1-2 kg per plant 	June to September	
		<ul style="list-style-type: none"> • 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 January	
		Deficient/scanty rainfall		
		<ul style="list-style-type: none"> • Use of MIS • Use mulching • Use subsurface drip irrigation if possible • Apply of <i>Maurram</i> in soil 	December to May Oct. to May December to May May to June	

New plantations				
1	Mango	Excess rainfall		
		<ul style="list-style-type: none"> • Adopt surface drainage in case of excess rainfall. • 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	-
		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

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 (GWO-1, Junagadh local(Pilipati), Talaja Red, Agrifound light red, GJRO-11, GJWO-3)	Excess rainfall		
		<ul style="list-style-type: none"> • Provide drainage • Delay in sowing 	June to September	<ul style="list-style-type: none"> • Raise nursery on raised bed or broad bed and furrow • Manage soil for good drainage
		Deficient/scanty rainfall		
		<ul style="list-style-type: none"> • Use micro irrigation with plastic mulch 	November to February	<ul style="list-style-type: none"> • Apply irrigation through MIS • Use plastic mulch • Give irrigation during night time to reduce transpiration • Soil amendments, and/or reduced tillage.
2	Garlic(GG 2, GG 3 & GG 4)	Excess rainfall		
		<ul style="list-style-type: none"> • Provide drainage • Delay in sowing 	June to September	<ul style="list-style-type: none"> • Manage soil for good drainage,
		Deficient/scanty rainfall		
		<ul style="list-style-type: none"> • Use micro irrigation with plastic mulch • Alternate furrow irrigation 	November to February	<ul style="list-style-type: none"> • Apply irrigation through MIS with mulch • Give irrigation during night time to reduce transpiration • Soil amendments, and/or reduced tillage.

3	Tomato (GT-1, 2, Anand Tomato -3, Junagadh Tomato-3, Pusha Rubi and Govt. approved hybrids)	Excess rainfall		
		<ul style="list-style-type: none"> Provide drainage 	June to September	<ul style="list-style-type: none"> Use raised bed or broad bed and furrow system Manage soil for better drainage
		Deficient/scanty rainfall		
		<ul style="list-style-type: none"> Use micro irrigation with plastic mulch 	November to February	<ul style="list-style-type: none"> Apply irrigation through drip with mulch Give irrigation during night time to reduce transpiration Soil amendments, and/or reduced tillage
S. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
4	Cucurbits Gourd:- (Aanad-1) Cucumber: (Gujarat cucumber-1) Sponge Gourd: GSG-1, GJSG-2 Ridge gourd :(GARG-1)	Excess rainfall		
		<ul style="list-style-type: none"> Provide drainage Avoid planting low areas of the field where water may collect. 	June to September	<ul style="list-style-type: none"> Avoid planting in low land areas of the field where water may collect. Manage soil for good drainage, Use subsoiler or vertical tillage to break up compacted layers.
		Deficient/scanty rainfall		
		<ul style="list-style-type: none"> Adoption of MIS and mulching 	November to February	<ul style="list-style-type: none"> Apply irrigation through MIS with mulch Give irrigation during night time to reduce transpiration Soil amendments, and/or reduced tillage.

7. Temperature related stresses for field and horticulture crops:

Excess temperatures/ Less than normal temperatures

SN	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
1	Groundnut Summer	Germination	< 17 ⁰ C	If temperature is below than 17 ⁰ C <ul style="list-style-type: none"> Delay sowing. Use organic mulch. Delay second irrigation after sowing. In case of line sowing harrowing to be followed to loosen the soil surface.
		Vegetative	>35 ⁰ C	<ul style="list-style-type: none"> Sprinkler and drip irrigation
		Pegging	>30 ⁰ C	<ul style="list-style-type: none"> Sprinkler and drip irrigation
		Pod development	>34 ⁰ C	<ul style="list-style-type: none"> Sprinkler and drip irrigation

2	Sesame summer	Germination	< 15 °C not suitable for germination	<ul style="list-style-type: none"> • Delay sowing.
		Growth and develop.	>30 °C	<ul style="list-style-type: none"> • Light and frequent irrigation.
		Flower dropping and pollination	>35°C	<ul style="list-style-type: none"> • Light and frequent irrigation
3	Pearl millet Summer	Germination	<18°C	<ul style="list-style-type: none"> • Delay sowing (2nd to 3rd week of Feb.)
		Crop growth	>33 °C	<ul style="list-style-type: none"> • Light and frequent irrigation
4	Cotton	Flowering and boll formation	>32 °C	<ul style="list-style-type: none"> • Drip irrigation • Straw mulching • Give frequent irrigation.
		Boll maturity	>38 °C	<ul style="list-style-type: none"> • Drip irrigation • Straw mulching • Give frequent irrigation.
5	Wheat	Germination	>25°C	<ul style="list-style-type: none"> • Delay sowing up to optimum temp (20-25°C)
		Anthesis	>22°C	<ul style="list-style-type: none"> • Light and frequent irrigation
		Milk	>26°C	<ul style="list-style-type: none"> • Light and frequent irrigation
		Grain filling	> 30°C not suitable	<ul style="list-style-type: none"> • Light and frequent irrigation • Use early sowing variety Lok-1 and prefer early maturing variety GW-173 and GW-11 in late sowing to avoid of high temp.
		Dough stage	7-18°C suitable 5 to 15 days	<ul style="list-style-type: none"> • Light and frequent irrigation If temp. greater than 18°C
6	Chick pea	Germination	>24°C.	<ul style="list-style-type: none"> • Delay sowing to get optimum temp (15-20°C)
		Flowering	>30°C.	<ul style="list-style-type: none"> • Give irrigation • External application of ABA* can protect plant against heat stress
		Pod development	>30°C.	<ul style="list-style-type: none"> • Give irrigation • External application of ABA* can protect plant against heat stress
		Seed development	>30°C.	<ul style="list-style-type: none"> • Give irrigation • External application of ABA* can protect plant against heat stress
7	Cumin	Germination	>22°C.	<ul style="list-style-type: none"> • Light and frequent irrigation • Delay sowing
8	Garlic	Bulb develop.	>25°C	<ul style="list-style-type: none"> • Drip irrigation • Frequent light irrigation
9	Onion	Bulb develop.	>32°C	<ul style="list-style-type: none"> • Drip irrigation • Light and frequent irrigation

SN	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
1	2	3	4	5
10	Tomato	Flowering	>32 ⁰ C	<ul style="list-style-type: none"> • Use of mulch and irrigate the crop with mini/micro sprinkler
		Fruit setting	>35 ⁰ C	<ul style="list-style-type: none"> • Use of mulch and irrigate the crop with sprinkler
11	Cucurbits	Whole crop period	> 25 ⁰ C	<ul style="list-style-type: none"> • Drip irrigation • Use of straw/ silver plastic mulch
12	Mango	Flowering & fruit setting	<15 ⁰ C Night & >25 ⁰ C Day during 5 days	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Nutrients & irrigation. • Spray NAA** 20 ppm + 2% urea • Mulching • Shelter belts/Wind breaks
		Maturity stage	35-40 ⁰ C during week or more causing sun burning mostly on western side fruits	<ul style="list-style-type: none"> • Irrigation • Mulching • Sod*** culture • Shelter belts/Wind breaks

*ABA-Abcsic acid

**NAA-Naphthalene acetic acid

***Sod culture- Green cover on soil by growing fodder or green manure crop to reduce soil temperature

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

S. No.	Soil type	Cropping system	Fodder name	Variety	Management practices
1	Coastal alluvial and saline soil	-	-	-	-

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

S. No.	Soil type	Cropping system	Crop name	Variety	Management practices
1	Coastal alluvial and saline soil	-	-	-	-

(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

S. No.	Soil type	Cropping system	Fodder name	Variety	Management practices
1	Coastal alluvial and saline soil	-	-	-	-

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

S. No.	Soil type	Cropping system	Fodder name	Variety	Management practices
1	Coastal alluvial and saline soil	-	-	-	-

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

S. No.	Soil type	Fodder name	Variety	Management practices
1	Medium to shallow black soils	Sorghum	Gundari GFS-3, GAFS-11, CSV-15, CSV-21F	• Adopt recommended package of agronomic practices
		Lucerne	Anand-2, 3	• Adopt recommended package of agronomic practices
		Maize	African tall	• Adopt recommended package of agronomic practices
		Grass	Hybrid Napier-CO-3, Jinjvo	• Adopt recommended package of agronomic practices
2	Coastal alluvial and saline soil	Sorghum	Gundari GFS-3, GAFS-11, CSV-15, CSV-21F	• Adopt recommended package of agronomic practices
		Lucerne	Anand-2	• Adopt recommended package of agronomic practices
		Maize	African tall	• Adopt recommended package of agronomic practices
		Grass	Hybrid Napier-CO-3, Jinjvo	• Adopt recommended package of agronomic practices

Livestock management during severe heat waves

Nutritional management	Shelter management	Health management	Miscellaneous, if any
<ul style="list-style-type: none"> • Feed 25 kg green fodder along with unconventional feed per animal. • Give jaggery water with fenugreek powder. • High energy, high density and low protein diet are beneficial. • Increasing the grain/forage ratio. 	<ul style="list-style-type: none"> • Covered the shelter roof with dry grass.. • 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). 	<ul style="list-style-type: none"> • Spray them with cool water, especially on the legs and feet, or stand them in water • Lay wet clothes over them. • Provide vitamin C through syrup for heat stress management. • Vaccinate animals against infectious diseases. 	<ul style="list-style-type: none"> • Cattle that are heat stressed will show increased respiration rates as they try to cool down themselves. • 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.

Livestock management during severe cold waves

Nutritional management	Shelter management	Health management	Miscellaneous, if any
<ul style="list-style-type: none"> • Feed silage and hay (Wheat straw treated with urea) along with concentrate feed. • An increased energy requirement for maintenance as a result of increased resting metabolic rate. 	<ul style="list-style-type: none"> • Operate heaters protect shed by tying gunny bags around shed. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Operate heaters, protect shed by tying gunny bags around shed. • Protect animals from direct cold waves. • Cover animal under insurance.