CONTINGENCY PLANS FOR RABI AND SUMMER CROPS

District: Gir Somnath Gujarat State

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

			Oct – Dec	Jan – Mar
(a)	Normal rainfall during *Rabi* season	:	19.60 mm	1.00 mm
(b)	Number of rainy days	:	0.90	0.10

Source: MSRS,JAU,Kodinar

2. Rabi crops cultivated

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

S. No	Cropping System	Crop name	Area ('000 ha)	Production ('000 t)	Productivity (Kg/ha)
1	Groundnut- based cropping system	Wheat	74.955	309.052	4111
		Sugarcane	12.836	995.722	74638
		Pearl millet	5.473	11.467	2022
		Chickpea	1.435	2.558	1737
		Coriander	13.800	19.734	1430
		Onion	3.600	90.000	25000
		Brinjal	2.090	41.423	19819
		Tomato	1.040	26.624	25600
2	Groundnut/wheat-based cropping system	Summer pulses (Green gram&Urd)	2.675	1.462	546
		Summer sesame	2.500	1.298	519
		Summer groundnut	7.803	14.129	1889
3	Cotton- based cropping system	Cotton	32.413	15.746	564
4	Horticulture fruit crops	Mango	13.890	95.146	6850
		Coconut	7.450	74128 ('000 nuts)	9950 (Nuts)
		Sapota	1.255	12.763	10169
		Banana	0.700	33.950	48500

Source: Reports of Department of Agriculture, Govt. of Gujarat, (2010-11 to 2014-15)) and Report of Department of Horticulture, Govt. of Gujarat, (2015-16). Horticulture crops, spices and vegetables data and *summer sesame are for the year2015-16.

2b Source wise (Water) cultivated area

S. No	Crop name	Cultivated area under ('000 ha)			
		Residual moisture condition/rainfed	Ground water irrigated	Tank irrigated/*Check dams/others*	Canal irrigated
1	Wheat	-	55.42		
2	Sugarcane	-	8.36		
3	Pearl millet	-	3.32		
4	Chickpea	-	0.86		
5	Summer pulses (Green gram&Urd)	-	0.73		
6	Summer sesame	-	0.88		
7	Summer groundnut	-	2.73		
8	Mango	-	5.16		
9	Coconut	-	1.02		
10	Sapota	-	0.89		
11	Others	-	6.95		
	Total	-	86.322	91.910	5.048

Source: PMKSY District Irrigation Plan (2016-2020), GGRCL, Vadodara report -2016, GirSomnath, Gujarat

3. Sowing window information

S. No.	Soil type	Cropping system	Crop name	Optimum sowing window (Please mention along with week i.e., 2nd week of Oct-4th week of Nov/etc.)
1	Medium & shallow black soils	Groundnut- based cropping system -	Wheat	Nov.2nd week to Nov.4th week
			Sugarcane	Oct.4th week to Feb.4th week
			Chickpea	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
		Groundnut/wheat- based cropping system	Summer pulses	Feb. 2nd week to Feb. 3rd week
			Summer sesame	Feb.3rd week to Feb.4th week
			Summer groundnut	Jan. 2nd week to Feb. 2nd week
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabipearl millet	Sept. 3rd week to Oct. 2nd week

4.Contingency measures Field crops

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

(a) Excess residual moisture

S. No.	Soil type	Cropping system	Crop name	Sowing Window	Variety	Management practices
1	Medium & shallow black soils	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

S. 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%.

S. 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

S. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium & shallow black soils	Groundnut- based cropping system	Wheat	Nov.2ndweek to Nov.4thweek	GW 496, GJW 463,GW 366, GW 451, Lok 1	• 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.
			Sugarcane	Oct.4thweek to Feb.4thweek	CoN 05071 (Early), Co 6304, Co 86032, CoN 91132 (Mid-late)	• Adopt recommended package of practices.
			Chickpea	Nov. 2ndweek to Nov. 4th week	GG- 1, GJG-3, GG-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).

S. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
		Groundnut/wheat based cropping system	Summer pulses	Feb. 2nd week to Feb. 3rd week	Green gram- GM 4 Urd- GU 1	• Adopt recommended package of practices.
			Summer sesame	Feb.3rd week to Feb.4th week	GT-3, GT-5	• Adopt recommended package of practices.
			Summer groundnut	Jan. 2nd week to Feb. 2nd week	GG 2,6, TG- 37- A, TPG 41, GJG-31	• Adopt recommended package of practices.
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabipearl millet	Sept. 2nd week to Oct. 2nd week	GHB-538 and Govt. approved hybrids	• Adopt recommended package of practices.
			Wheat	Nov.2nd week to Nov.4th week	KRL 19, Lok 1	• 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.

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

(b) Normal rainfall

S. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
1	Medium & shallow black soils	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.4th week	GW 496, GJW 463,GW 366, GW 451, Lok 1	• 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.
			Sugarcane	Oct.4th week to Feb.4th week	CoN 05071 (Early), Co 6304, Co 86032, CoN 91132 (Midlate)	• Adopt recommended package of practices. • Adopt micro irrigation system. • Mulching in ratoon crop
			Chickpea	Nov. 2nd week to Nov. 4th week	GG- 1, GJG-3, GG-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).

S. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
		Groundnut/wheat-based cropping system	Summer pulses	Feb. 2nd week to Feb. 3rd week	Green gram- GM 4 Urd- GU 1	• Adopt recommended package of practices.
			Summer sesame	Feb.3rd week to Feb.4th week	GT-3, GT-5	• Adopt recommended package of practices.
			Summer groundnut	Jan. 2nd week to Feb. 2nd week	GG 2,6, TG- 37- A, TPG 41, GJG-31	• Adopt recommended package of practices.
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabi pearl millet	Sept. 2nd week to Oct. 2nd week	GHB-538 and Govt. approved hybrids	• Adopt recommended package of practices.
			Wheat	Nov.2nd week to Nov.4th week	KRL 19, Lok 1	• 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.

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

S. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
1	Medium & shallow black soils	Groundnut- based cropping system	Wheat	Nov.2nd week to Nov.3th week	GW 496, GJW 463, GW 366, Lok 1, GW 451	• 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
			Sugarcane	Oct.4th week to Feb.4th week	CoN 05071 (Early), CoN 91132 (Midlate)	• Adopt management practices as given in point 4.4(a) plus following practices • Use of mulching. • Adoption of MIS • Adopt alternate furrow irrigation.
			Chickpea	Nov. Ist week to Nov. 3rd week	GG- 1, GJG-3, GJG-5	• Adopt management practices as given in point 4.4(a) plus following practices

S. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Coriander	Nov.2nd week to Nov. 3rd week	GC-2, 3	• Adopt management practices as given in point 4.4(a) plus following practices • Use organic manure • Adopt MIS with organic mulching • Irrigate at critical stages only. • Give irrigation during night time to reduce transpiration
		Groundnut/wheat-based cropping system	Summer pulses	-	-	• Avoid summer crop sowing
			Summer sesame	-	-	• Avoid summer crop sowing
			Summer groundnut	-	-	• Avoid summer crop sowing
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabibajra	Sept. 2nd week to Oct. 2nd week	GHB-538 and Govt. approved hybrids	• Adopt management practices as given in point 4.4(a) plus following practices • Adopt micro irrigation system • Irrigate the crop at critical stage • Use side tillers as fodder purpose

(d) Scanty rainfall in *Kharif* season

S. No.	**Soil type**	**Cropping system**	**Crop name**	**Sowing time**	**Variety**	**Management practices**
1	Medium &shallow black soils	Groundnut- based cropping system	Sugarcane	Oct.4th week to Feb.4th week	CoN 05071 (Early), CoN91132 (Midlate)	• Adopt management practices as given in point 4.4(a) plus following practices • Restricted planting only with micro irrigation • Give emphasis on growing seed cane • Trash mulching
			Wheat	-	-	• Avoid wheat sowing
			Chickpea	Nov. Ist week to Nov. 2nd week	GG- 1, GJG-3, GG-5	• 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

S. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Coriander	Nov.2nd week to Nov.4th week	GC-2,3	• Adopt management practices as given in point 4.4(a) plus following practices • Use organic manure • Use MIS irrigation • Irrigate at critical stages only. • Thinning of plants and sell as green coriander • Remove weeds • Irrigate during night to reduce transpiration
		Groundnut/wheat-based cropping system	Summer pulses	-	-	• Avoid summer crop sowing
			Summer sesame	-	-	• Avoid summer crop sowing
			Summer groundnut	-	-	• Avoid summer crop sowing
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabi pearl millet	Sept. 2nd week to Oct. 2nd week	GHB-538 and Govt. approved hybrids	• Adopt management practices as given in point 4.4(a) plus following practices • Adoption of MIS • Give irrigation during night time to reduce transpiration • Use side tillers as fodder purpose

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

(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**
Sugarcane	• Surface drainage	• Surface drainage • Provide physical support through tying the bunch of plants	• Surface drainage • Provide physical support through tying the bunch of plants	-

Wheat	-	-	• Surface drainage (for management of water logging, lodging crop • To control black point in grain, spray mancozeb 0.2%(27 g/10 litre water).	• 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 etc., • Preparation for quick drying technique • Separate good and bad lot.
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 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.
Coriander	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 litre water) • Spray 0.2% (30 g/10 litre 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.

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.

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

S. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
1	Medium & shallow black soils	Groundnut- based cropping system	Sugarcane	Oct.4thweek to Feb.4thweek	-	• Avoid sugarcane planting
			Wheat	Nov.2ndweek to Nov.4thweek	Lok-1 GW-11	• Canal water should be released to irrigate at critical stages only. • Conjunctive use of canal and ground water or ground water should be utilized at later stage.
			Chickpea	Oct. 2ndweek to Nov. 2ndweek	GJG-3, GJG-5	• Irrigation at branching stage • Canal water should be released to irrigate during critical stages only. • If irrigation are possible, irrigate at branching and pod development stages.
			Coriander	Nov.2ndweek to Nov.4thweek	GC-2,3	• Thinning of plants and sell as green coriander • Supply irrigation during night time to reduce transpiration • Organic manure application • Adoption of MIS • Irrigation at critical stage
		Groundnut/wheat-based cropping system	Summer pulses	-	-	• Avoid summer crop sowing
			Summersesame	-	-	• Avoid summer crop sowing
			Summer groundnut	-	-	• Avoid summer crop sowing

S. No.	Soil type	Cropping system	Crop name	Sowing window	Variety	Management practices
2	Coastal alluvial soils	Groundnut- based cropping system	Semi rabipearl millet	Sept. 2nd week to Oct. 2nd week	GHB-538 and Govt. approved hybrids	• Irrigation at critical stages • Give irrigation during night time to reduce transpiration, if possible • Canal water should be released to irrigate during critical stages only. • If the groundwater is available, it 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 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)

S. 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 • Spray 0.2% wettable sulphur(30 g/10 litre water) or 0.005 % hexaconazole(hexaconazole 5 EC @ 10 ml/10 litre water) for protection against powdery mildew • 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 • Use of sub surface drip irrigation, if possible	December to May October to May October to May October to November October to May	

S. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
2	Coconut	**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	
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	**Banana**	**Excess rainfall**		
		• Provide drainage	June to September	Adopt surface drainage in case of stagnant waterl.
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching	December to May October to May	
	New plantations			
1	Mango	**Excess rainfall**		
		• Provide proper drainage • Provide staking • Drenching of carbendazim @ 1 g/litre water • Soil pulverization around the plant base (Forking)	June to September June to September June to September June to September	
		Deficient/scanty rainfall		
		• Adoption of MIS • Use of mulching • Soil pulverization around the plant base (Forking)	December to May October to May October to May	

S. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
2	Coconut	**Excess rainfall**		
		• Add gypsum @ 1-2 kg/plant • Drenching of carbendazim @ 1 g/litre water	June to September June to September	
		Deficient/scanty rainfall		
		• Adopt drip irrigation system • Use of mulching	December to May October to May	
3	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 May	Apply irrigation through drip with mulch or subsurface drip irrigation in case of last monsoon below normal
4	Banana	**Excess rainfall**		
		• Provide drainage • Earthing up	June to September June to September	Adopt surface drainage in case of excess rainfall.
		Deficient/scanty rainfall		
		• Use of MIS • Use of mulching	December to May October to May	Sugarcane trash and banana trash can be used for mulching.

6. Contingency measures for Horticulture Crops(vegetables)

S. 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**		
		• Provide drainage for nursery • Delay in sowing	August to September	Nursery raising on raised bed/BBF
		Deficient/scanty rainfall		
		• Use micro irrigation with plastic mulch	November 15 to February 15.	Apply irrigation through drip with mulch in case of last monsoon below normal
2	Brinjal(JBGR-1, GLB-2, GJB-2,3, GJLB-4, GABH-3, 4)	**Excess rainfall**		
		• Provide drainage for nursery	July to August	Use surface drainage system
		Deficient/scanty rainfall		
		• Use micro irrigation with plastic mulch and /or place the drip system to subsurface	September to March	Apply irrigation through drip with mulch in case of last monsoon below normal
3	Tomato (GT-1, 2, Anand Tomato -3, Junagadh Tomato-3, Pusha Rubi and Govt. approved hybrids)	**Excess rainfall**		
		• Provide drainage for nursery	June to September	-
		Deficient/scanty rainfall		
		• Use micro irrigation with plastic mulch	November 15 to February 15	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

SN	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
		Milk	>26 ^{0}C	• Light and frequent irrigation
		Dough stage	7-18 ^{0}C suitable 5 to 15 days	• Light and frequent irrigationif temp. 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
2	Sugarcane	Growth and develop.	>30 ^{0}C	• Light and frequent irrigation
		Tillering	< 20 ^{0}C not suitable	• Light and frequent irrigation • Trash mulching
3	Pearl millet Semi rabi	Crop growth	>33 ^{0}C	• Light and frequent irrigation
4	Pearl millet Summer	Germination	<18^{0}C	• Delay sowing (Second/thirdweek of Feb.)
		Crop growth	>33 ^{0}C	• Light and frequent irrigation
5	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
6	Coriander	Germination	>25^{0}C	• Light and frequent Irrigation • Delay sowing.

SN	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
7	Onion	Bulb develop.	>32 ^{0}C	• Drip irrigation • Frequent light irrigation
8	Garlic	Bulb develop.	>25 ^{0}C	• Drip irrigation • Frequent light irrigation
9	Brinjal	Whole crop period	>35^{0}C	• Drip irrigation • Use of straw/ silver plastic mulch
10	Tomato	Flowering	>32^{0}C	• Use of mulch and irrigate the crop withmini/micro sprinkler
		Fruit setting	**>**35°C	• Use of mulch and irrigate the crop with sprinkler
11	Sesame summer	Germination	< 15^{0}C not suitable for germination	• Delay sowing.
		Growth and develop.	>30 ^{0}C	• Light and frequent irrigation.
		Flower dropping and pollination	>35^{0}C	• Light and frequent irrigation
12	Groundnut Summer	Germination	< 17^{0}C	If temperature is below than 17^{0}C • 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	• Sprinkler and drip irrigation
		Pegging	>30^{0}C	• Sprinkler and drip irrigation
		Pod development	>34 ^{0}C	• Sprinkler and drip irrigation
13	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.

SN	Crop name	Stage of crop growth	Threshold temperature	Suggested management practices
14	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 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	• Irrigation • Mulching • Sod*** culture • Shelter belts/Wind breaks
15	Coconut	Tree growth	>35°C	• Application of lime solution on the trunk up to a height of 2-3 m at the start of the summer season
		Flowering & Fruit setting	<20 ^{0} C & >35°C	• Regular irrigation is recommended during low or high temperature.
16	Banana	Pl. growth	< 10 ^{0}C low & > 38 ^{0}C high for period of 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
		Flowering	< 15 ^{0}C low & > 25 ^{0}C high for period of 5 days	
		Fruit maturity	> 38 ^{0}C high for one week or more	• Wrapping or sleeving of bunch • Irrigation • Mulching or sod culture • Shelter belts/wind breaks

*ABA-Abscisic acid

**NAA-Naphthalene acetic acid

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

* 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

S. No.	Soil type	Cropping system	Fodder name	Variety	Management practices
	NA	-	-	-	-

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

S. No.	Soil type	Cropping system	Crop name	Variety	Management practices
	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

S. No.	Soil type	Cropping system	Fodder name	Variety	Management practices
	NA	-	-	-	-

(c) 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
	NA	-	-	-	-

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 & shallow black to mixed red & black soils	Lucerne	Anand-2, 3	Adoption of Sprinkler irrigation system.
		Sorghum	Gundari, GFS-3, GAFS-11, CSV-15, CSV-21F	Adopt recommended package of practices
		Grass	Napier Jinjvo	Adopt recommended package of practices
1	Coastal alluvial soils	Lucerne	Anand-2, 3	Reduce sowing area. Adoption of sprinkler irrigation system.
		Sorghum	Gundari, GFS-3, GAFS-11, CSV-15, CSV-21F	Adopt recommended package of practices
		Grass	Napier, Jinjvo	Adopt recommended package of 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 jaggerywater 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 protection in western side of shed) • 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.
Cold wave			
• Feed silage & Hay (Urea treated with wheat straw) 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. (Provide special protection in northern side of shed) •	• Add antibiotics in drinking water to 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.