

# CONTINGENCY PLANS FOR RABI AND SUMMER CROPS

## District: Devbhumi Dwarka Gujarat State

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

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

Source: PMRS,JAU,Jamnagar

### 2. Rabi crops cultivated

#### 2a Area 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	Chickpea	31.300	35.05	1.120
		Cumin	0.450	383	0.85
		Wheat	6.67	21.41	3.210
		Coriander	0.715	1037	1.45
		Sesame(Summer)	2.91	1378	0.474
		Groundnut (Summer)	2.63	5.32	2.025
		Okra	0.460	3312	7.20
		Brinjal	0.240	4440	18.50
		Tomato	0.245	7301	29.80
		Chilli	0.450	855	1.90
		Cluster bean	0.086	830	9.65
2	Cotton based cropping system	Cotton	35.11	80.75	2.300
3	Horticulture fruit crop	Ber	0.181	1714	9.48
		Pomegranate	0.141	1252	8.900
		Sapota	0.102	1182	11.57
		Coconut	0.358	3580000 (Nuts)	10000 (Nuts)

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
	<b>Field crops</b>				
1	Chickpea		27.02	1.53	2.75
2	Wheat		5.17	0.4	1.1
3	Groundnut (Summer)		1.97	0.66	
4	Sesame (Summer)		2.19	0.72	
	<b>Vegetable crops</b>				
5	Brinjal		0.240	-	
6	Okra		0.460		
7	Tomato		0.245		
8	Cluster bean		0.086		
	<b>Spices crops</b>				
9	Chilli		0.450		
10	Cumin		0.450	-	
11	Coriander		0.715	-	
	<b>Fruit crops</b>				
12	Ber		0.181	-	
13	Pomegranate		0.141	-	
14	Sapota		0.102		
15	Coconut		0.358	-	

Source: PMKSY District Irrigation plan (2016-2020) Devbhumi Dwarka, Gujarat, GGRCL, Vadodara

## 2. Sowing window information

Sr. No.	Soil type	Cropping system	Crop name	Optimum sowing window
1	Medium & shallow black soils (All four talukas)	Groundnut- based cropping system	Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week
			Cumin	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week
			Wheat	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week
			Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week
			Okra	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week
			Brinjal	Aug. 2 <sup>nd</sup> week to Sept. 2 <sup>nd</sup> week
			Tomato	Aug. 2 <sup>nd</sup> week to Sept. 2 <sup>nd</sup> week
			Chilli	Aug. 2 <sup>nd</sup> week to Sept. 2 <sup>nd</sup> week
		Groundnut/wheat- based cropping system	Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week
			Cluster bean (Summer)	Jan. 2 <sup>nd</sup> week to Feb. 2 <sup>nd</sup> week
			Okra (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	Groundnut- based cropping system	Pearl millet (Semi rabi)	Oct.1 <sup>st</sup> week to Oct.2 <sup>nd</sup> 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 & 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**

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	Management practices
1	Medium & shallow black soils (All four talukas)	Groundnut- based cropping system	Wheat	Nov. 2 <sup>nd</sup> week to Nov. 4 <sup>th</sup> week	GW 496, GJW 463, GW 366, Lok-1, GW-451	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices.</li> <li>Immediate after last irrigation spray 2 % urea and mencozeb 75 % WP (27g/10 litre water) for better quality of grain.</li> </ul>
			Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week	GG 1, GJG 3, GJG 5	<ul style="list-style-type: none"> <li>Adopt recommended agronomic practices</li> <li>Monitor the crop for heliothis and prodenia infestation, if infestation observed above ETL spray spinosad 45 % SC (3 ml/10 lit. water)..</li> </ul>
			Cumin	Nov. 2 <sup>nd</sup> week to Nov. 4 <sup>th</sup> week	GC-3, GC-4	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices</li> <li>Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease</li> <li>After germination make alternative spray of mencozeb 75 % WP (27g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval.</li> </ul>

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
						<ul style="list-style-type: none"> <li>Under cloudy weather and fog condition make extra spray of mencozeb 75 % WP (27g/10 litre water) for prevention of blight.</li> </ul>
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-2	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices</li> <li>Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease</li> <li>After germination make alternative spray of mencozeb 75 % WP (27g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseases at 10-12 days interval.</li> </ul>
			Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
		Groundnut/wheat based cropping system	Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
			Groundnut (Summer)	Jan. 2 <sup>nd</sup> week to Feb. 2 <sup>nd</sup> week	GG 2,6, TG 37 A, TPG 41, TG 26	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	-	Semi-rabi Pearl millet	Oct 1 <sup>st</sup> week to Oct. 2 <sup>nd</sup> week	GHB 538& Govt. approved hybrids	<ul style="list-style-type: none"> <li>Adopt recommended package of practices.</li> </ul>

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	Management practices
1	Medium & shallow black soils(All four talukas)	Groundnut-based cropping system	Wheat	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GW 496, GJW 463, GW 366, Lok-1, GW-451	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices.</li> <li>Immediate after last irrigation spray 2 % urea and mencozeb 75 % WP (27g/10 litre water) for better quality of grain.</li> </ul>
			Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week	GG 1, GJG 3, GJG 5	<ul style="list-style-type: none"> <li>Adopt recommended agronomic practices</li> <li>Monitor the crop for heliothis and prodenia infestation, if infestation observed above ETL spray spinosad 45 % SC (3 ml/10 lit. water).</li> </ul>
			Cumin	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-3, GC-4	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices</li> <li>Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease</li> <li>After germination make alternative spray of mencozeb 75 % WP (27g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseasesat 10-12 days interval.</li> <li>Under cloudy weather and fog condition make extra spray of mencozeb 75 % WP (27g/10 litre water) for prevention of blight.</li> </ul>
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-2	<ul style="list-style-type: none"> <li>Adopt recommended agronomic and irrigation practices</li> <li>Seed treatment with thirum @ 2-3 g/kg seed for prevention of wilt disease</li> <li>After germination make alternative spray of mencozeb 75 % WP (27g/10 litre water) and hexaconazole 5 % EC (10 ml/10 lit. water) for prevention of blight and PM diseasesat 10-12 days interval.</li> </ul>
			Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
		Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>	
		Groundnut/ wheat based cropping system	Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>
			Groundnut (Summer)	Jan. 2 <sup>nd</sup> week to Feb. 2 <sup>nd</sup> week	GG 2,6, TG 37 A, TPG 41, TG 26	<ul style="list-style-type: none"> <li>Adopt recommended package of practices</li> </ul>

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	-	Semi-rabi Pearl millet	Oct 1 <sup>st</sup> week to Oct. 2 <sup>nd</sup> week	GHB 538 & Govt. approved hybrids	<ul style="list-style-type: none"> <li>Adopt recommended package of practices.</li> </ul>

**(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 black soils(All four talukas)	Groundnut-based cropping system	Wheat	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GW 496, GJW 463, GW 366, Lok-1, GW-451	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3(a) plus following practices.</li> <li>Use MIS irrigation system</li> <li>Irrigate during critical stages only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week	GG 1, GJG 3, GJG 5	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3 (a) plus following practices.</li> <li>Use MIS irrigation system with organic mulch</li> <li>Irrigate during critical stages only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Cumin	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-3, GC-4	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3(a) plus following practices.</li> <li>Use MIS irrigation system and irrigate upto flowering stage only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-2	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3(a) plus following practices.</li> <li>Adopt MIS with organic mulching</li> <li>Irrigate during critical stages only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26,	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
		Groundnut/wheat based cropping system	Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	-	Semi-rabi Pearl millet	Oct 1 <sup>st</sup> week to Oct. 2 <sup>nd</sup> week	GHB 538 & Govt. approved hybrids	<ul style="list-style-type: none"> <li>Adopt recommended package of practices.</li> <li>Adoption of MIS</li> <li>Irrigation at critical stage</li> <li>Use side tillers as fodder purpose</li> </ul>

**(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 four talukas)	Groundnut-based cropping system	Wheat	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GW 496, GJW 463, GW 366, Lok-1, GW-451	<ul style="list-style-type: none"> <li>Avoid wheat sowing</li> </ul>
			Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week	GG 1, GJG 3, GJG 5	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3 (a) plus following practices Irrigate at branching stage.</li> <li>If two irrigations are possible, irrigate during branching and pod development stages only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Cumin	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-3, GC-4	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3 (a) plus following practices Use drip irrigation system and irrigate upto flowering stage only.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-2	<ul style="list-style-type: none"> <li>Adopt management practices as given in point 4.3 (a) plus following practices Thinning of plants and sell as green coriander</li> <li>Use of Drip irrigation system</li> <li>Irrigation during critical stages.</li> <li>Give irrigation during night time to reduce transpiration</li> </ul>

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Sesame (Summer)	-	-	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
			Groundnut (Summer)	-	-	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
		Groundnut/wheat based cropping system	Sesame (Summer)	-	-	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
			Groundnut (Summer)	-	-	<ul style="list-style-type: none"> <li>Avoid summer crop sowing</li> </ul>
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	-	Semi-rabi Pearl millet	Oct 1 <sup>st</sup> week to Oct. 2 <sup>nd</sup> week	GHB 538 & Govt. approved hybrids	<ul style="list-style-type: none"> <li>Adoption of MIS</li> <li>Give irrigation during night time to reduce transpiration</li> <li>Use side tillers as fodder purpose</li> <li>Use of mulching</li> </ul>

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
Wheat	-	-	<ul style="list-style-type: none"> <li>Surface drainage (for management of water logging, lodging crop and black point in grain. spray mancozeb 0.2% (27g/ 10 lit. water)</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage etc.,</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>

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				
Chickpea	-	-	<ul style="list-style-type: none"> <li>Provide drainage, harvest immediately after drying</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage etc.,</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>
Groundnut (summer)	-	-	<ul style="list-style-type: none"> <li>Immediately harvest bunch groundnut.</li> <li>Quick surface drainage, open channel around field.</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>
Sesame (summer)	-	-	<ul style="list-style-type: none"> <li>Quick surface drainage, open channel around field.</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>
Perl millet (semi rabi)	-	-	<ul style="list-style-type: none"> <li>Immediately harvest the crop</li> <li>Surface drainage (for management of water logging)</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage etc.</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>
Cumin	Surface drainage (For management of water logging condition)	Surface drainage for management of water logging	<ul style="list-style-type: none"> <li>Surface drainage (for management of water logging crop</li> <li>To control cumin blight)spray mancozeb 0.2%% (27g/ 10 lit. water)</li> <li>Spray 0.2% % (30g/ 10 lit. water) wettable sulphur for protection against powdery mildew disease</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produces to farm shed</li> <li>Protection against pest/disease damage in storage etc.,</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>

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
Coriander	Surface drainage (For management of water logging condition)	Surface drainage for management of water logging	<ul style="list-style-type: none"> <li>Surface drainage (for management of water logging crop)</li> <li>Spray 0.2% (30g/ 10 lit. water) wettable sulphur for protection against powdery mildew disease</li> </ul>	<ul style="list-style-type: none"> <li>Protect product with plastic sheet (100 µ UV stabilized colour plastic) or shift produce to farm shed</li> <li>Protection against pest/disease damage in storage etc.,</li> <li>Preparation for quick drying technique</li> <li>Separate good and bad lot.</li> </ul>

#### 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	Management practices
1	Medium & shallow black soils (All four talukas)	Groundnut-based cropping system	Wheat	Nov. 2 <sup>nd</sup> week to Nov. 4 <sup>th</sup> week	GW 496, GJW 463, GW 366, Lok-1, GW-451	<ul style="list-style-type: none"> <li>Avoid wheat sowing</li> </ul>
			Chickpea	Oct. 2 <sup>nd</sup> week to Nov. 2 <sup>nd</sup> week	GJG 3	<ul style="list-style-type: none"> <li>Irrigate at branching stage.</li> <li>If two irrigations are possible, irrigate during branching and pod development stages only.</li> </ul>
			Cumin	Nov. 2 <sup>nd</sup> week to Nov. 4 <sup>th</sup> week	GC-3, GC-4	<ul style="list-style-type: none"> <li>Canal water should be released to irrigate during critical stages only.</li> <li>Conjunctive use of canal and ground water</li> <li>If the groundwater is available, it should be utilized during later stages</li> </ul>

Sr. No.	Soil type	Cropping system	Crop name	Sowing time	Variety	Management practices
			Coriander	Nov.2 <sup>nd</sup> week to Nov.4 <sup>th</sup> week	GC-2	<ul style="list-style-type: none"> <li>• Thinning of plants and sell as green coriander</li> <li>• Canal water should be released to irrigate during critical stages only.</li> <li>• Conjunctive use of canal and ground water</li> <li>• If the groundwater is available, it should be utilized during later stages</li> <li>• Alternate furrow irrigation</li> </ul>
			Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>• Avoid summer crop sowing</li> </ul>
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26,	<ul style="list-style-type: none"> <li>• Avoid summer crop sowing</li> </ul>
		Groundnut/wheat based cropping system	Sesame (Summer)	Feb.3 <sup>rd</sup> week to Feb.4 <sup>th</sup> week	GT 2, GT 3, GT 4,GT 5	<ul style="list-style-type: none"> <li>• Avoid summer crop sowing</li> </ul>
			Groundnut (Summer)	Feb.2 <sup>nd</sup> week to Feb.4 <sup>th</sup> week	GG-2,6, GJG-31 TG-37A, TPG-41, TG-26,	<ul style="list-style-type: none"> <li>• Avoid summer crop sowing</li> </ul>
2	Coastal alluvial soils(Jam Khambhaliya, Dwarka, Jam Kalyanpur)	-	Semi-rabi Pearl millet	Oct 1 <sup>st</sup> week to Oct. 2 <sup>nd</sup> week	GHB 538 & Govt. approved hybrids	<ul style="list-style-type: none"> <li>• Adopt recommended package of practices.</li> <li>• Adoption of MIS</li> <li>• Irrigation at critical stage</li> <li>• Use side tillers as fodder purpose</li> <li>• Conjunctive use of canal and ground water</li> <li>• If the groundwater is available, it should be utilized during later stages</li> <li>• Alternate furrow irrigation</li> </ul>

## **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 up to 4<sup>th</sup> 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 up to 4<sup>th</sup> 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 4<sup>th</sup> 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
<b>Existing plantations</b>				
1	Pomegranate	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Spray 0.05% ethrel for flower setting and uniform ripening</li> <li>• Add gypsum @ 1-2 kg/plant</li> </ul>	June to September December to Jan. June to September	Adopt surface drainage in case of excess rainfall.
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of MIS</li> <li>• Use of mulching</li> <li>• Soil pulverization around the plant base (Forking)</li> <li>• Use of morum</li> <li>• Use of sub surface drip irrigation, if possible</li> <li>• Spray 0.2% boron</li> </ul>	December to May October to May October to May October to November October to May October to May	
2	Sapota	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Add gypsum @ 1-2 kg/plant</li> </ul>	June to September June to September	Adopt surface drainage in case of excess rainfall.
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of MIS</li> <li>• Use of mulching</li> <li>• Soil pulverization around the plant base (Forking)</li> <li>• Use of morum</li> </ul>	December to May October to May October to May October to November	
3	Coconut	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Apply periodical racking around trunk for reduction of root feeders</li> <li>• Apply NAA as root feeding technique for reduction fruit dropping.</li> </ul>	June to September Throughout season  October to November	

Sr. No.	Crop Name	Specific management practices to be taken up following excess/deficient/scanty rainfall	Time of intervention	Remarks
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of MIS</li> <li>• Use of mulching</li> </ul>	December to May October to May	
4	Ber	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Add gypsum @ 1-2 kg/plant</li> </ul>	June to September June to September	Adopt surface drainage in case of excess rainfall.
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of MIS</li> <li>• Use of mulching</li> <li>• Soil pulverization around the plant base (Forking)</li> <li>• Use of morum</li> <li>• Use of sub surface drip irrigation, if possible</li> </ul>	December to May October to May October to May October to November October to May	
<b>New plantations</b>				
1	Sapota	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> </ul>	June to September	Adopt surface drainage in case of excess rainfall.
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of drip irrigation system</li> <li>• Use of mulching</li> <li>• Soil pulverization around the plant base (Forking)</li> <li>• Use of morum</li> </ul>	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
2	Coconut	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>• Provide drainage</li> <li>• Apply periodical racking around trunk for reduction of root feeders</li> </ul>	June to September Throughout season	
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>• Use of MIS</li> <li>• Use of mulching</li> <li>• Soil pulverization around the plant base (Forking)</li> </ul>	December to May October to May October to May	

### 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	Okra Guj.Okra-2, Guj.Hy.Okra-1, ParbhaniKranti	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>Provide drainage</li> <li>Delay in sowing</li> </ul>	August to September	Use surface drainage system
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>Use micro irrigation with plastic mulch</li> <li>Use bio-fertilizer instead of chemical fertilizers</li> <li>Periodical inter-culturing</li> </ul>	November 15 to February 15.	Apply irrigation through drip with mulch in case of last monsoon below normal
2	Brinjal GBH-1,2, Junagadh Ravaiya, Junagadh oblong, green round brinjal-1, Pusa Hy.-5,6; PLR-1	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>Provide drainage for nursery</li> </ul>	July to August	Use surface drainage system
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>Use micro irrigation with plastic mulch and /or place the drip system to subsurface</li> </ul>	September to March	Apply irrigation through drip with mulch in case of last monsoon below normal
3	Tomato Junagadh Rubi; G.Tomato-1,2; Pusa Hy.-2,4	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>Provide drainage for nursery</li> </ul>	June to September	Use surface drainage system
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>Use micro irrigation with plastic mulch</li> </ul>	November 15 to February 15	Apply irrigation through drip with mulch in case of last monsoon below normal
4	Cluster bean PusaNavbahar, PusaSadabahar, PusaSaradbahar	<b>Excess rainfall</b>		
		<ul style="list-style-type: none"> <li>Provide drainage</li> <li>Delay in sowing</li> </ul>	August to September	Use surface drainage system
		<b>Deficient/scanty rainfall</b>		
		<ul style="list-style-type: none"> <li>Use micro irrigation with plastic mulch</li> <li>Use bio-fertilizer instead of chemical fertilizers</li> <li>Periodical inter-culturing</li> </ul>	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	2	3	4	5
1	Groundnut Summer	Germination	< 17 <sup>o</sup> C	If temperature is below than 17 <sup>o</sup> C <ul style="list-style-type: none"> <li>• Delay sowing.</li> <li>• Use organic mulch.</li> <li>• Delay second irrigation after sowing.</li> <li>• In case of line sowing harrowing to be followed to loose the soil surface.</li> </ul>
		Vegetative	>35 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Sprinkler and drip irrigation</li> </ul>
		Pegging	>30 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Sprinkler and drip irrigation</li> </ul>
		Pod development	>34 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Sprinkler and drip irrigation</li> </ul>
2	Cotton	Flowering and boll formation	>32 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Drip irrigation</li> <li>• Straw mulching</li> <li>• Give frequent irrigation.</li> </ul>
		Boll maturity	>38 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Drip irrigation</li> <li>• Straw mulching</li> <li>• Give frequent irrigation.</li> </ul>
3	Sesame summer	Germination	< 15 <sup>o</sup> C not suitable for germination	<ul style="list-style-type: none"> <li>• Delay sowing.</li> </ul>
		Growth and develop.	>30 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Light and frequent irrigation.</li> </ul>
		Flower dropping and pollination	>35 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Light and frequent irrigation</li> </ul>
4	Pearl millet Semi rabi	Crop growth	>33 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Light and frequent irrigation</li> </ul>
5	Wheat	Germination	>25 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Delay sowing up to optimum temp(20-25<sup>o</sup>C )</li> </ul>
		Anthesis	>22 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Light and frequent irrigation</li> </ul>
		Milk	>26 <sup>o</sup> C	<ul style="list-style-type: none"> <li>• Light and frequent irrigation</li> </ul>
		Grain filling	>30 <sup>o</sup> C not suitable	<ul style="list-style-type: none"> <li>• Light and frequent irrigation</li> <li>• Use early sowing variety Lok-1 and prefer early maturing variety GW173 and GW 11 in late sowing to avoid of high temp.</li> </ul>

1	2	3	4	5
		Dough stage	7-18 °C suitable 5 to 15 days	<ul style="list-style-type: none"> <li>Light and frequent irrigation if temp. greater than 18 °C</li> </ul>
6	Tomato	Flowering	>32 °C	<ul style="list-style-type: none"> <li>Use of mulch and irrigate the crop with mini/micro sprinkler</li> </ul>
		Fruit setting	>35 °C	<ul style="list-style-type: none"> <li>Use of mulch and irrigate the crop with sprinkler</li> </ul>
7	Brinjal	Whole crop period	>35 °C	<ul style="list-style-type: none"> <li>Drip irrigation</li> <li>Use of straw/ silver plastic mulch</li> </ul>
8	Chilli	Whole crop period	>34 °C	<ul style="list-style-type: none"> <li>Drip irrigation</li> <li>Use of straw/ silver black plastic mulch</li> </ul>
9	Chickpea	Germination	>24 °C	<ul style="list-style-type: none"> <li>Delay sowing to get optimum temp(15-20 °C)</li> </ul>
		Flowering	>30 °C	<ul style="list-style-type: none"> <li>Give irrigation</li> <li>External application of ABA* can protect plant against heat stress</li> </ul>
		Pod development	>30 °C	<ul style="list-style-type: none"> <li>Give irrigation</li> <li>External application of ABA* can protect plant against heat stress</li> </ul>
		Seed development	>30 °C	<ul style="list-style-type: none"> <li>Give irrigation</li> <li>External application of ABA* can protect plant against heat stress</li> </ul>
10	Coriander	Germination	>25 °C	<ul style="list-style-type: none"> <li>Light and frequent Irrigation</li> <li>Delay sowing.</li> </ul>
11	Cumin	Germination	>22 °C	<ul style="list-style-type: none"> <li>Light and frequent irrigation</li> <li>Delay sowing.</li> </ul>
12	Coconut	Tree growth	>35 °C	<ul style="list-style-type: none"> <li>Application of lime solution on the trunk up to a height of 2-3 m at the start of the summer season</li> </ul>
		Flowering & Fruit setting	<20 °C & >35 °C	<ul style="list-style-type: none"> <li>Regular irrigation is recommended during low or high temperature.</li> </ul>
13	Pomegranate	Pl. growth	< 18 °C low & > 35 °C high	<ul style="list-style-type: none"> <li>Smudging technique during low temperature at early morning.</li> <li>Irrigation during low or high temperature.</li> </ul>
		Flowering & fruit setting	< 20 °C low & > 35 °C high	<ul style="list-style-type: none"> <li>Mulching during low or high temperature.</li> <li>Shelter belts/wind breaks</li> </ul>

1	2	3	4	5
		Fruit maturity	> 40 °C high for one week or more	<ul style="list-style-type: none"> <li>• Wrapping of individual fruits</li> <li>• Frequent and light irrigation</li> <li>• Mulching or sod culture</li> <li>• Shelter belts/wind breaks</li> </ul>

\* 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

\*ABA-Absciscic acid    \*\*NAA-Naphthalene acetic acid

**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	<ul style="list-style-type: none"> <li>• Surface drainage (to control water logging condition)</li> </ul>

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

Sr. No.	Soil type	Cropping system	Crop name	Variety	Management Practices
1	NA	Groundnut based cropping system	Sorghum	Gundhari, GFS-3, GAFS-11, CSV-21F	<ul style="list-style-type: none"> <li>• Adopt recommended package of agronomic practices</li> </ul>

**(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	<ul style="list-style-type: none"> <li>• Thinning and maintain the plant stand</li> <li>• Don't feed as green fodder.</li> </ul>

**(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 & shallow black to mixed red & black soils	Lucerne	Anand-2	Adopt recommended package of agronomic practices
		Sorghum	Gundari GFS-3, GAFS-11, CSV-21F	Adopt recommended package of agronomic practices
		Grass	Hybrid Napier-CO-3, Jinjvo	Adopt recommended package of agronomic practices
2	Coastal alluvial soils	Lucerne	Anand-2	Adopt recommended package of agronomic practices
		Sorghum	Gundari GFS-3, GAFS-11, CSV-21F	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
<b>Heat wave</b>			
<ul style="list-style-type: none"> <li>Feed 25 kg green fodder along with unconventional feed per animal.</li> <li>Give jiggery water with fenugreek powder.</li> <li>High energy density and low protein diet are beneficial.</li> <li>Increasing the grain/ forage ratio.</li> </ul>	<ul style="list-style-type: none"> <li>Covered the shelter roof with dry grasses.</li> <li>Provide Fans &amp; sufficient ventilation.</li> <li>Use fogger/ sprinklers system</li> <li>Forestry blocks can provide temporary shelter from extreme heat.</li> <li>Providing good-quality drinking water and shade (natural or artificial).</li> </ul>	<ul style="list-style-type: none"> <li>Spray them with cool water, especially on the legs and feet, or stand them in water</li> <li>Lay wet towels over them.</li> <li>Provide Vitamin C through Syrup for heat stress management.</li> <li>Vaccinate the animals against infectious diseases</li> </ul>	<ul style="list-style-type: none"> <li>Cattle that are heat stressed will show increased respiration rates as they try to cool themselves down.</li> <li>Don't allowed cattle to walk in extreme heat.</li> <li>Use sprinklers and shade in holding yards.</li> <li>Air flow is also important.</li> <li>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.</li> <li>Cover animal under insurance.</li> </ul>
<b>Cold wave</b>			
<ul style="list-style-type: none"> <li>Feed silage &amp; Hay (Wheat straw treated with urea) along with concentrate feed.</li> <li>An increased energy requirement for maintenance as a result of increased resting metabolic rate.</li> </ul>	<ul style="list-style-type: none"> <li>Operate heaters protect shed by tying gunny bags around shed.</li> </ul>	<ul style="list-style-type: none"> <li>Add antibiotics in drinking water to protect young calves from Pneumonia.</li> <li>Cold environment increases the whole body glucose turnover and glucose oxidation thus resulting in less production of ketones.</li> </ul>	<ul style="list-style-type: none"> <li>Operate heaters, protect shed by tying gunny bags around shed.</li> <li>Protect animals from direct cold waves.</li> <li>Cover animal under insurance.</li> </ul>