

State: **SIKKIM**

Agriculture Contingency Plan for District: SOUTH SIKKIM

1.0 District Agriculture profile				
1.1	Agro-Climatic/Ecological Zone			
	Agro Ecological Sub Region (ICAR)	Eastern Himalayas, Warm Perhumid Eco-Region (16.2)		
	Agro-Climatic Zone (Planning Commission)	Eastern Himalayan Region(II)		
	Agro Climatic Zone (NARP)	Tropical to temperate with lower to higher hills, alpine zone and snow bound areas.		
	List all the districts or part thereof falling under the NARP Zone	East Sikkim (Gangtok), South Sikkim (Namchi), North Sikkim (mangan), West Sikkim (Gyalsing)		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		27°12'40'' to 27°30'99''N	88°28'08'' to 88°29'07''E	300- 5000m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	ICAR Research Complex for NEH Region, Sikkim Center, Tadong, Gangtok, Sikkim		
Mention the KVK located in the district	KVK, South Sikkim, Namthang			

1.2	Rainfall	Normal RF(mm)	Number of Rainy days	Normal Onset	Normal Cessation
	SW monsoon (June-Sep)	658.40	66	2 nd week of June	4 th week of September
	NE Monsoon(Oct-Dec)	56.32	14	3rd week of October	2 nd Week of November
	Winter (Jan- March)	22.72	14	1 st week of January	3 rd week of March
	Summer (Apr-May)	151.80	19	3 rd week of April	3 rd week of May
	Annual	889.24	113		

1.3	Land use pattern of the district	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent Pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current Fallows
	Area ('000 ha)		38.581	2.519	2.754	1.209	2.754	4.515	2.086	1.004

1.4	Major Soils	Area ('000 ha)	Percent (%) of total
	Brown- red		
	Yellow soil		
	Lateritic soil		
	Sandy loam		

1.5	Agricultural land use	Area ('000 ha)	Cropping intensity %
	Net sown area	21.74	126
	Area sown more than once	16.84	
	Gross cropped area	38.581	

1.6	Irrigation	Area (*000 ha)		
	Net irrigated area	2.105		
	Gross irrigated area	5.245		
	Rainfed area	15.435		
	Sources of Irrigation	Number	Area (*000 ha)	% of total irrigated area
	Canals			
	Tanks / ponds	13		
	Open wells			
	Bore wells			
	Lift irrigation schemes			
	Micro-irrigation	28	0.025	
	Other sources (Springs)			
	Catch water drains	2		
	Tap			
	Harvested water (rain)			
	Total Irrigated Area		2.105	
	Pump sets			
	No. of Tractors			
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited			
	Critical			
Semi- critical				
Safe				
Wastewater availability and use				
Ground water quality				
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70				

1.7 Area under major field crops & horticulture (2008-09)

1.7	Major field crops cultivated	Area ('000 ha)							Summer	Grand total
		<i>Kharif</i>			<i>Rabi</i>					
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total			
Maize	-	15.00	15.00	-	-	-	-	15.00		
Soybean	-	3.69	3.69	-	-	-	-	3.69		
Rice	-	2.46	2.46	-	-	-	-	2.46		
Buckwheat	-	1.38	1.38	-	-	-	-	1.38		
Blackgram	-	1.30	1.30	-	-	-	-	1.30		
Rapeseed and Mustard	-	-	-	1.30	1.30	-	-	1.30		
Wheat	-	-	-	-	1.25	1.25	-	1.25		
Finger Millet	-	0.95	0.95	-	-	-	-	0.95		
Other Pulses	-	0.82	0.82	-	-	-	-	0.82		
Barley	-	-	-	-	0.15	0.15	-	0.15		

* Source: Food Security and Agriculture Development Department, Government of Sikkim, Annual Report 2008-09

	Horticultural crops	Total	Irrigated	Rainfed ('000 ha)
	Orange (Sikkim Mandarin)	0.926	-	0.926
	Passion fruit	0.270	-	0.270
	Other fruits	0.596	-	0.596
	Rabi Vegetables	1.392	-	-
	Kharif Vegetables	1.036	-	-

	Off-season Vegetables	1.529	-	-
	Potato (Kharif)	0.868	-	-
	Potato (Rabi)	1.050	-	-
	Other roots and tubers	0.203	-	-

* Source: Horticulture and Cash Crop Development Department, Government of Sikkim, Annual Report (2007-08)

1.7	Medicinal and Aromatic crops	-	-	-
1.7	Plantation/ Spices crops	-	-	-
	Large Cardamom	2.550	-	-
	Ginger	2.390	-	-
	Turmeric	0.276	-	-
	Tea	0.173	-	-

* Source: Horticulture and Cash Crop Development Department, Government of Sikkim, Annual Report (2007-08)

1.7f	Fodder crops	Total area ('000 ha)	Irrigated area ('000 ha)	Rainfed area ('000 ha)
1.7g	Grazing land			
1.7h	Sericulture etc	0.004	-	

1.8	Livestock (in number)	Male ('000)	Female ('000)	Total ('000)
	Indigenous Siri cattle	7.880	11.429	19.309
	Crossbred cattle	7.668	15.846	23.514
	Non descriptive Buffaloes (local low yielding)			0.087
	Graded Buffaloes			
	Goat	13.250	31.824	45.074
	Sheep	0.120	0.142	0.262
	Others (Pig)	7.704	9.851	17.555
	Commercial dairy farms (Number)			-

Source : Summary Report on 18th Livestock census 2007, Department of AH,LF& VS, Govt of Sikkim

1.9	Poultry	No. of farms	Total No. of birds ('000)
	Commercial (Broiler)		55.516
	Backyard (Layer)		57.770

1.10	Fisheries (Data source: Chief Planning Officer of district)						
	A. Capture						
	i) Marine (Data Source: Fisheries Department)	No. of fishermen	Boats		Nets		Storage facilities (Ice plants etc.)
			Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	
	ii) Inland (Data Source: Fisheries Department)	No. Farmer owned ponds		No. of Reservoirs		No. of village tanks	
	B. Culture						
		Water Spread Area (ha)		Yield (t/ha)		Production (*000 tons)	
	i) Brackish water (Data Source: MPEDA/ Fisheries Department)						
ii) Fresh water (Data Source: Fisheries Department)							

1.11 Production and Productivity of major crops

1.11	Name of crop	Kharif		Rabi		Summer		Total		Crop residue as fodder ('000 tons)
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	
Major Field crops (Crops identified based on total acreage)										
	Maize	22.31	1590.26					22.31	1590.26	
	Rice	4.05	1689.69					4.05	1689.69	
	Blackgram	1.17	830.16					1.17	830.16	
	Finger Millet	0.94	955.49					0.94	955.49	
	Buckwheat	0.90	863.58					0.90	863.58	
	Soybean	1.142	875.93					1.142	875.93	
	Pulses	2.202	900.28					2.202	900.28	
	Wheat			1.95	1214.98			1.95	1214.98	
	Rape & Mustard	-	-	1.19	799.61			1.19	799.61	
	Barley	-	-	0.20	1013.33			0.20	1013.33	

Major Horticultural crops - Fruits (Crops identified based on total acreage)										
	Orange(Mandarin)	1.756	1896					1.756	1896	
	Passion fruit	0.057	211					0.057	211	
	Other fruits	1.058	1775					1.058	1775	

Horticultural Crops : Vegetables										
	Rabi Vegetables			6.179	4439			6.179	4439	
	Kharif Vegetables	5.047	4872					5.047	4872	
	Potato (Kharif)	3.710	4274					3.710	4274	
	Potato (Rabi)			5.218	4970			5.218	4970	
	Other roots and tubers	8.928	4655					8.928	4655	
Plantation/ Spice Crops										
	Large Cardamom	0.581	228					0.581	228	
	Ginger	13.288	5560					13.288	5560	
	Turmeric	0.953	3453					0.953	3453	

Source: Horticulture and Cash Crop Development Department, Government of Sikkim, Annual Report (2007-08)

1.12	Sowing window for 5 major crops	Maize	Rice	Blackgram	Wheat	Rape and Mustard
	Kharif-Rainfed	3 rd week of February to 1 st week of April		July to August	-	-
	Kharif-Irrigated		2 nd week of June to 3 rd week of July	-	-	-
	Rabi-Rainfed			-	2 nd week of September to 2 nd week of October	September to October (dry field)
	Rabi-Irrigated			-	November to December	2 nd week of November to 2 nd week of December (Paddy field)

1.13	What is the major contingency the district is prone to? (Tick mark)	Regular	Occasional	None
	Drought		√	
	Flood			√
	Cyclone			√
	Hail storm		√	
	Heat wave			√
	Cold wave	√		
	Frost	√		
	Sea water intrusion			
	Pests and disease outbreak		√	
	Landslide	√		

1.14	Include Digital maps of the district for	Location map of district within State as Annexure- I	Enclosed: Yes
		Mean annual rainfall as Annexure- II	Enclosed: Yes
		Soil map as Annexure -III	Enclosed: Yes

Annexure -1

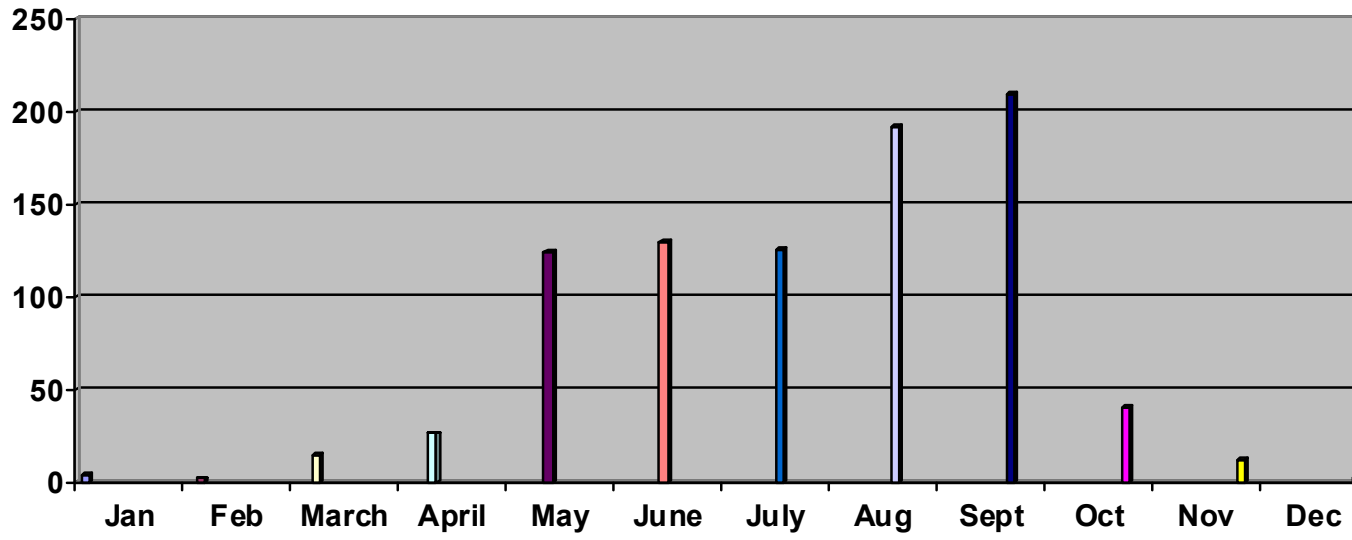
Location map of South Sikkim



Annexure-II

Mean Annual rainfall of South Sikkim

RANGE OF RAINFALL IN SOUTH SIKKIM



Annexure-III



Source: Department of Agriculture Govt. of Sikkim

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop / Cropping system	Change in crop / cropping system including variety	Agronomic measures	Remarks on Implementation
Delay by 2 weeks June 3 rd week	Rainfed	Maize based Cropping System a. Maize + Finger Millet (intercropping, Higher Altitude) b. Blackgram (after maize, lower elevation) c. Maize + Soybean (intercropping, higher elevation) d. Maize + Ginger (Mid altitude region) e. Maize + Vegetables/ wheat/Barley f. Rabi Maize + Vegetables/ Mustard/Tori g. Maize + Potato/ Vegetables h. Maize + Topoica Perennial crops –Sikkim Mandarin, Large cardamom, other fruits	No change	Delay the seedling raising of finger millet Wider spacing (60 X 30) cm for maize Frequent interculture operation for conservation of moisture Mulching in ginger Management of soil acidity Solanaceous crops should be planted in well drained, slightly sloppy land	Supply of quality seeds through ICAR, ATMA, NSC, SAUs

		<p>Paddy based cropping System</p> <p>a. Paddy</p> <p>b. Paddy + Black Gram (black gram in bund)</p> <p>c. Paddy + soybean (in bunds)</p>			
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Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop / Cropping system	Change in crop / cropping system including variety	Agronomic measures	Remarks on Implementation
<p>Delay by 4 weeks</p> <p>July 1st week</p>	Rainfed	<p>Maize based Cropping System</p> <p>a. Maize + Finger Millet (intercropping, Higher Altitude)</p> <p>b. Urd (after maize, lower elevation)</p> <p>c. Maize + Soyabean (intercropping, higher elevation)</p> <p>d. Maize + Ginger (Mid altitude region)</p> <p>e. Maize + Vegetables/ wheat/Barley</p> <p>f. Rabi Maize + Vegetables/ Mustard/Tori</p> <p>g. Maize + Potato/ Vegetables</p> <p>h. Maize + Topoica</p> <p>Perennial crops –Sikkim</p>	<p>Field crops :</p> <p>Finger millet : Indaf- 5, 8, 9, local (murkay, Mithay), VL Mandua-315, VL Mandua-324</p> <p>Maize : C-1415, C-1837, HQPM-1, Vivek- 15, Vivek -9, Vivek-23 (Hybrid), Suwan Composite, Local</p> <p>Urd: Paheli dal (local)</p> <p>Soybean: PK-1042, 1024, PK-262, local (black bold) , VL-soya-47</p> <p>Ginger : Nadia, Bhaisey</p> <p>Barley : VL-46, VL Barley-1, HBL-276, HBL-1</p> <p>Topoica : Local</p> <p>Horticultural crops</p> <p>Potato: Kufri Jyoti, K. Chandramukhi, Kufri Badshah, K. Kanchan, K. Megha,</p>	<p>Delay the seedling raising of finger millet</p> <p>Wider spacing (60 X 30) cm for maize</p> <p>Frequent interculture operation for conservation of moisture</p> <p>Mulching in ginger</p> <p>Management of soil acidity</p> <p>Timely thinning to maintain proper spacing</p> <p>Transplanting of rice</p>	<p>Supply of quality seeds through ICAR, ATMA, NSC, SAUs</p>

		<p>Mandarin, Large cardamom, other fruits</p>	<p>K. Giriraj Cabbage: Pusa Mukta, Green Ball, Bahar, Green Express, BC-76 Cauliflower: Pusa Kartik Shanker, Suwashini, Girija, Barkha, Excel-16, Pusa Sukti, Dania Kalimpong. Knol-Khol : Pusa Virat, Winner, Tomato: Avinash, Anup, Romeo, All Rounder, Rockey, Rupali, Kashi Vishesh Broccoli: Everest, Aishwarya, Palam Samridhi, Pusa KTS-1, Puspa. Pea : Arkel, Arka Ajit, Vivek Matar 9, Vivek Matar 8, Bonvelle, Azad. Cowpea: Kashi Kanchan, Pusa Komal. Carrot: Pusa Asita, Pusa Pudhira. Okra: VL Bhindi 1, Kashi Mangali, Kashi Vibhuti, Kashi Pragati, Kashi Satdhari. Brinjal: Pusa Sheetal, Pusa Shyamal, Pusa Bhairav, Kashi Taru, PPL, PPR. French bean: Arka Komal, Arka Sunidhi, VL Lata Bean 17, VL Lata Bean 12. Bottle Gourd: Pusa Naveen, Pusa Summer Prolific Long. Turmeric : Lakadong, Megha Turmeric-1 Citrus : Sikkim Mandarin Large Cardamom : Ramsay, Sawaney, Golsey, Varlangey</p>	<p>should be completed by mid week of July</p> <p>Solanaceous crops should be planted in well drained, slightly sloppy land</p> <p>System of rice intensification at lower elevation</p>	
		<p>Paddy based cropping System</p> <p>a. Paddy</p> <p>b. Paddy + Black Gram (black gram in bund)</p>	<p>Paddy- Sughandha-2, PD-10, KRH-2; Local (Attay, basmati Krishna bhog, japani Black gram: local</p>		

		c. Paddy + soybean (in bunds)			
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Condition	Major Farming situation	Normal Crop / Cropping system	Suggested Contingency measures		
			Change in crop / cropping system including variety	Agronomic measures	Remarks on Implementation
<p>Early season drought (delayed onset)</p> <p>Delay by 6 weeks</p> <p>July 3rd week</p>	Rainfed	<p>Maize based Cropping System</p> <p>a. Maize + Finger Millet (intercropping, Higher Altitude)</p> <p>b. Urd (after maize, lower elevation)</p> <p>c. Maize + Soyabean (intercropping, higher elevation)</p> <p>d. Maize + Ginger (Mid altitude region)</p> <p>e. Maize + Vegetables/ wheat/Barley</p> <p>f. Rabi Maize + Vegetables/ Mustard/Tori</p> <p>g. Maize + Potato/ Vegetables</p> <p>h. Maize + Topoica</p> <p>Perennial crops –Sikkim Mandarin, Large cardamom, other fruits</p>	<p>Field crops :</p> <p>Finger millet : Indaf- 5, 8, 9, local (murkay, Mithay), VL Mandua-315, VL Mandua-324</p> <p>Maize : C-1415, C-1837, HQPM-1, Vivek-15, Vivek -9, Vivek-23 (Hybrid), Suwan Composite, Local</p> <p>Urd: Paheli dal (local)</p> <p>Soybean: PK-1042, 1024, PK-262, local (black bold) , VL-soya-47</p> <p>Ginger : Nadia, Bhaisey</p> <p>Wheat: HD 2402, HD 2643, HD-2687, PBW- 343, VL 798, VW 0254, VW 0270, VW 0321, VL Gehun 832, VL Gehun 802</p> <p>Barley : VL-46, VL Barley-1, HBL-276, HBL-1</p> <p>Topoica : Local</p> <p>Mustard / Rapeseed: TS-29, TS-36, TS-38</p> <p>TM-2, M 27, SS-I-II, Pusa Jaikisan, Pusa bold</p>	<p>Mulching in ginger</p> <p>Wider spacing (60 X 30) cm for maize</p> <p>Frequent interculture operation for conservation of moisture</p> <p>Selection of short duration varieties (80-90) days</p> <p>Management of soil acidity</p> <p>Timely thinning to maintain proper spacing</p> <p>Mulching of crops</p>	<p>Supply of quality seeds through ICAR, ATMA, NSC, SAUs</p>

		<p>Paddy based cropping System</p> <ol style="list-style-type: none"> a. Paddy b. Paddy + Black Gram (black gram in bund) c. Paddy + soybean (in bunds) 	<p>Vegetable crops</p> <p>Potato: Kufri Jyoti, K. Chandramukhi, Kufri Badshah, K. Kanchan, K. Megha, K. Giriraj</p> <p>Cabbage: Pusa Mukta, Green Ball, Bahar, Green Express, BC-76</p> <p>Cauliflower: Pusa Kartik Shanker, Suwashini, Girija, Barkha, Excel-16, Pusa Sukti, Dania Kalimpong.</p> <p>Knol-Khol : Pusa Virat, Winner,</p> <p>Tomato: Avinash, Anup, Romeo, All Rounder, Rockey, Rupali, Kashi Vishesh</p> <p>Broccoli: Everest, Aishwarya, Palam Samridhi, Pusa KTS-1, Puspa.</p> <p>Pea : Arkel, Arka Ajit, Vivek Matar 9, Vivek Matar 8, Bonville, Azad.</p> <p>Cowpea: Kashi Kanchan, Pusa Komal.</p> <p>Carrot: Pusa Asita, Pusa Pudhira.</p> <p>Okra: VL Bhindi 1, Kashi Mangali, Kashi Vibhuti, Kashi Pragati, Kashi Satdhari.</p> <p>Brinjal: Pusa Sheetal, Pusa Shyamal, Pusa Bhairav, Kashi Taru, PPL, PPR.</p> <p>French bean: Arka Komal, Arka Sunidhi, VL Lata Bean 17, VL Lata Bean 12.</p> <p>Bottle Gourd: Pusa Naveen, Pusa Summer Prolific Long.</p> <p>Turmeric : Lakadong, Megha Turmeric-1</p> <p>Citrus : Sikkim Mandarin</p> <p>Large Cardamom : Ramsay, Sawaney, Golsey, Varlangey</p> <p>Paddy- Sughandha-2, PD-10, KRH-2; Local (Attay, basmati Krishna bhog, japani</p> <p>Black gram: local</p>	<p>with green leaves</p> <p>Solanaceous crops should be planted in well drained, slightly sloppy land</p> <p>SRI technique of paddy cultivation (20 X 20) cm</p>	
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Condition	Major Farming situation	Normal Crop / Cropping system	Change in crop / cropping system including variety	Agronomic measures	Remarks on Implementation
Early season drought (delayed onset)	Rainfed	Maize based Cropping System a. Maize + Finger Millet (intercropping, Higher Altitude) b. Urd (after maize, lower elevation) c. Maize + Soyabean (intercropping, higher elevation) d. Maize + Ginger (Mid altitude region) e. Maize + Vegetables/ wheat/Barley f. Rabi Maize + Vegetables/ Mustard/Tori g. Maize + Potato/ Vegetables h. Maize + Topoica Perennial crops –Sikkim Mandarin, Large cardamom, other fruits	Field crops : Finger millet : Indaf- 5, 8, 9, local (murkay, Mithay), VL Mandua-315, VL Mandua-324 Maize : C-1415, C-1837, HQPM-1, Vivek-15, Vivek -9, Vivek-23 (Hybrid), Suwan Composite, Local Urd: Paheli dal (local) Soybean: PK-1042, 1024, PK-262, local (black bold) , VL-soya-47 Ginger : Nadia, Bhaisey Barley : VL-46, VL Barley-1, HBL-276, HBL-1 Topoica : Local Horticultural crops Potato: Kufri Jyoti, K. Chandramukhi, Kufri Badshah, K. Kanchan, K. Megha, K. Giriraj Cabbage: Pusa Mukta, Green Ball, Bahar, Green Express, BC-76 Cauliflower: Pusa Kartik Shanker, Suwashini, Girija, Barkha, Excel-16, Pusa	Mulching in ginger Wider spacing (60 X 30) cm for maize Frequent interculture operation for conservation of moisture Selection of short duration varieties (80-90) days Management of soil acidity Intercropping of pulses with maize Timely thinning to maintain proper spacing Mulching of crops	Supply of quality seeds through ICAR, ATMA, NSC, SAUs
Delay by 8 weeks					
August 1 st week					

		<p>Sukti, Dania Kalimpong. Knol-Khol : Pusa Virat, Winner, Tomato: Avinash, Anup, Romeo, All Rounder, Rockey, Rupali, Kashi Vishesh Broccoli: Everest, Aishwarya, Palam Samridhi, Pusa KTS-1, Puspa. Pea : Arkel, Arka Ajit, Vivek Matar 9, Vivek Matar 8, Bonville, Azad. Cowpea: Kashi Kanchan, Pusa Komal. Carrot: Pusa Asita, Pusa Pudhira. Okra: VL Bhindi 1, Kashi Mangali, Kashi Vibhuti, Kashi Pragati, Kashi Satdhari. Brinjal: Pusa Sheetal, Pusa Shyamal, Pusa Bhairav, Kashi Taru, PPL, PPR. French bean: Arka Komal, Arka Sunidhi, VL Lata Bean 17, VL Lata Bean 12. Bottle Gourd: Pusa Naveen, Pusa Summer Prolific Long. Turmeric : Lakadong, Megha Turmeric-1 Citrus : Sikkim Mandarin Large Cardamom : Ramsay, Sawaney, Golsey, Varlangey</p> <p>Paddy based cropping System</p> <ol style="list-style-type: none"> Paddy Paddy + Black Gram (black gram in bund) Paddy + soybean (in bunds) 	<p>with green leaves</p> <p>Early sowing of winter vegetables/ field crops</p> <p>SRI technique of paddy cultivation (20 X 20) cm</p>	
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Condition			Suggested Contingency measures		
			Crop management	Soil nutrient &	Remarks on
Early season	Major	Normal Crop / Cropping			

drought (Normal onset)	Farming situation	system		moisture conservation measures	Implementation
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/ crop stand etc.	Rainfed	Maize based Cropping System a. Maize + Finger Millet (intercropping, Higher Altitude) b. Urd (after maize, lower elevation) c. Maize + Soyabean (intercropping, higher elevation) d. Maize + Ginger (Mid altitude region) e. Maize + Vegetables/ wheat/Barley f. Rabi Maize + Vegetables/ Mustard/Tori g. Maize + Potato/ Vegetables h. Maize + Topoica Perennial crops –Sikkim Mandarin, Large cardamom, other fruits	Field crops : Finger millet : Indaf- 5, 8, 9, local (murkay, Mithay), VL Mandua-315, VL Mandua-324 Maize : C-1415, C-1837, HQPM-1, Vivek- 15, Vivek -9, Vivek-23 (Hybrid), Suwan Composite, Local Urd: Paheli dal (local) Soybean: PK-1042, 1024, PK-262, local (black bold) , VL-soya-47 Ginger : Nadia, Bhaisey Wheat: HD 2402, HD 2643, HD-2687, PBW- 343, VL 798, VW 0254, VW 0270, VW 0321, VL Gehun 832, VL Gehun 802 Barley : VL-46, VL Barley-1, HBL-276, HBL-1 Topoica : Local Mustard / Rapeseed: TS-29, TS-36, TS-38 TM-2, M 27, SS-I-II, Pusa Jaikisan, Pusa bold Horticultural crops Potato: Kufri Jyoti, K. Chandramukhi, Kufri Badshah, K. Kanchan, K. Megha, K. Giriraj Cabbage: Pusa Mukta, Green Ball, Bahar, Green Express, BC-76 Cauliflower: Pusa Kartik Shanker, Suwashini, Girija, Barkha, Excel-16, Pusa Sukti, Dania Kalimpong. Knol-Khol : Pusa Virat, Winner, Tomato: Avinash, Anup, Romeo, All Rounder, Rockey, Rupali, Kashi Vishesh Broccoli: Everest, Aishwarya, Palam Samridhi, Pusa KTS-1, Puspa. Pea : Arkel, Arka Ajit, Vivek Matar 9, Vivek Matar 8, Bonvelle, Azad. Cowpea: Kashi Kanchan, Pusa Komal.	Mulching with green/ dry leaves Wider spacing (60 X 30) cm for maize Frequent interculture operation for conservation of moisture Cover cropping with main crop Furrow application of FYM Soil moisture conservation measures to be followed	Supply of quality seeds through ICAR, ATMA, NSC, SAUs

		<p>Paddy based cropping System</p> <ol style="list-style-type: none"> Paddy Paddy + Black Gram (black gram in bund) Paddy + soybean (in bunds) 	<p>Carrot: Pusa Asita, Pusa Pudhira. Okra: VL Bhindi 1, Kashi Mangali, Kashi Vibhuti, Kashi Pragati, Kashi Satdhari. Brinjal: Pusa Sheetal, Pusa Shyamal, Pusa Bhairav, Kashi Taru, PPL, PPR. French bean: Arka Komal, Arka Sunidhi, VL Lata Bean 17, VL Lata Bean 12. Bottle Gourd: Pusa Naveen, Pusa Summer Prolific Long. Turmeric : Lakadong, Megha Turmeric-1 Citrus : Sikkim Mandarin Large Cardamom : Ramsay, Sawaney, Golsey, Varlangey</p> <p>Paddy- Sughandha-2, PD-10, KRH-2; Local (Attay, basmati Krishna bhog, japani) Black gram: local</p>	<p>Early sowing of winter vegetables/ field crops</p> <p>Water harvesting in Jalkund for life saving irrigation</p>	
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Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Mid season drought (long dry spell consecutive 2 weeks rainless, (> 2.5mm) period)					

<p>At vegetative stage</p>	<p>Rainfed</p>	<p>Maize based Cropping System a. Maize + Finger Millet (intercropping, Higher Altitude) b. Urd (after maize, lower elevation) c. Maize + Soyabean (intercropping, higher elevation) d. Maize + Ginger (Mid altitude region) e. Maize + Vegetables/ wheat/Barley f. Rabi Maize + Vegetables/ Mustard/Tori g. Maize + Potato/ Vegetables h. Maize + Topoica Perennial crops –Sikkim Mandarin, Large cardamom, other fruits</p>	<p>Field crops : Finger millet : Indaf- 5, 8, 9, local (murkay, Mithay), VL Mandua-315, VL Mandua-324 Maize : C-1415, C-1837, HQPM-1, Vivek-15, Vivek -9, Vivek-23 (Hybrid), Suwan Composite, Local Urd: Paheli dal (local) Soybean: PK-1042, 1024, PK-262, local (black bold) , VL-soya-47 Ginger : Nadia, Bhaisey Wheat: HD 2402, HD 2643, HD-2687, PBW- 343, VL 798, VW 0254, VW 0270, VW 0321, VL Gehun 832, VL Gehun 802 Barley : VL-46, VL Barley-1, HBL-276, HBL-1 Topoica : Local Mustard / Rapeseed: TS-29, TS-36, TS-38 TM-2, M 27, SS-I-II, Pusa Jaikisan, Pusa bold Horticultural crops Potato: Kufri Jyoti, K. Chandramukhi, Kufri Badshah, K. Kanchan, K. Megha, K. Giriraj Cabbage: Pusa Mukta, Green Ball, Bahar, Green Express, BC-76 Cauliflower: Pusa Kartik Shanker, Suwashini, Girija, Barkha, Excel-16, Pusa Sukti, Dania Kalimpong. Knol-Khol : Pusa Virat, Winner, Tomato: Avinash, Anup, Romeo, All Rounder, Rockey, Rupali, Kashi Vishesh Broccoli: Everest, Aishwarya, Palam Samridhi, Pusa KTS-1, Puspa. Pea : Arkel, Arka Ajit, Vivek Matar 9,</p>	<p>Mulching with green/ dry leaves Wider spacing (60 X 30) cm for maize Frequent interculture operation for conservation of moisture Life saving irrigation Cover cropping with main crop Furrow application of FYM Soil moisture conservation measures to be followed Early sowing of winter vegetables/ field crops Water harvesting in Jalkund for life saving irrigation</p>	<p>Supply of quality seeds through ICAR, ATMA, NSC, SAUs</p>
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		<p>Vivek Matar 8, Bonville, Azad. Cowpea: Kashi Kanchan, Pusa Komal. Carrot: Pusa Asita, Pusa Pudhira. Okra: VL Bhindi 1, Kashi Mangali, Kashi Vibhuti, Kashi Pragati, Kashi Satdhari. Brinjal: Pusa Sheetal, Pusa Shyamal, Pusa Bhairav, Kashi Taru, PPL, PPR. French bean: Arka Komal, Arka Sunidhi, VL Lata Bean 17, VL Lata Bean 12. Bottle Gourd: Pusa Naveen, Pusa Summer Prolific Long. Turmeric : Lakadong, Megha Turmeric-1 Citrus : Sikkim Mandarin Large Cardamom : Ramsay, Sawaney, Golsey, Varlangey</p> <p>Paddy- Sughandha-2, PD-10, KRH-2; Local (Attay, basmati Krishna bhog, japani Black gram: local</p> <p>Paddy based cropping System</p> <ol style="list-style-type: none"> Paddy Paddy + Black Gram (black gram in bund) Paddy + soybean (in bunds) 		
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Condition	Major Farming situation	Normal Crop/cropping system	Suggested Contingency measures		
			Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Mid season drought (long dry)					

spell)					
At flowering/ fruiting stage	Rainfed	<p>Maize based Cropping System</p> <p>a. Maize + Finger Millet (intercropping, Higher Altitude)</p> <p>b. Urd (after maize, lower elevation)</p> <p>c. Maize + Soyabean (intercropping, higher elevation)</p> <p>d. Maize + Ginger (Mid altitude region)</p> <p>e. Maize + Vegetables/ wheat/Barley</p> <p>f. Rabi Maize + Vegetables/ Mustard/Tori</p> <p>g. Maize + Potato/ Vegetables</p> <p>h. Maize + Topoica</p> <p>Perennial crops –Sikkim Mandarin, Large cardamom, other fruits</p> <p>Paddy based cropping System</p> <p>a. Paddy</p> <p>b. Paddy + Black Gram (black gram in bund)</p> <p>c. Paddy + soybean (in bunds)</p>	<p>Wider spacing (60 X 30) cm for maize</p> <p>Furrow application of FYM</p> <p>Cover cropping with main crop</p>	<p>Mulching with green/ dry leaves</p> <p>Frequent interculture operation for conservation of moisture</p> <p>Life saving irrigation</p> <p>Soil moisture conservation measures to be followed</p> <p>Water harvesting in Jalkund for life saving irrigation</p>	Supply of quality seeds through ICAR, ATMA, NSC, SAUs

Condition			Suggested Contingency measures		
Terminal drought (early)	Major farming situation	Normal Crop/cropping system	Crop management	Rabi Crop Planning	Remarks on Implementation

withdrawal of Monsoon)					
At vegetative stage	Rainfed	<p>Maize based Cropping System</p> <p>a. Maize + Finger Millet (intercropping, Higher Altitude)</p> <p>b. Urd (after maize, lower elevation)</p> <p>c. Maize + Soyabean (intercropping, higher elevation)</p> <p>d. Maize + Ginger (Mid altitude region)</p> <p>e. Maize + Vegetables/ wheat/Barley</p> <p>f. Rabi Maize + Vegetables/ Mustard/Tori</p> <p>g. Maize + Potato/ Vegetables</p> <p>h. Maize + Topoica</p> <p>Perennial crops –Sikkim Mandarin, Large cardamom, other fruits</p> <p>Paddy based cropping System</p> <p>a. Paddy</p> <p>b. Paddy + Black Gram (black gram in bund)</p> <p>c. Paddy + soybean (in bunds)</p>	<p>Mulching with green/ dry leaves</p> <p>Wider spacing (60 X 30) cm for maize</p> <p>Life saving irrigation</p> <p>Cover cropping with main crop</p> <p>Furrow application of FYM</p> <p>Soil moisture conservation measures to be followed</p> <p>Frequent interculture operation for conservation of moisture</p> <p>Water harvesting in Jalkund for life saving irrigation</p>	Sowing of mustard during September in dry field	Supply of quality seeds through ICAR, ATMA, NSC, SAUs

2.1.2 Drought - Irrigated situation – Not applicable

Condition	Suggested Contingency measures				
	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delayed release of water in canals due to low rainfall	Paddy field	Paddy (sub merged condition)		SRI	
Limited release of water in canals due to low rainfall	Not applicabl				
Non release of water in canals under delayed onset of monsoon in catchment					
Lack of inflows into tanks due to insufficient /delayed onset of monsoon					
Insufficient groundwater recharge due to low rainfall					

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

Condition	Suggested contingency measure			
	Vegetative stage	Flowering stage	Crop maturity stage	Post harvest
Continuous high rainfall in a short span leading to water logging				
Maize	Ridge planting, proper drainage	Provide drainage	Drain out water, Harvesting at physiological maturity stage	Shift to safer and dry place
Soyabean	Ridge planting, proper drainage	Provide drainage	Drain out water	Shift to safe place, dry in shade and turn frequently
Blackgram	Provide drainage	Provide drainage	Drain out water	Safe storage in dry place, protect against storage pest and disease
Paddy	Drain out excess water	Drain out excess water	Drain out excess water	Dry and safe storage, protect against storage pest and disease
Rape seed & mustard	Ridge planting, proper drainage	Provide drainage		Dry and store in air tight condition
Finger millet	Drain out excess water	Drain out excess water	Drain out excess water	Shift to safer and dry place
Horticulture				
Orange & other fruits	Provide drainage, protection from fungal diseases	Provide drainage, protection from fungal diseases	Drainage, protection from fungal diseases	Store in shady and dry place, quick marketing
Ginger	Ridge planting, drainage, protection from fungal diseases	Proper drainage	Drainage,	Dry and safe storage at optimum temperature
Cardamom	protection from fungal diseases	protection from fungal diseases	protection from fungal diseases	Quick drying and safe storage
Vegetables	Ridge planting, provide drainage and protection from fungal disease	Provide drainage	Drainage	Dry and shift to safer place having optimum temperature

Heavy rainfall with high speed winds in a short span²				
Outbreak of pests and diseases due to unseasonal rains				
Maize	Need based plant protection IPDM, disease resistant varieties, IPM for pluses	Need based plant protection,IPDM, IPM for pluses		Safe storage, protection against storage pest and diseases
Finger millet				
Rape & mustard				
Urd				
Soyabean				
Paddy				
Horticulture				
Mandarin	Need based plant protection IPDM	Need based plant protection IPDM		Safe storage, protection against storage pest and diseases
Other fruits				
Ginger	Need based plant protection IPDM	Need based plant protection IPDM	Harvest the crop	Safe storage, protection against storage pest and diseases
Cardamon				
Vegetables	Resistant varieties	Bio control		
Other spices				
	Crop rotation			

2.3 Floods: Not experienced

Condition	Suggested contingency measure ^o			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Transient water logging/ partial inundation				
Continuous submergence for more than 2 days				
Sea water intrusion				

2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone : Not experienced / encountered

Extreme event type	Suggested contingency measure ^f			
	Seedling / nursery stage	Vegetative stage	Reproductive stage	At harvest
Heat Wave				
Cold wave				
Mustard	Irrigation Nursery should be raised inside well covered structure and about 50 percent more seedlings should be raised	Irrigation Replanting Planting of trees to act as wind break Staking of plants	Irrigation Planting of trees (wind break)	Go for early harvest
Pea				
wheat				
Finger millet Soybean				
Horticulture				
Cardamom	Irrigation Nursery should be raised inside well covered structure and about 50 percent more seedlings should be raised	Irrigation Replanting Planting of trees to act as wind break Staking of plants	Irrigation Planting of trees (wind break)	Go for early harvest
Orange				
Potato				
Vegetables				
Frost				
Mustard	Irrigation Frost resistant varieties to be selected Raised nursery About 50% more seedlings to be raised	irrigation irrigation irrigation	irrigation irrigation irrigation	
Finger millet				
Pea				
wheat				
Urd				
Rape seed & mustard				
Horticulture				
Mandarin	Protected by shade net Irrigation Raised nursery	Irrigation Replanting	Irrigation	Go for early harvest
Other fruits				

	More seedlings to be planted	Planting of trees to act as wind break Staking of plants	Planting of trees (wind break)	
Cardamom	Protected by shade net and irrigation Raised nursery More seedlings to be planted			
Potato	Irrigation Frost resistant variety			
Vegetables Other spices	Protected in poly tunnel or poly house or shade house Raised nursery Frost resistant variety			
Hailstorm				
Maize	Nursery should be raised inside well covered structure and about 50 percent more seedlings should be raised	Replanting Planting of trees to act as wind break Staking of plants	Planting of trees (wind break)	Go for early harvest
wheat				
Mustard				
Urd				
Rape & mustard				
Horticulture				
Vegetables	Use Hailstrom net Raised nursery More seedlings to be planted	Replanting Planting of trees to act as wind break Staking of plants	Planting of trees (wind break)	Go for early harvest
Orange	Use hailstorm net in nursery			
Cardamom	Use hailstorm net in nursery Raised nursery More seedlings to be planted			
Ginger Spices				
Cyclone				

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event ^s	During the event	After the event
Drought			
Feed and fodder availability	<ul style="list-style-type: none"> • Insurance • Cultivation of perennial fodder on bunds and waste land • Establishing fodder banks, encouraging fodder crops in irrigated area • Silage – using excess fodder for silage 	<ul style="list-style-type: none"> • Utilizing fodder from perennial trees and fodder bank reserves • Utilizing fodder stored in silos • Transporting excess fodder from adjoining districts 	<ul style="list-style-type: none"> • Availing Insurance • Culling of unproductive livestock
Drinking water	<ul style="list-style-type: none"> • Preserving water in the tank for drinking purpose • Water harvesting in Jalkund Structure 	<ul style="list-style-type: none"> • Using preserved water in the tanks for drinking 	
Health and disease management	<ul style="list-style-type: none"> • Veterinary preparedness with medicines and vaccines 	<ul style="list-style-type: none"> • Conducting mass animal Health Camps and treating the affected ones in the campaign 	<ul style="list-style-type: none"> • Culling sick / unproductive animals
Floods	NA		
Cyclone	NA		
Cold wave			
Shelter/environment management	<ul style="list-style-type: none"> • Construction of animal house preferably with wooden plank flooring with the provision of a well-protected half wall surrounding the house to protect the livestock from direct effect of cold. 	<ul style="list-style-type: none"> • Renovation of existing animal house. • Floor should always be kept clean and dry. • Use of gunny bags for covering the uncovered portion of the side wall 	

	<ul style="list-style-type: none"> • Selection of site that allows good wind control is preferable. 	during night	
Health and disease management	Veterinary preparedness with medicines and vaccines	Balanced feeding. Supplementation of vitamin and mineral mixtures. Vaccination and animal health camp.	Culling of affected animals
Any other i. Landslide ii. Earthquake	<ul style="list-style-type: none"> • Cultivation of broom grass, napier, bamboo etc 		

2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event ^a	During the event	After the event	
Drought				
Shortage of feed ingredients	Insurance & Integration Establishing feed serve bank	Utilizing from feed serve banks	Availing insurance Strengthening the feed serve Banks	
Drinking water	Rain water harvesting/ Jalkund	Utilising the stored water		
Health and disease management	Emergency Veterinary preparedness with medicines, vaccination for treatment	Campaign and Mass Vaccination	Culling affected birds	

Housing management	Heat insulation of roof walls			
Floods				
Cyclone				
Cold wave				
Shelter/environment management	Insurance Create scientific brooding facilities for chicks Keep in stock, dried locally available litter materials like saw dust, paddy husk, etc Heat insulation	Improved brooding practices Maintain brooding temperature through continuous electricity supply	Culling & disposal of sick birds	
Health and disease management	Veterinary preparedness with medicines and vaccines	Urgent vaccination and quarantine of affected birds Supplementation of vitamins		

2.5.3 Fisheries/ Aquaculture : Not applicable

	Suggested contingency measures		
	Before the event ^a	During the event	After the event
1) Drought			
A. Capture			
B. Aquaculture			

2) Floods			
A. Capture			
B. Aquaculture			
3. Cyclone / Tsunami			
4. Heat wave and cold wave			