



भारतीय कृषि
ICAR

INDIAN COUNCIL OF
AGRICULTURAL RESEARCH

DISTRICT WISE CONTINGENCY PLAN TO DEAL WITH **EL NIÑO**

PREPAREDNESS | RESPONSE | RESILIENCE



BUILDING A
DROUGHT RESILIENT
MANIPUR

MANIPUR



PADDY



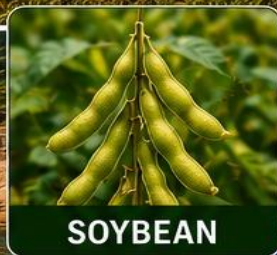
MAIZE



BLACK GRAM



GREEN GRAM



SOYBEAN



EARLY WARNING
& MONITORING



WATER
MANAGEMENT



SUSTAINABLE
AGRICULTURE



COMMUNITY
PARTICIPATION

TOGETHER, LET'S BUILD A RESILIENT MANIPUR

PREPARE TODAY • PROTECT TOMORROW • PROSPER TOGETHER

Manipur

Manipur, located in the north eastern region of India, is predominantly an agrarian state where agriculture is the primary source of livelihood for a large proportion of the rural population. The state is characterized by fertile valley plains surrounded by hills, providing diverse agro-climatic conditions suitable for the cultivation of cereals, pulses, oilseeds, horticultural crops, and plantation crops. Although the state receives abundant rainfall, agriculture remains largely dependent on the timely onset and proper distribution of the southwest monsoon. Variability in rainfall significantly affects crop production, food security, and rural livelihoods.

Major Kharif crops include Paddy, maize, soybean, pigeon pea, black gram, green gram, sesame, and vegetables. During the Rabi season, wheat, rapeseed-mustard, lentil, pea, potato, and vegetables are cultivated in suitable irrigated areas. Horticultural crops such as pineapple, orange, passion fruit, banana, ginger, turmeric, and large cardamom are also important contributors to the state's agricultural economy. Manipur receives an average annual rainfall of 1,400–2,000 mm, with nearly 75–80% occurring during the southwest monsoon (June–September). Hence, agriculture is highly dependent on the timely arrival and distribution of monsoon rainfall.

Historical Impact of El Niño on Manipur

Manipur is vulnerable to El Niño-induced monsoon variability, which often results in delayed monsoon onset, below-normal rainfall, and prolonged dry spells during the Kharif season. These conditions reduce soil moisture, lower water availability for irrigation, and adversely affect paddy cultivation, which is the dominant crop in the state. Moisture stress also reduces the productivity of maize, pulses, oilseeds, and horticultural crops. During severe El Niño years, reduced agricultural production, water scarcity, and declining farm incomes negatively impact the livelihoods and food security of rural communities.

Effects on Major Crops

- Paddy: Delayed nursery raising and transplanting, poor tillering, and reduced grain yield.
- Maize: Poor germination, reduced cob development, and lower grain filling.
- Soybean: Poor flowering, reduced pod formation, and lower yields.
- Black Gram: Flower drop and poor pod development.
- Green Gram: Reduced flowering and productivity due to moisture stress.

- Sesame: Poor capsule development and reduced seed filling.
- Rapeseed-Mustard: Delayed sowing due to inadequate residual soil moisture.
- Ginger: Poor rhizome development under prolonged dry spells.
- Turmeric: Reduced rhizome growth and lower productivity.
- Vegetables: Moisture stress causes reduced growth, flower drop, and lower yields.

Contingency Plans for Major Crops Grown in Manipur

Crop	El Niño Situation	Recommended Contingency Measures
Paddy	Delayed monsoon and transplanting	Community nursery, direct-seeded Paddy (DSR), short-duration varieties, moisture conservation
Maize	Delayed sowing	Early-maturing hybrids, ridge sowing, mulching
Soybean	Delayed monsoon	Short-duration varieties, seed treatment, line sowing
Black Gram (Urd bean)	Late sowing	Short-duration varieties, foliar nutrition
Green Gram (Moong bean)	Dry spells	Early maturing varieties, foliar spray of 2% urea
Sesame	Failure of soybean sowing	Use as contingency crop, line sowing
Rapeseed-Mustard	Poor residual moisture	Early sowing, protective irrigation
Ginger	Moisture stress	Mulching, raised beds, supplemental irrigation
Turmeric	Delayed rainfall	Organic mulching, protective irrigation
Vegetables	Water scarcity	Drip irrigation, mulching, cultivation of short-duration vegetables

Agriculture in Manipur is highly dependent on the southwest monsoon and is therefore vulnerable to El Niño-induced rainfall deficits. Delayed monsoon onset, prolonged dry spells, and reduced soil moisture significantly affect the productivity of Paddy, maize, pulses, oilseeds, and horticultural crops. Adoption of drought-tolerant varieties, efficient water management, rainwater harvesting, mulching, and climate-smart agricultural practices will improve the resilience and sustainability of Manipur's agriculture under El Niño condition.

Districts vulnerable to El Nino

High	Medium	Low
Imphal East, Senapati, Tamenglong, Tengnoupal, Ukhrul	Nil	Nil

Actionable Comprehensive Plans for Contingency

State	MANIPUR	District	IMPHAL EAST
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	734.9	More than 19%	Less than 595.269
June	205.3		
July	212.3		
August	161.9		
September	155.4		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	0	Gross irrigated area:	0
Net Rainfed area		Gross rainfed area	

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	-	-
Wells	-	-
Tanks	-	-
Other sources	-	-

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	0	0	
2	Jowar	-	-	
3	Maize	0		
4	Bajra	-		
5	Ragi	-		

Pulses& Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	-		
4	Soyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		
4	Other Fodder crops	-		

Crop Plan- Beginning of the season

Condition		Suggested Contingency measures			
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 4 weeks (July 1 st week)	AES-I : Sub-tropical middle high land	Paddy/ Paddy-Rapeseed mustard/ Pea Blackgram – Rabi vegetable Blackgram/Soybean – Rabi oilseed/pulses/ vegetables Paddy – Potato/Watermelon/ bottlegourd/pumpkin	No change No change	- Direct sowing of rice, ploughing the field in advance (during April - May)	-

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 4 weeks (July 1 st week)	AES-II : Sub-tropical low lying	Paddy / Paddy – Rapeseed mustard	No change Ring bundh model, Paddy in main field suitable kharif oilseed & pulses or other vegetables on the bundhs, fish in the trench	Dapog nursery, Direct sowing of rice	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 4 weeks (July 1 st week)	AES-III : Sub-tropical hilly terrain	Kharif crops (soybean, blackgram, groundnut, cassava, sweet potato, longbean, ricebean, frenchbean, kidneybean, mung); rabi crops (potato, pea, pumpkin, bottlegourd, colocassia, yam)	Prefer short duration varieties in different crops for example Soybean: JS-335, Local		

Contingency measures- Mid season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 6 weeks (July 3 rd week)	AES-I : Sub-tropical middle high land	Paddy/ Paddy-Rapeseed mustard/ Pea Blackgram – Rabi vegetable Blackgram/Soybean – Rabi oilseed/pulses/vegetables	Paddy – Potato Paddy – Vegetables Greengram /Blackgram/ Soybean/ Groundnut – Rabi oilseed/pulses/vegetables	Dapog nursery, Direct sowing of rice	-

Delay by 8 weeks (August 1 st week)		Paddy – Potato/Watermelon/ bottlegourd/pumpkin	Paddy – Monocrop Paddy – Watermelon/ bottlegourd/ pumpkin/vegetables Blackgram/Rabi oilseed & pulses/ vegetables	Direct sowing of short duration rice varieties Dapog nursery Drought continued in Manipur during 2009 upto 1 st week of November, under such situation, rabi crops like field pea, wheat, lentil, lathyrus etc. followed by pre-kharif oilseed & pulses may be taken up.	
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Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on implementation
Delay by 6 weeks (July 3 rd week)	AES-II : Sub-tropical low lying	Paddy / Paddy – Rapeseed mustard	No change	Direct sowing of short duration paddy varieties	
Delay by 8 weeks (August 1 st week)			Ring bundh model, Paddy in main field suitable kharif oilseed & pulses or other vegetables on the bundhs, fish in the trench		

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on implementation
Delay by 6 weeks (July 3 rd week)	AES-III : Sub-tropical hilly terrain	Kharif crops (soybean, blackgram, groundnut, cassava, sweet potato, longbean, ricebean, frenchbean, kidneybean, mung); rabi crops (potato, pea, pumpkin, bottlegourd, colocassia, yam)	Prefer short duration varieties in different crops for example Soybean: JS-335, Local		
Delay by 8 weeks (August 1 st week)			Plan for early rabi crops with pulses (Blackgram) or vegetables		

Contingency measures- End of the season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on implementation

Delay by 8 weeks (August 1 st week)	AES-I : Sub-tropical middle high land	Paddy/ Paddy-Rapeseed mustard/ Pea Blackgram – Rabi vegetable Blackgram/Soybean – Rabi oilseed/pulses/vegetables Paddy – Potato/Watermelon/bottlegourd/pumpkin	Paddy – Monocrop Paddy – Watermelon/bottlegourd/pumpkin/vegetables Blackgram/Rabi oilseed & pulses/vegetables	Direct sowing of short duration rice varieties Dapog nursery Drought continued in Manipur during 2009 upto 1 st week of November, under such situation, rabi crops like field pea, wheat, lentil, lathyrus etc. followed by pre-kharif oilseed & pulses may be taken up.	-
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Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 8 weeks (August 1 st week)	AES-II : Sub-tropical low lying	Paddy / Paddy – Rapeseed mustard	No change Ring bundh model, Paddy in main field suitable kharif oilseed & pulses or other vegetables on the bundhs, fish in the trench		

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on implementation
Delay by 8 weeks (August 1 st week)	AES-III : Sub-tropical hilly terrain	Kharif crops (soybean, blackgram, groundnut, cassava, sweet potato, longbean, ricebean, frenchbean, kidneybean, mung); rabi crops (potato, pea, pumpkin, bottlegourd, colocassia, yam)	Plan for early rabi crops with pulses (Blackgram) or vegetables		

Irrigated situation

Condition			Suggested Contingency measures
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	Major Farming situation	Normal crop/ cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
Delayed / limited release of water in canals due to low rainfall	AES-I : Sub-tropical middle high land	Paddy – Monocrop Paddy – Rapeseed mustard Paddy – Pea Blackgram – Rabi vegetable Blackgram/Soybean – Rabi oilseed/pulses/vegetables Paddy – Potato Paddy – Watermelon/ bottlegourd/pumpkin	Not required	Not required	
	AES-II : Sub-tropical low lying	Paddy – Monocrop Paddy – Rapeseed mustard			
	AES-III : Sub-tropical hilly terrain	Kharif crops (soybean, blackgram, groundnut, cassava, sweet potato, longbean, ricebean, frenchbean, kidneybean, mung); rabi crops (potato, pea, pumpkin, bottlegourd, colocassia, yam)			

Resource management technologies

Crop diversification through climate resilient groundnut variety ICGS-76

Climate vulnerability: Moisture stress

Background:

Paddy is the traditional crop cultivated in the fields of the tribal farmers. This is often not sustainable nor profitable. To sustain the food requirement of the burgeoning population in the fragile hilly rainfed uplands, improvement in agricultural productivity through the adoption of improved crop varieties suitable to targeted environments is the need of the hour. Also, crop diversification with oilseed crops such as groundnut in the existing cropping pattern (rice/maize) in the degraded sloppy uplands assures better nutritional security by providing vegetable protein and edible oils.

Resilient technology

Groundnut var. ICGS-76 has shown greater adaptability in the degraded strong acid soils of hilly ecosystems. A proven high yielding variety, it matures in 120 days and is tolerant to bud necrosis disease besides having good recovery from mid-season drought. This crop has been able to withstand several abiotic stresses (soil degradation from Jhuming, acidity) and thus, they could produce up to 60.3% higher mean dry pod yield over local varieties under similar agro-ecosystem management.

Performance and impact of technology

Crop diversification with groundnut has ensured better productivity and profitability with higher net returns without any extra cost to the existing production system. This is also offered a viable alternative to the existing low profit cereal based cropping systems (rice/maize- fallow) in the region, thereby improving sub-optimal cropping intensity (cropping intensity and area diversification in the degraded soils of the district. The farmers have achieved a yield of 20.5 quintals ha⁻¹ as compared to 16.58 (q ha⁻¹) in traditional varieties and achieving a yield increase of 19.12%

Actionable Comprehensive Plans for Contingency

State	MANIPUR	District	SENAPATI
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	766.8	More than 19%	Less than 621.108
June	209.8		
July	211.2		
August	181.6		
September	164.2		

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:	0	Gross irrigated area:	0
Net Rainfed area		Gross rainfed area	

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	-	-
Wells	-	-
Tanks	-	-
Other sources	-	-

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	0	0	
2	Jowar	-	-	
3	Maize	0		
4	Bajra	-		
5	Ragi	-		

Pulses& Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	-		
4	Soyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		
4	Other Fodder crops	-		

Contingency measures- Mid season

Condition			Suggested Contingency measures		
	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Mid-season drought (Long dry spell stage)	Rainfed, Terrace, Upland	Rice	Weeding, Nutrient, pest & disease magt.	Split appln of K2O	
		Maize	Weeding, Nutrient, pest & disease	Balanced appln of NPK & forrow sowing	

			magt., Mulching	
		Cabbage	Weeding, Nutrient, pest & disease magt., Mulching	Balanced appln of NPK
		Potato	Weeding, Nutrient, pest & disease magt., Mulching, late variety	Balanced appln of NPK
		Blackgram/Greengram	Weeding, Mulching, late variety, Short duration	Balanced appln of NPK

Condition			Suggested Contingency measures		
	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Mid season drought (Long dry spell consecutive 2 weeks rainless long dry)					

At flowering / fruiting stage	Rainfed, Terrace, Upland Rainfed,	Rice		Care & management	
			Life saving irrigation		

		Maize	Weed magt.	Mulching, Life saving irrigation
		Cabbage	Irrigation	Mulching, Life saving irrigation
		Potato	Irrigation	Mulching, Life saving irrigation
		Blackram/Greengram	Irrigation	Life saving irrigation

Condition			Suggested Contingency measures		
Terminal drought	Major Farming situation	Normal Crop/cropping system	Crop management	Rabi Crop planning	Remarks on Implementation
(Early withdrawal of monsoon)	Rainfed,	Rice	Early sowing, Weeding, Nutrient, pest & disease magt.	Mustard	
				Mustard	
	Terrace, Upland Rainfed,	Maize	Early sowing, Weeding, Nutrient, pest & disease magt		
		Cabbage Potato	Early sowing, Weeding, Nutrient, pest & disease magt Early sowing, Weeding, Nutrient, pest	Cabbage	
				Pea	

			& disease magt		
		Blackgram/Greengram	Early sowing, Weeding, Nutrient, pest & disease magt, short duration	Potato	

Contingency measures- End of the season

Condition			Suggested Contingency measures		
Terminal drought	Major Farming situation	Normal Crop/cropping system	Crop management	Rabi Crop planning	Remarks on Implementation
(Early withdrawal of monsoon)	Rainfed,	Rice	Early sowing, Weeding, Nutrient, pest & disease magt.	Mustard	
				Mustard	
	Terrace, Upland Rainfed,	Maize	Early sowing, Weeding, Nutrient, pest & disease magt		
		Cabbage	Early sowing, Weeding, Nutrient, pest & disease magt	Cabbage	
		Potato	Early sowing, Weeding, Nutrient, pest & disease magt	Pea	

			Early sowing, Weeding, Nutrient, pest & disease magt, short duration		
		Blackgram/Greengram		Potato	

Drought - Irrigated situation-- not applicable

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	Not applicable				
Limited release of water in canals due to low rainfall					
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					
Insufficient flow of water in streams					

Resource management technologies

Conserving soil health: Minimum tillage in pea cultivation

Climate vulnerability: Moisture stress

Background: Excessive tillage in hilly terrain of Senapathi district in Manipur leads to loss of top fertile surface soil.

Details of the technology

After harvesting of paddy crop, the field is fallow due to moisture constraint. Hence minimum tillage was demonstrated in Senapati district for pea cultivation. This helps farmers to upgrade

their household income improving quality of life and motivated for better farm income activities. Presently the minimum tillage has become an eye opener amongst the farmers from NICRA village as well as the neighboring farmers of the NICRA village.

Performance and impact of technology

The improved pea variety Prakash with minimum tillage recorded 28.7 and 66.1% higher yield and net returns when compared to the local check. This underscores the potential of enhanced agricultural practices to boost economic viability, suggesting that farmers may benefit from adopting such interventions for improved financial outcomes.

Intercropping of groundnut and maize

Climate vulnerability: Moisture stress

Background: Sole cropping is risky records lower yields and incomes. Further it may also lead to soil erosion. Maize being the erosion permitting crop the sole crop of maize increases soil erosion and nutrient loss. In addition to this in appropriate farming practices such as Jhum cultivation and deforestation aggravates the situation and results in severe soil degradation

Resilient technology

To minimise or to check soil erosion and degradation, maize intercropped with groundnut as cover crop is recommended for soil and moisture conservation and nutrient recycling. Maize: groundnut system was planted in 1:2 and 1:3.

Performance and impact of technology

The yield, gross return, and B:C ratio of maize/groundnut intercrop were found higher than that sole crop maize. Sole cropping system recorded lower B:C ratio (2.5) than intercropping system (3.1). Maize Equivalent Yield (MEY) in intercropping was 49.5 q ha⁻¹ whereas sole crop of maize recorded 31.5 q ha⁻¹ (Table 2.2.2). Besides yield advantage intercropping helps in conservation of soil moisture, reduce erosion and thereby conserves soil resources, suppression of weeds and increase in crop yields.

Actionable Comprehensive Plans for Contingency

State	MANIPUR	District	TAMENGLONG
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	4019.4	More than 19%	Less than 3255.714
June	1317.1		
July	1213.6		
August	667.3		
September	821.4		

Forecast probability for the season (as per IMD):Below Normal

Irrigation info:

Net irrigated area:	0	Gross irrigated area:	0
Net Rainfed area		Gross rainfed area	

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals	-	-
Wells	-	-
Tanks	-	-
Other sources	-	-

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice	0	0	
2	Jowar	-	-	
3	Maize	0		
4	Bajra	-		
5	Ragi	-		

Pulses& Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram	-		
2	Groundnut	-		
3	Sesamum	-		
4	Soyabean	-		
5	Sunflower	-		
6	Castor	-		

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton	-		
2	Jute	-		
3	Mesta	-		
4	Sunhemp	-		

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane	-		
2	Tobacco	-		
3	Guar seed	-		
4	Other Fodder crops	-		

Crop Plan- Beginning of the season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
Delay by 4 weeks 1 st week of May	Shallow red soils	Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	IWMP
		Maize	Choose alternate crops like pulses	Mulching	ISOPOM
		Chilli	Pulse crop/ Intercropping	Bamboo drip irrigation	NFSM
	Upland	Orange/Perennial plantation	Choose alternate crops like pulses	Drip irrigation, & Mulching	IWMP
		Banana	Prefer dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	IWMP

		King Chilli	Choose alternate crops like pulses	Bamboo drip irrigation & mulching practice	NFSM
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching	
		Banana	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching	
	Eroded hill slops	Pigeon pea	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching	
		Jackfruits/ Perennial plantation	Jackfruit	Mulching	
		Papaya	Papaya	Rice husk mulching	

Contingency measures- Mid season

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
Delay by 6 weeks 3rd week of May	Shallow red soils	Paddy/Main crop	Upland rice/ Mixed cropping	Decrease spacing & Mulching	IWMP
		Maize	Maize short duration var.	Mulching	ISOPOM
		King Chilli	King Chilli	Mulching	NFSM
	Upland	Orange/ Perennial plantation	Pulses crops & Intercropping	Drip irrigation, cover crop & Mulching	IWMP
		Banana	Prefer Dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	IWMP
		King Chilli	Chilli with pulses crops	Bamboo drip irrigation & mulching practice	NFSM
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching	-
		Banana	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching	
	Eroded hill slops	Pigeon pea	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching	
		Jackfruits/ Perennial plantation	Jackfruit	Mulching	
		Papaya	Papaya	Rice husk mulching	

Condition				Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation ^e	
Delay by 8 weeks 1 st week of June	Shallow red soils	Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	IWMP	
		Maize	Prefer short duration var.	Mulching	ISOPOM	
		Chilli	Chilli	Bamboo drip irrigation	NFSM	
	Upland	Orange/ Perennial plantation	Choose Pulses crops & Intercropping	Drip irrigation, cover crop & Mulching	IWMP	
		Banana	Prefer dwarf & drought resistant variety	Supplemental irrigation & Mulching	IWMP	
		Paddy	Upland rice/ Mixed cropping	Mulching	IWMP	
		King Chilli Intercropping	Chilli with pulses crops	Bamboo drip irrigation & mulching practice	NFSM	
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching		
		Banana	Dwarf & drought resistant variety		IWMP	
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching		
	Eroded hill slopes	Pigeon pea	Dwarf & drought resistant variety	Mulching	IWMP	
		Colocasia	Colocasia with pulses crops	Decrease spacing & Mulching		
		Jackfruits/ Perennial plantation	Jackfruit	Mulching		
		Papaya	Papaya	Rice husk mulching		

Condition						Suggested Contingency measures		
Mid season drought (Long dry spell)				Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
At flowering / fruiting stage	Shallow red soils	Upland rice	Intercropping with pulses	Mulching Supplemental irrigation			-	
		Maize	Intercropping with pulses crops					
	Uplands	Orange	Pulses crops & Intercropping	Supplemental irrigation & Mulching				
		Banana	Pulses crops & Intercropping					

		Paddy	Upland rice/ Mixed cropping		
		King Chilli	Pulses crops & Intercroppin g	Drip irrigation & mulching	
	Mediu m lands	Tree bean/ Perennial plantatio n	Pulses crops & Intercroppin g	Supplemental irrigation & Mulching	
		Banana	Dwarf & drought resistant variety		
		Colocasia	Pulses crops & Intercroppin g		
	Eroded hill slope	Pigeon pea	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	
		Colocasia	Colocasia with pulses crops	Mulching	
		Papaya	Pulses crops & Intercroppin g	Rice husk mulching	

Contingency measures- End of the season

Contingency measures - End of the season					
Condition			Suggested Contingency measures		
Terminal drought	Major Farming situation	Normal Crop/ cropping system	Crop management	Rabi Crop planning	Remarks on Implementation
	Shallow red soils	Upland rice	Resowing & Crop rotation	Intercropping with short duration pulses	-
		Maize	Intercropping with pulses crops		
		King Chilli	Intercropping with pulses crops		
	Uplands	Orange/ Perennial plantation	Pulses crops & Intercropping	Soil & moisture conservation practices like cover crop & Mulching	
		Banana	Dwarf & drought resistant variety		
		Paddy	Upland rice/ Mixed cropping		
		King Chilli	King Chilli with pulses crops	Bamboo drip irrigation & mulching practice	
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching	
		Banana	Dwarf & drought resistant variety		
		Colocasia	Colocasia with pulses crops		

	Eroded hill slope	Pigeon pea	Dwarf & drought resistant variety	Supplemental irrigation & Mulching Rice husk mulching	
		Colocasia	Colocasia with pulses crops		
		Papaya	Pulses crops & Intercropping		

Irrigated situation

Condition			Suggested Contingency measures		
Delayed release of water in canals due to low rainfall	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
	Shallow red soils	Upland rice	Upland rice/ Mixed cropping	Decrease spacing & Mulching	-
		Maize	Prefer short duration var.	Mulching	
		King Chilli	Pulses crops & Intercropping	Bamboo drip irrigation	
	Uplands	Orange/ Perennial plantation	Intercropping with pulses crops to conserve soil & moisture	Supplemental irrigation & Mulching	
		Tree bean/ Perennial plantation			
		Pigeon pea/ Intercropping	Dwarf & drought resistant variety		
	Medium lands	Banana	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	
		Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	
		Chilli	Chilli with pulses crops	Bamboo drip irrigation & mulching	

Condition			Suggested Contingency measures		
Limited release of water in canals due to low rainfall	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
	Shallow red soils	Upland rice	Upland rice/ Mixed cropping	Decrease spacing & Mulching	-
		Maize	Maize short duration var.	Mulching	
		King Chilli	Pulses crops & Intercropping	Bamboo drip irrigation	
	Uplands	Orange/ Perennial plantation	Pulses crops & Intercropping	Supplemental irrigation & Mulching	
		Tree bean/ Perennial plantation	Intercropping with pulses crops		
		Pigeon pea/ Intercropping	Dwarf & drought resistant variety		
	Medium lands	Banana	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	
		Paddy	Upland rice/ Mixed cropping	Decrease spacing & Mulching	
		Chilli	King Chilli with pulses crops	Bamboo drip irrigation & mulching practice	

Condition			Suggested Contingency measures		
Non-release of water in canals under delayed onset of monsoon in catchment	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
	Uplands	Upland rice	Pulses	Decrease spacing & Mulching	-
		Maize		Mulching	
		King Chilli		Bamboo drip irrigation	
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching	
		Orange/ Perennial plantation	Intercropping with pulses crops to conserve soil & moisture	Cover crop & Mulching	
		Pigeon pea/ Intercropping	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	

Condition			Suggested Contingency measures		
Lack of inflows into tanks due to insufficient/ delayed onset of monsoon	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation
	Uplands	Upland rice	Upland rice/ Mixed cropping	Decrease spacing & Mulching	-
		Maize	Maize short duration var.	Mulching	
		King Chilli	Pulses crops & Intercropping	Bamboo drip irrigation	
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching	
		Orange/ Perennial plantation		Cover crops & Mulching	
		Pigeon pea/ Intercropping	Dwarf & drought resistant variety	Supplemental irrigation & Mulching	

Condition			Suggested Contingency measures			
Insufficient groundwater recharge due to low rainfall	Major Farming situation	Normal Crop/cropping system	Change in crop/ cropping system	Agronomic measures	Remarks on Implementation	
	Uplands	Upland rice	Upland rice/ Mixed cropping	Decrease spacing & Mulching	-	
		Maize	Pulses crops & Mixed cropping	Mulching		
		King Chilli	King Chilli/Mixed cropping	Bamboo drip irrigation & Mulching		
	Medium lands	Tree bean/ Perennial plantation	Intercropping with pulses crops	Supplemental irrigation & Mulching		
		Orange/Perennial plantation				
		Pigeon pea/ Intercropping	Dwarf & drought resistant variety			

Resource management technologies

Crop diversification through climate resilient groundnut variety ICGS-76

Climate vulnerability: Moisture stress

Background:

Paddy is the traditional crop cultivated in the fields of the tribal farmers. This is often not sustainable nor profitable. To sustain the food requirement of the burgeoning population in the fragile hilly rainfed uplands, improvement in agricultural productivity through the adoption of improved crop varieties suitable to targeted environments is the need of the hour. Also, crop diversification with oilseed crops such as groundnut in the existing cropping pattern (rice/maize) in the degraded sloppy uplands assures better nutritional security by providing vegetable protein and edible oils.

Resilient technology

Groundnut var. ICGS-76 has shown greater adaptability in the degraded strong acid soils of hilly ecosystems. A proven high yielding variety, it matures in 120 days and is tolerant to bud necrosis disease besides having good recovery from mid-season drought. This crop has been able to withstand several abiotic stresses (soil degradation from Jhuming, acidity) and thus, they could produce up to 60.3% higher mean dry pod yield over local varieties under similar agro-ecosystem management.

Performance and impact of technology

Crop diversification with groundnut has ensured better productivity and profitability with higher net returns without any extra cost to the existing production system. This is also offered a viable alternative to the existing low profit cereal based cropping systems (rice/maize- fallow) in the region, thereby improving sub-optimal cropping intensity (cropping intensity and area diversification in the degraded soils of the district. The farmers have achieved a yield of 20.5 quintals ha⁻¹ as compared to 16.58 (q ha⁻¹) in traditional varieties and achieving a yield increase of 19.12%

Crop diversification with Soybean for climate resilience

Climate vulnerability: Moisture stress

Background:

The tribal farmers of the district traditionally practice mono-cropping. Unfortunately, rice cultivation is subjected to the erratic and uncertain rainfall. To increase crop productivity and improve soil fertility, soybean was introduced. But the area under soybean was very limited in this region due to lack of improved varieties, poor agronomic practices such as higher seed rate, irregular sowing time, defective method of sowing etc. which made it a highly unpopular crop in the district.

Resilient technology

To improve farm productivity as well as to retain soil fertility the improved soybean var DSb-19 was introduced. Soybean was found to be possessing a very high nutritional value along with high yield potential. Besides being a good climate resilient crop, it is also a rich source of protein, they are also important for sustainable agriculture enriching the soil through biological nitrogen fixation. These crops fit well in the various cropping systems without disturbing the main cereal crops. Hence, it is important to develop high yielding variety of this crop.

Performance and impact of technology

The soybean cultivation was carried out to demonstrate the production and economic benefit of adopting improved technologies through line sowing at 45 cm x 15 cm spacing in adopted farmer's fields. The crops were harvested at maturity stage. The farmers have greatly benefitted and achieved a yield of 18.58 q ha⁻¹ as compared to 12.80 q ha⁻¹ in traditional varieties thus achieving a yield increase of 31.11 %

Actionable Comprehensive Plans for Contingency

State	MANIPUR	District	TENGNOUPAL
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Rainfall info (mm)

Month/season	Normal rainfall (mm)	Expected deficiency, %	Expected rainfall (mm)
June-Sep	0	More than 19%	Less than 0
June			
July			
August			
September			

Forecast probability for the season (as per IMD): Below Normal

Irrigation info:

Net irrigated area:		Gross irrigated area:	
Net Rainfed area		Gross rainfed area	0

Source wise irrigation area details (ha)

Source of irrigation	Net	Gross
Canals		
Wells		
Tanks		
Other sources		

Crop Profile (Kharif)

Cereals

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Rice			0
2	Jowar			0
3	Maize			0
4	Bajra			0
5	Ragi			0

Pulses& Oilseeds

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Arhar/ Redgram			0
2	Groundnut			0
3	Sesamum			0
4	Soyabean			0
5	Sunflower			0
6	Castor			

Fibre

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Cotton			0
2	Jute			0
3	Mesta			0
4	Sunhemp			0

Other crops

S.No	Crop name	Total area (ha)	Irrigated area (ha)	Rainfed area (ha)
1	Sugarcane			0
2	Tobacco			0
3	Guar seed			0
4	Other Fodder crops			0

Crop Plan- Beginning of the season

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 4 weeks (July 1 st week)	Lowland silty clay loam soils (rainfed)	Paddy-mustard or rape/ Paddy-Pea/ Paddy-potato/ Paddy-vegetables	Rice variety –Pariphou,PAC 807(F1),Leimaphou,Lungnila,Tamphaphou followed by Kufri Jyoti	Rice to be transplanted density 10x10 cm & 3-4 seedlings/hill	
	Medium land – silty clay to clay	Rice-vegetables	French bean or cabbage or broccoli or bottle gourd, or pumpkin or bitter gourd. Transplanting with short duration varieties (Pari,807) broadcasting of leima, Tampha,Lungnila.	-	

	loam soils (Rainfed)				
	Foot hills with gentle slope with clay loam soils (Rainfed)	Pulses,oilseeds	-	-	

Contingency measures- Mid season

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 6 weeks July 3 rd week	Lowland silty clay loam soils (rainfed)	Paddy-oilseed	Rice-Pari,Norin 18,Moirangphou(local) followed by pulses-Arkel,Azad,lentil,gram	Broadcasting sprouted seedlings of rice	
		Paddy-pulses	Maize-Pusa early hybrid maize	-	
		Paddy-vegetables	French bean or cabbage or broccoli or bottle gourd, or pumpkin or bitter gourd.	-	
	Foot hills with gentle slope with clay loam soils (Rainfed)	Blackgram	Blackgraml: T-9	Adopt line sowing	

Condition			Suggested Contingency measures		
Early season drought (delayed onset)	Major Farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomic measures	Remarks on Implementation
Delay by 8 weeks (August 1 st week)	Not applicable				

Condition			Suggested Contingency measures		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measues	Remarks on Implementation
At vegetative stage	Lowland silty clay loam soils (rainfed)	Rice-pea Rice-oilseed Rice-Potato-cucurbits Rice-vegetable	Vegetables	Repairing of bunds to check leakage Mulching	

Condition			Suggested Contingency measures		
Mid season drought (long dry spell)	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
At flowering/ fruiting stage	Lowland silty clay loam soils (rainfed)	Rice-Pea Rice-Mustard Rice-Potato-Pumpkin	Application of anti-transpirant like kaoline (2%) Foliar application of MOP 1.5%		

Contingency measures- End of the season

Contingency measures – End of the season			Suggested Contingency measures		
Condition	Major Farming situation	Normal Crop/cropping system	Crop management	Soil nutrient & moisture conservation measures	Remarks on Implementation
Early season drought (Normal onset)	Lowland silty clay loam soils (rainfed)	Rice-pea-Rice Rice-Mustard Rice-Potato-Cucurbits Rice-Vegetables	Maintain dry nursery to use for gap filling		
	Foot hills with gentle slope with clay loam soils (Rainfed)	Oilseeds & pulses	Gap filling	Mulching	
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.					
Condition			Suggested Contingency measures		
Terminal drought	Major Farming situation	Normal Crop/cropping system	Crop management	Rabi Crop planning	Remarks on Implementation
	Lowland silty clay loam soils (rainfed)	Rice-Pea Rice-Mustard Rice-Potato-Pumpkin	Harvest at physiological maturity	Early planting of rabi crops.	Seed from reliable sources through RKVY,ATMA

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