



भारतीय कृषि  
ICAR

INDIAN COUNCIL OF  
AGRICULTURAL RESEARCH

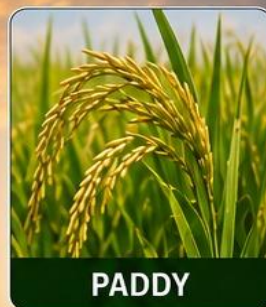
# DISTRICT WISE CONTINGENCY PLAN TO DEAL WITH **EL NIÑO**

PREPAREDNESS | RESPONSE | RESILIENCE



BUILDING A  
DROUGHT RESILIENT  
MEGHALAYA

**MEGHALAYA**



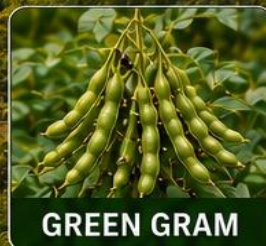
PADDY



MAIZE



BLACK GRAM



GREEN GRAM



SOYBEAN



EARLY WARNING  
& MONITORING



WATER  
MANAGEMENT



SUSTAINABLE  
AGRICULTURE



COMMUNITY  
PARTICIPATION

**TOGETHER, LET'S BUILD A RESILIENT MEGHALAYA**

PREPARE TODAY • PROTECT TOMORROW • PROSPER TOGETHER



## **Meghalaya**

Meghalaya, located in the northeastern Himalayan region of India, is an agrarian state where agriculture is the primary source of livelihood for a majority of the rural population. The state is known for its high rainfall, undulating hills, and rich biodiversity. Agriculture is predominantly rainfed, with both traditional shifting cultivation (Jhum) and settled farming practiced across different regions. The diverse agro-climatic conditions support the cultivation of cereals, pulses, oilseeds, spices, fruits, and plantation crops, making agriculture an important contributor to the state's economy and food security.

Major Kharif crops include Paddy, maize, finger millet, soybean, black gram, green gram, sesame, ginger, turmeric, and vegetables. During the Rabi season, rapeseed-mustard, potato, pulses, wheat (limited areas), and vegetables are cultivated. Horticultural crops such as pineapple, orange, banana, arecanut, black pepper, bay leaf, and broom grass are also important contributors to farmers' income. Meghalaya receives an average annual rainfall of 2,000–4,000 mm, with nearly 75–80% occurring during the southwest monsoon (June–September). Therefore, agricultural production depends heavily on the timely onset and proper distribution of monsoon rainfall.

### **Historical Impact of El Niño on Meghalaya**

Meghalaya is vulnerable to El Niño-induced monsoon variability, which often causes delayed monsoon onset, below-normal rainfall, and prolonged dry spells despite the state's generally high annual rainfall. Reduced rainfall lowers soil moisture, stream flow, and groundwater recharge, affecting rainfed agriculture and horticulture. Major crops such as Paddy, maize, ginger, turmeric, soybean, and fruits experience moisture stress during critical growth stages, resulting in reduced productivity. El Niño also affects spring water sources and increases water scarcity in upland areas, thereby impacting rural livelihoods and food security.

### **Effects on Major Crops**

- Paddy: Delayed nursery raising, poor transplanting, reduced tillering, and lower grain yield.
- Maize: Poor germination, reduced cob formation, and lower grain filling.
- Finger Millet: Reduced ear-head development and lower grain yield.
- Soybean: Poor flowering, reduced pod formation, and lower productivity.
- Black Gram & Green Gram: Flower drop and reduced pod development.

- Sesame: Poor capsule formation and reduced seed filling.
- Ginger: Poor rhizome development due to moisture stress.
- Turmeric: Reduced rhizome growth and lower yields.
- Orange & Pineapple: Fruit drop, poor fruit size, and reduced quality.
- Vegetables: Moisture stress reduces growth, flowering, and marketable yield.

### Contingency Plans for Major Crops Grown in Meghalaya

| Crop                   | El Niño Situation      | Recommended Contingency Measures                                                              |
|------------------------|------------------------|-----------------------------------------------------------------------------------------------|
| Paddy                  | Delayed monsoon        | Community nursery, direct-seeded Paddy (DSR), short-duration varieties, moisture conservation |
| Maize                  | Delayed sowing         | Early-maturing hybrids, ridge sowing, mulching                                                |
| Finger Millet          | Moisture stress        | Early sowing, line sowing, moisture conservation                                              |
| Soybean                | Delayed monsoon        | Short-duration varieties, seed treatment                                                      |
| Black Gram (Urdbean)   | Late sowing            | Short-duration varieties, foliar nutrition                                                    |
| Green Gram (Moongbean) | Dry spells             | Early maturing varieties, foliar spray of 2% urea                                             |
| Sesame                 | Rainfall deficit       | Use as contingency crop, line sowing                                                          |
| Ginger                 | Moisture stress        | Mulching, raised beds, supplemental irrigation                                                |
| Turmeric               | Delayed rainfall       | Organic mulching, protective irrigation                                                       |
| Rapeseed-Mustard       | Poor residual moisture | Early sowing, protective irrigation                                                           |

Agriculture in Meghalaya 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 adversely affect Paddy, maize, millets, pulses, spices, and horticultural crops. Adoption of drought-tolerant varieties, efficient water management, rainwater harvesting, mulching, watershed development, and climate-smart agricultural practices can significantly improve the resilience and sustainability of Meghalaya's agriculture under El Niño conditions.

### Districts vulnerable to El Nino

| High            | Medium                                                                                                             | Low                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| West Garo Hills | East Garo Hills, East Khasi Hills, North Garo Hills, South Garo Hills, South West Garo Hills, South West Khasi Hi* | East Jaintia Hills, Ribhoi, West Jaintia Hills, West Khasi Hills |

# Actionable Comprehensive Plans for Contingency

|       |           |          |                 |
|-------|-----------|----------|-----------------|
| State | MEGHALAYA | District | EAST GARO HILLS |
|-------|-----------|----------|-----------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1880.3               | More than 19%          | Less than 1523.043     |
| June         | 571.3                |                        |                        |
| July         | 528.1                |                        |                        |
| August       | 389.9                |                        |                        |
| September    | 391                  |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 6962  | Gross irrigated area: | 7580  |
| Net Rainfed area    | 16350 | Gross rainfed area    | 20831 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 6962 | 7580  |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 3444            | 3444                | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 839             |                     | 839               |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |

## Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 93              |                     | 93                |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 264             |                     | 264               |
| 4    | Soyabean       | 105             |                     | 105               |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | 17              |                     |                   |

## Fibre

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Cotton    | 306             |                     | 306               |
| 2    | Jute      | 45              |                     | 45                |
| 3    | Mesta     | 15              |                     | 15                |
| 4    | Sunhemp   | -               |                     |                   |

## Other crops

| S.No | Crop name          | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|--------------------|-----------------|---------------------|-------------------|
| 1    | Sugarcane          | 27              |                     | 27                |
| 2    | Tobacco            | 107             |                     | 107               |
| 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 including variety                                                                                                                                                       | Agronomic measures                              | Remarks on Implementation |
| Delay by 4 weeks (July 1 <sup>st</sup> week) | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli + Tapioca + Sweet Potato + Ginger + Turmeric | <b>Paddy:</b> Bhalum-1, Bhalum-2<br><b>Maize:</b> Da61a, Vijay composite<br><b>Intercropping:</b> Maize+ cowpea, Maize+ Blackgram/ greengram<br><b>Turmeric:</b> Lakadang, RCT-1<br><b>Ginger:</b> Nadia | Conservation furrow, Intercultivation, mulching | -                         |
|                                              | Rainfed medium land            | Sali Paddy(sole)<br>Sali paddy-mustard                                                     | <b>Paddy:</b> Sahsarang Swarna mahsuri                                                                                                                                                                   | SRI, ICM method for paddy cultivation           |                           |

|  |                 |                                                     |                                                          |                                                               |  |
|--|-----------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|--|
|  |                 | Maize (sole)                                        | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 | Mulching with weed spp. Adopt closer spacing 40x30cm in maize |  |
|  |                 | Maize-mustard/vegetable                             | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 |                                                               |  |
|  |                 | Cowpea, bhendi, amaranthus, chilli, banana, pumpkin |                                                          |                                                               |  |
|  | Rainfed lowland | Boropaddy                                           | <b>Boro paddy:</b> KRH-2, Jaymati, Naveen                |                                                               |  |

| Early and mid-season drought<br>Outbreak of pests and diseases due to unusual rains | Suggested contingency measures                                                                                                                                                                                                                                                                                               |                                                     |                                                                                                                                                        |                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | Vegetative stage                                                                                                                                                                                                                                                                                                             | Flowering stage                                     | Crop maturity                                                                                                                                          | Post harvest                                                                                                                                                                                                       |
| Paddy                                                                               | 1.Weed control<br>2.For seed and root pests and stem borers, seedling maggots and locust suitable IPM measures should be followed<br>3.For Rhizoctonia root rot-cultural, chemical (mancozeb 3g/lit of water for foliar application) and biological control                                                                  | Follow suitable crop protection measures            | Spray with suitable insecticides to avoid cut worm infestation<br><br>Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.    | Harvest the crop at maturity, dry properly and store in gunny bags.                                                                                                                                                |
| Pulses                                                                              | 1.Remove weeds<br>2.seedling mortality can be reduced by delayed planting until mid-November<br>3.For powdery mildew disease spray the crop at the appearance of the disease with wettable sulphur like sulfex. Spray at 15 days interval.<br>4 For hairy caterpillars and loopers spray with phosphomedon 2ml/lit of water. | Follow suitable crop protection measures            | Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.<br><br>After harvest collect the plants left in the field and burn them. | leave the harvested crop in small heaps for 2-3 days for curing. After curing collect the crop at one place and detach the pods either by hand or using groundnut plucker for separating the pods from the plants. |
| Maize, pumpkin, tapioca, sweet potato(mixed cropping)                               | Need based plant protection measures both IPM & IDM.                                                                                                                                                                                                                                                                         | Need based plant protection measures both IPM & IDM | Need based plant protection measures both IPM & IDM                                                                                                    | -                                                                                                                                                                                                                  |

#### 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 |
| <b>Delay by 6 weeks</b> (July 3 <sup>rd</sup> week) | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Intercropping:</b><br>Maize+ cowpea(2:1),<br>Maize+Blackgram/<br>greengram(1:1)<br>Blackgram: T 9, kalindi<br>Green gram: K-851, samrat<br>Soybean: JS 80-21, JS 335 | Conservation furrow, mulching, harvest green cob of maize |                           |

|  |                     |                                            |                                                                          |                                                            |  |
|--|---------------------|--------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|--|
|  | Rainfed medium land | Sali Paddy<br>Sali paddy-mustard/vegetable | <b>Paddy:</b> Satyaranjan, Basundhara<br>French bean, Bhendi, Amaranthus | SRI/ICM method for Paddy cultivation, Zero tillage Mustard |  |
|  | Rainfed lowland     | Boropaddy                                  | <b>Boro paddy:</b> Jaymati, Kanaklata, Naveen                            |                                                            |  |

| 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                                                                                                                               | Soilnutrient&moisture conservation measures                   | Remarks on Implementation |
| At vegetative stage                                                                | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Weeding, Life saving irrigation from Jalkund, farm pond                                                                                       | Jalkund, mulching, conservation furrow, repair bunds          |                           |
|                                                                                    | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Dual cropping of paddy with Azolla<br>Postponement of topdressing of Nitrogen, life saving irrigation, IPM, IDM for pest & disease management | Azolla, Compost, Vermicompost, Integrated nutrient management |                           |
|                                                                                    |                         | Maize (sole)                                                                             |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Maize-mustard/vegetable                                                                  |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Cowpea, French bean, coriander, radish, palak                                            |                                                                                                                                               |                                                               |                           |
| Rainfed lowland                                                                    | Boropaddy               | No change                                                                                | -                                                                                                                                             |                                                               |                           |

| Condition                           |                                |                                                                                          | Suggested Contingency measures                |                                                       |                           |
|-------------------------------------|--------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|---------------------------|
| Mid season drought (long dry spell) | Major Farming situation        | Normal Crop/cropping system                                                              | Crop management                               | Soilnutrient&moisture conservation measures           | Remarks on Implementation |
| At flowering/ fruiting stage        | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Life saving irrigation from Jalkund, fam pond | Jalkund, Vermicompost @ 2t/ha,                        |                           |
|                                     | Rainfed medium to shallow land | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Weeding, life saving irrigation               | Vermicompost@ 2t/ha, FYM@ 5 t/ha, Mulching, farm pond |                           |
|                                     |                                | Maize (sole)                                                                             | Earthing up for maize                         |                                                       |                           |
|                                     |                                | Maize- mustard/vegetable                                                                 |                                               |                                                       |                           |
|                                     | Rainfed lowland                | Boropaddy                                                                                | Life saving irrigation                        |                                                       |                           |

**Contingency measures- End of the season**



| Condition                                                            |                         |                                                                                          | Suggested Contingency measures                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
|----------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Terminal drought<br>(Early withdrawal of monsoon)                    | Major Farming situation | Normal Crop/cropping system                                                              | Crop management                                                                           | Rabi Crop planning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Remarks on Implementation |
| Heavy uneven rainfall, mid season dry spell, medium to shallow soils | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Harvest mature crops<br><br>Damaged crops may used as fodder depending on the suitability | Plan for Winter vegetables ( cabbage, cauliflower, tomato, broccoli etc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |
|                                                                      | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   |                                                                                           | Mustard, Pea Vegetables greengram                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
|                                                                      |                         | Maize (sole)                                                                             | Harvest green cob                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
|                                                                      |                         | Maize-mustard/vegetable                                                                  |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
|                                                                      |                         | Cole crops, French bean, radish, carrot,                                                 | Cole crops nursery under protected polyhouse, Ridge plot for frenchbean, radish           | - Rabi cropping with cole crops such as Cauliflower (mid season varieties – Improved japaneses, Pusa Synthetic, Pusa snowball etc. ) and Cabbage ( Varieties – Golden acre, Pride of india, Pusa Mukta etc.), Knolkhol (White viena) etc.<br>- Growing of Tomato, Brinjal, pea, potato and Leafy vegetables like Spinach, Radish etc. with recommended varieties and package of practices.<br>--Growing of rabi field crops like toria, lentil,<br>- Rabi cropping with cole crops such as Cauliflower (mid season varieties – Improved japaneses, Pusa Synthetic, Pusa snowball etc. ) and Cabbage ( Varieties – Golden acre, Pride of |                           |

|  |                 |           |  |                                                                                                                                                                                                                                                            |  |
|--|-----------------|-----------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                 |           |  | india, Pusa Mukta etc.), Knolkhol (White viena) etc.<br>- Growing of Tomato, Brinjal, pea, potato and Leafy vegetables like Spinach, Radish etc. with recommended varieties and package of practices.<br>--Growing of rabi field crops like toria, lentil, |  |
|  | Rainfed lowland | Boropaddy |  |                                                                                                                                                                                                                                                            |  |

#### Drought - Irrigated situation

| Condition                                              | Major Farming situation | Normal Crop/cropping system            | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------|-------------------------|----------------------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                        |                         |                                        | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Delayed release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard | Boro paddy                     | Weeding, life saving irrigation | -                         |
|                                                        |                         | Maize (sole)                           | Intercropping                  | Earthing up for maize, Mulching |                           |
|                                                        |                         | Maize- mustard                         |                                |                                 |                           |
|                                                        |                         | Cowpea and frenchbean                  |                                |                                 |                           |

| Condition                                              | Major Farming situation | Normal Crop/cropping system                                              | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------|-------------------------|--------------------------------------------------------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                        |                         |                                                                          | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Limited release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard<br>Maize (sole)<br>Maize- mustard | Boro paddy<br>Rice-fallow      | Lifesaving irrigation, Mulching |                           |
|                                                        |                         | Bhindi, radish, tomato, abbage, cauliflower                              |                                |                                 |                           |

| Condition                                                                  | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                                   |                           |
|----------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|-----------------------------------|---------------------------|
|                                                                            |                         |                             | Change in crop/cropping system | Agronomic measures                | Remarks on Implementation |
| Non release of water in canals under delayed onset of monsoon in catchment | Lateritic soils         | Fallow                      | Sali Paddy(sole late sown)     | Life saving irrigation<br>weeding |                           |

| Condition |                         |                                  | Suggested Contingency measures |                    |                           |
|-----------|-------------------------|----------------------------------|--------------------------------|--------------------|---------------------------|
|           | Major Farming situation | Normal Crop/cropping system      | Change in crop/cropping system | Agronomic measures | Remarks on Implementation |
|           |                         | Tapioca, colocasia, sweet potato |                                |                    |                           |

| Condition                                                                |                         |                             | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                                          | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon | Medium to shallow land  | Fallow                      | Boro paddy                     | Weeding, life saving irrigation |                           |
|                                                                          |                         | Vegetables                  | Root crops, onion, colocasia   | Mulching                        |                           |

| Condition                                             |                            |                             | Suggested Contingency measures                 |                                                         |                           |
|-------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------|
|                                                       | Major Farming situation    | Normal Crop/cropping system | Change in crop/cropping system                 | Agronomic measures                                      | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | Low land shallow tube well | Cropping system 1: Fallow   | Boro paddy<br>Lentil, pea, mustard, vegetables | Limited irrigation at critical stages, SRI & ICM method |                           |

## Resource management technologies

### Jalkund – A boon for vegetable production

#### Background

The uncertain and erratic, high intense rains, lack of proper rainwater management leads to sewerwater scarcity, particularly during the post-monsoon season (November-April). This unavailability of adequate amount of water during the post rainy season (November-April) poses a serious problem for successful *rabi* vegetable cultivation. Hence, rainwater harvesting and storage is essential. Rainwater harvesting and efficient utilization hold promise in hilly areas and is a key to a sustainable livelihood.

#### Resilient technology

Jalkund, a micro low-cost rainwater harvesting structure is a suitable technology for providing climate resilience and improving the livelihood of small and marginal farmers. The water stored can be reused during moisture-stress periods. Jalkund is a water harvesting structure in which a pond of 5×4×1.5 m<sup>3</sup> is done at the selected site before the onset of the monsoon.

The Jalkunds are preferred on the hilltops and the upper portion of the slopes to divert water by the gravitational flow. A proper side slope is maintained for all four walls to provide stability and to hold the lining materials properly. The bottom and all sides of the Jalkund should be plastered with a slurry of clay and cow dung mixed in a ratio of 5:1 to avoid any damage to the lining material. After clay-plastering, about 3-5 cm thick cushioning should be done with locally available dry pineleaves, coir pith, paddy husk, thatch grass, etc. (@ 2–3 kg m<sup>-2</sup>) on the walls and bottom, to avoid any kind of damage to the lining material from any sharp or conical gravel, etc. This pit is lined with a Silpaulin lining film. This Jalkund has a storage capacity of 30,000 liters for harvesting rainwater during the rainy season and its subsequent use during dry periods to provide critical irrigation to high value winter vegetables.

The capacity of Jalkund can differ. Each Jalkund can harvest one and half times its original capacity considering its replenishment by intermittent rains and consequent evaporation loss of about 10%. A trench of 25×25 cm<sup>2</sup> has to be made around the Jalkund to bury the edges of lining materials and to hold the sheet firmly from all the corners.

**Ridge and furrow in maize**

**Climate vulnerability: Moisture stress, frost, erratic and intensive rainfall**

**Details of technology**

Ridges of 60 cm bottom width and 30 cm top width were prepared with 20 cm height. Unit cost for implementation of ridges and furrows was ₹ 4,500 ha<sup>-1</sup>.

**Performance and impact of technology**

Good germination percentage (91%) and higher plant stand was observed at harvest (87%) by adoption of ridges and furrows technology. The yield, net returns and BC ratio increased by 43%, 90% and 21% respectively (Table 2.1.10).

**Scope for upscaling**

Ridge and furrow technology has a potential for upscaling in rainfed terraces in collaboration with the concerned agriculture department.

**Black polythene mulch: A strategy for *in-situ* moisture conservation****Climate vulnerability: Drought, dry spell and cyclone****Background**

In North East region of India, rainfed farming is predominant. Rainfall is erratic and ill distribution hence, moisture stress is common. This soil moisture stress reduces crop growth, in addition to this the weed infestation and soil temperature is a major concern as it affects crop growth and germination.

**Resilient technology**

Black plastic mulch can be adopted as a low-cost and climate-smart agricultural technology, particularly suited to the hilly and high-rainfall areas of the North Eastern (NE) region of India. Plastic mulch moderates the soil temperature, reduces evaporation, and holds moisture in the soil. It also controls weeds, reduces soil erosion, protects plants from pests, and enhance crop resilience under variable climatic conditions which helps to increase both crop yield and quality. The black plastic film absorbs solar energy during the day, heating up and transferring warmth to the soil through conduction, especially when in close contact. This results in increased soil temperature, which supports early seed germination, vigorous root growth, and improved nutrient uptake, crucial in the cooler microclimates of NE hill states. At night, when temperatures drop especially under clear skies and dry air, the mulch helps to retain soil warmth, reducing thermal stress on crops. This diurnal temperature regulation is particularly beneficial for temperature sensitive vegetables like cabbage, cauliflower, broccoli and tomato.

**Performance and impact of technology**

The black plastic mulch (100 micron) is laid just before sowing the crop. Crops grow through slits and holes in thin plastic sheet. Plastic mulch showed a positive impact on yield and water use efficiency of plants. The mulching techniques are being used widely in irrigated crop production worldwide. It can also be implemented in summer vegetable production. Black plastic mulching produced higher weight of cabbage. The use of this technology improved crop yields and income of the farming community by 43% and 52% respectively (Table 2.1.11). The beneficiaries plan to increase the area under tomato and cabbage for sustainable production.

# Actionable Comprehensive Plans for Contingency

|       |           |          |                    |
|-------|-----------|----------|--------------------|
| State | MEGHALAYA | District | EAST JAINTIA HILLS |
|-------|-----------|----------|--------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 4490.6               | More than 19%          | Less than 3637.386     |
| June         | 1191.4               |                        |                        |
| July         | 1555.4               |                        |                        |
| August       | 882                  |                        |                        |
| September    | 861.8                |                        |                        |

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

## Irrigation info:

|                     |      |                       |      |
|---------------------|------|-----------------------|------|
| Net irrigated area: | 3520 | Gross irrigated area: | 3665 |
| Net Rainfed area    | 2800 | Gross rainfed area    | 4958 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 3520 | 3665  |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 25              | 25                  | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 432             |                     | 432               |
| 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        | 10              |                     | 10                |
| 4    | Soyabean       | 77              |                     | 77                |
| 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          | 5               |                     | 5                 |
| 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 including variety | Agronomic measures                    | Remarks on Implementation |
| Delay by 4 weeks<br>July 1 <sup>st</sup> week | 1.FS-I (Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very | Cropping System:1<br>Rice based Cropping System<br><br>a. Rice-<br>Ranjit,Bahadur,Pankaj | No Change                                          | Normal recommended practice of sowing | Sowing time-June to July  |

|                                                             |                                                                                                                                                                         |                                                                                                   |           |                                                                                                                                                                                                                                                     |                                               |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
|                                                             | steep slope (25-33%),rain fed.                                                                                                                                          | b. Maize-Vijay,Ganga-101,Ranjit,Deccan,Ganga-5,Gangasafed,Ganga-4,Amber,Sona,Kisan,Jawahar,Vikram | No Change | Normal recommended practice of sowing                                                                                                                                                                                                               | Sowing time-April to May                      |
|                                                             |                                                                                                                                                                         | c. Soyabean-Clark-63,BraggHill,Punjab-1,Hardee,Lee,Local                                          | No Change | Normal recommended practice of sowing                                                                                                                                                                                                               | Sowing time-June to July/August toSeptember   |
| Pre-monsoon<br>Delay by 4 weeks<br>May 1 <sup>st</sup> week | 1.FS-I<br>(Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed.    | Cropping system 2 : Horticulture basedcropping system<br>a.Citrus- Khasi mandarin                 | No change | Construction of half moon trenches<br>Intercropping with leguminous vegetables<br>Proper nutrient management should be followed<br>Cleaning of basin and mulching.                                                                                  | Planting time- June-August                    |
|                                                             |                                                                                                                                                                         | b. Arecanut – Local selection, Mangla, Sumangala                                                  | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with organic materials</li> </ul>                                                                                                            | Transplanting time – June- July               |
|                                                             |                                                                                                                                                                         | c. Black pepper-Panniyur 1, Panniyur 2                                                            | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with organic materials</li> </ul>                                                                                                            | Planting time-May-June                        |
|                                                             |                                                                                                                                                                         | d. Litchi - Muzaffarpur                                                                           | No change | Construction of half moon trenches<br>Intercropping with leguminous vegetables<br>Proper nutrient management should be followed<br>Cleaning of basin and mulching.                                                                                  | Planting time- June-August                    |
|                                                             |                                                                                                                                                                         | e. Potato – Kufri Jyoti, Kufri Megha                                                              | No change | <ul style="list-style-type: none"> <li>• Land should be thoroughly ploughed</li> <li>• Proper manuring with organic manures should be done</li> <li>• Life saving irrigation should be given at tuber initiation to tuber maturity stage</li> </ul> | Sowing time- October-November                 |
|                                                             | 2. FS-II<br>(Agri+Hort+AH+Seri)<br>Mid altitude areas.Elevation more than (600-1200m msl)heavy rainfall (less than 4000-8000mm)<br>Moderately-strongly sloping,rain fed | a.Rice-Shah Sarang I,LampnahI,RCPL 1-3,RCPL 3-3,Ngoba,Manipur                                     | No Change | Normal recommended practice of sowing                                                                                                                                                                                                               | Sowing time-May to June                       |
|                                                             |                                                                                                                                                                         | b.Maize-Local white,Localyellow,Vijay,Kisan,NLDwhite,Naveen,Ageti 76                              | No Change | Normal recommended practice of sowing                                                                                                                                                                                                               | Sowing time- March to April                   |
|                                                             |                                                                                                                                                                         | c.Soyabean- Clark-63,BraggHill,Punjab-1,Hardee,Lee,Local                                          | No Change | Normal recommended practice of sowing                                                                                                                                                                                                               | Sowing time- June to July/August to September |

|                                                            |                                                                                                                                                                         |                                                                             |           |                                                                                                                                                                                                                                                               |                                                   |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|                                                            |                                                                                                                                                                         |                                                                             |           |                                                                                                                                                                                                                                                               |                                                   |
| Premonsoon<br>Delay by 4 weeks<br>May 1 <sup>st</sup> week | 2. FS-II<br>(Agri+Hort+AH+Seri)<br>Mid altitude areas.Elevation more than (600-1200m msl)heavy rainfall (less than 4000-8000mm)<br>Moderately-strongly sloping,rain fed | Horticulture basedcropping system<br>a.Pineapple – Kew, Queen               | No Change | <ul style="list-style-type: none"> <li>• Normal sowing can be done</li> <li>• Land should be well prepared</li> <li>• Recommended dose of organic manure should be applied before planting</li> <li>• Mulching should be done with plant materials</li> </ul> | Planting time- May-August                         |
|                                                            |                                                                                                                                                                         | b.Turmeric- Lakadong, ,RCT-1                                                | No Change | <ul style="list-style-type: none"> <li>• Delay sowing till May</li> <li>• Land should be well prepared</li> <li>• Recommended dose of organic manure should be applied before planting</li> <li>• Mulching should be done with plant materials</li> </ul>     | Sowing time-April to May                          |
|                                                            |                                                                                                                                                                         | c.Ginger- Nadia, Suprabha, Thinglaidong, Thingpui                           | No Change | <ul style="list-style-type: none"> <li>• Delay sowing by May</li> <li>• Land should be well prepared</li> <li>• Recommended dose of organic manure should be applied before planting</li> <li>• Mulching should be done with plant materials</li> </ul>       | Sowing time- April to May                         |
|                                                            |                                                                                                                                                                         | d. Banana- Jahaji, Local variety                                            | No change | Intercropping with leguminous vegetables <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Cleaning of basin and mulching with plant materials</li> </ul>                                                         | Planting time- May-July                           |
|                                                            | 3. FS-III<br>(Agri+Hort+AH)High altitude areas. Elevation more 1200m msl+)Medium and heavy rainfall(4000-8000mm)Moderately sloping,rain fed                             | a.Rice-Megha Rice I,Megha Rice II,USI,Localvarieties                        | No Change | Normal recommended practice of sowing                                                                                                                                                                                                                         | Sowing time- April to 1 <sup>st</sup> week of May |
|                                                            |                                                                                                                                                                         | B .Maize-Local white, Local yellow, Vijay,Kisan,NLD white ,Naveen, Ageti 76 | No Change | Normal recommended practice of sowing                                                                                                                                                                                                                         | Sowing time- March to April                       |
|                                                            |                                                                                                                                                                         | c. Soyabean- Clark-63,BraggHill, Punjab-1,Hardee,Lee,Local                  | No Change | Normal recommended practice of sowing                                                                                                                                                                                                                         | Sowing time- June to July/August to September     |
| Pre-monsoon<br>Delay by 4 weeks                            | 3. FS-III<br>(Agri+Hort+AH)High altitude areas.Elevation more 1200m msl+)Medium                                                                                         | Horticulture based cropping system<br>a. Citrus- Khasi mandarin             | No change | Intercropping with leguminous vegetables<br>Construction of half moon trenches                                                                                                                                                                                |                                                   |

|                             |                                                                      |                                                               |           |                                                                                                                                                                                                                                                                                  |                                       |
|-----------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| May 1 <sup>st</sup><br>week | and heavy<br>rainfall(4000-<br>8000mm)Moderately<br>sloping,rain fed |                                                               |           | Proper nutrient management<br>should be followed<br>Cleaning of basin and<br>mulching.                                                                                                                                                                                           | Planting<br>time- June-<br>August     |
|                             |                                                                      | b. Potato– Kufri<br>Jyoti, Kufri Megha                        | No change | <ul style="list-style-type: none"> <li>Sowing can be done from February</li> <li>Land should be thoroughly ploughed</li> <li>Proper manuring with organic manures should be done</li> <li>Lifesaving irrigation should be given at tuber initiation to tuber maturity</li> </ul> | Sowing<br>time-<br>January -<br>March |
|                             |                                                                      | c. Turmeric-<br>Lakadong ,RCT-1                               | No Change | <ul style="list-style-type: none"> <li>Delay sowing till May</li> <li>Land should be well prepared</li> <li>Recommended dose of organic manure should be applied before planting</li> <li>Mulching should be done with plant materials</li> </ul>                                | Sowing<br>time-April to<br>May        |
|                             |                                                                      | d.Ginger- Nadia                                               | No Change | <ul style="list-style-type: none"> <li>Delay sowing till May</li> <li>Land should be well prepared</li> <li>Recommended dose of organic manure should be applied before planting</li> <li>Mulching should be done with plant materials</li> </ul>                                | Sowing<br>time- April<br>to May       |
|                             |                                                                      | e. Tomato- Hybrid<br>17, Jessica,<br>Namdhari,<br>Chiranjeevi | No change | <ul style="list-style-type: none"> <li>Delay sowing till March</li> <li>Apply recommended dose of organic manures</li> <li>Mulching with plant materials</li> <li>Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul>                              | Sowing<br>time- March-<br>July        |
|                             |                                                                      | f. Cabbage –<br>MahycoHybrid 139,<br>Wonderball               | No change | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with plant materials</li> <li>Life saving irrigation should be given at head formation stage</li> </ul>                                                                       | Sowing<br>time- March-<br>September   |

| Condition                                                                        |                         |                             | Suggested Contingency measures             |                                                |                           |
|----------------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------------------|------------------------------------------------|---------------------------|
| Mid-season drought (long dry spell consecutive 2 weeks rainless,(> 2.5mm) period | Major Farming situation | Normal Crop/cropping system | Crop management &Plant protection measures | Soil nutrient & moisture conservation measures | Remarks on Implementation |
|                                                                                  |                         |                             |                                            |                                                |                           |

|                     |                                                                                                                                                                    |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|                     |                                                                                                                                                                    |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |
| At vegetative stage | 1.FS-I (Agri+Hort+AH+Fisheri es)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | Rice                                                                              | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray Tricyclazole against blast</li> <li>Spray Carbendazim or Edinophos or Mancozeb against brown spot</li> <li>Release of bio agents Trichogramma spp or spraying of Chloropyriphos, Regent against stem borer and leaf folder</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>Weed out the field.</li> <li>Strength the field bunds &amp; close the holes</li> <li>Provide life saving irrigation.</li> <li>Inter-cultivation(Soil mulching)</li> <li>Open conservation furrow(give distance/interval)</li> <li>Organic mulching with previous crop residues.</li> <li>Compartmental bunding</li> <li>Follow ridge and furrow method of planning</li> </ul> | Sowing of good quality seeds.                |
|                     |                                                                                                                                                                    | Maize                                                                             | <ul style="list-style-type: none"> <li>Application of Metarrhizium anisopliae, Bacillus thuringiensis, Stinernemasppfor management of cutworm</li> <li>Application of Carbofuran for control of borer, cutworm, thrips, termite &amp; Shoot fly.</li> </ul>                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |
|                     |                                                                                                                                                                    | Soybean                                                                           | <ul style="list-style-type: none"> <li>Application of phorate for control of stem fly, blue beetle.</li> <li>Application of Methomyl for controlling defoliators, semiloopers etc</li> </ul>                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |
|                     |                                                                                                                                                                    | Cropping system 2 : Horticulture basedcropping system<br>a.Citrus- Khasi mandarin | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray Imidacloprid against soft bodied insect viz, psylla, miners, scales, aphids,mealy bugs ets</li> <li>Spray Neem oil against Citrus butterfly</li> <li>Plugging holes made by trunk borer and application of fumigants</li> <li>Spraying of Copper fungicides against pink diseases, powdery mildew,etc</li> </ul> | <ul style="list-style-type: none"> <li>Construction of half moon trenches</li> <li>Organic mulching with previous crop residues.</li> <li>Follow intercropping in rolling topography for moisture conservation.</li> <li>Follow ridge and furrow method of planting</li> <li>Application of organicmanure</li> <li>Lifesaving irrigation should be given at critical stages</li> </ul>                               | Constructions of water harvesting structures |

|  |  |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |      |
|--|--|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|
|  |  | b. Litchi       | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray Malathion against Litchi bug</li> </ul>                                                                                                                                                                                                                                                                                         | -do- | -do- |
|  |  | c. Arecanut     | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Drench the crown with Bordeaux mixture 1% against bud rot and fruit rot</li> </ul>                                                                                                                                                                                                                                                    | -do- | -do- |
|  |  | d. Black pepper | <ul style="list-style-type: none"> <li>Remove infected vines</li> <li>Spray Bordeaux mixture 1% against Phytophthora Foot rot</li> </ul> <p>Apply Bordeaux paste to stem from the ground level upto 50 cm height</p>                                                                                                                                                                                                                                          | -do- | -do- |
|  |  | e. Tomato       | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray bio pesticide Trichoderma viridae or Indofil or Dithane M-45 alternate with Bluecopper for management of late blight disease</li> <li>Spray NPV or Neem oil against <i>Helicoverpa armigera</i></li> </ul> <p>Soil drenching with COC or Streptocycline against bacterial wilt-</p>                                             | -do- | -do- |
|  |  | f. Cabbage      | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Release of bio agents Trichogramma brassicae against Pieris brassicae</li> <li>Spray Neem oil for management of lepidopteran pests</li> <li>Application of Metarrhizium anisopliae, Bacillus thuringiensis, Stenonemaspp or Carbofuran for management of cutworm and white grub</li> <li>Spray Mancozeb against black spot</li> </ul> | -do- | -do- |
|  |  | g. Potato       | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> </ul>                                                                                                                                                                                                                                                                                                                                     | -do- | -do- |

|                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                         |                                              |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|
|                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"><li>Spray bio pesticide Trichoderma viridae or Indofil or Dithane M-45 alternate with Blue copper for management of late blight disease</li><li>Spray NPV or Neem oil against Helicoverpa armigera</li><li>Soil drenching with COC or Streptocycline against bacterial wilt</li></ul> |                                              |      |
| 2. FS-II<br>(Agri+Hort+AH+Seri) Mid altitude areas. Elevation more than (600-1200m msl) heavy rainfall (less than 4000-8000mm) Moderately-strongly sloping, rain fed. | Rice                                                                   | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                         |                                              |      |
|                                                                                                                                                                       | Maize                                                                  | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | Soyabean                                                               | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | Cropping system 2 : Horticulture based cropping system<br>a. Pineapple | <ul style="list-style-type: none"><li>Application of organic manure</li><li>Foliar application of nutrients 1% urea</li></ul>                                                                                                                                                                                                                                 | <ul style="list-style-type: none"><li>Organic mulching with previous crop residues.</li><li>Follow ridge and furrow method of planting</li><li>Life saving irrigation should be given at critical stages</li></ul>                                                                                                      | Constructions of water harvesting structures |      |
|                                                                                                                                                                       | b. Turmeric-                                                           | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | c. Ginger                                                              | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                         |                                              |      |
|                                                                                                                                                                       | g. Banana-                                                             | <ul style="list-style-type: none"><li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO3</li><li>Intercropping with leguminous vegetables</li><li>Regular removal of old, dried and infested leaves</li><li>Manual collection and killing of Pseudostem and Rhizome adult weevil</li><li>Inject Carbaryl@ 2g/l in the infested pseudostem</li></ul> | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
| 3. FS-III<br>(Agri+Hort+AH) High altitude areas. Elevation more 1200m msl+) Medium and heavy rainfall (4000-8000mm) Moderately sloping, rain fed.                     | Rice                                                                   | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | Maize                                                                  | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | Soyabean                                                               | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       | Horticulture based cropping system<br>Citrus Potato, tomato, cabbage   | -do-                                                                                                                                                                                                                                                                                                                                                          | -do-                                                                                                                                                                                                                                                                                                                    | -do-                                         | -do- |
|                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                         |                                              |      |

|  |  |                        |  |  |  |
|--|--|------------------------|--|--|--|
|  |  | e, turmeric,<br>ginger |  |  |  |
|--|--|------------------------|--|--|--|

| Condi<br>on                                        |                                                                                                                                                                                          |                                                                                    | Suggested Contingency measures                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                   |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Mid<br>season<br>drought<br>(long<br>dry<br>spell) | Major Farming<br>situation                                                                                                                                                               | Normal<br>Crop/cropping<br>system                                                  | Crop management & Plant<br>protection measures                                                                                                                                                                                                                                                                                                              | Soil nutrient & moisture<br>conservation measures                                                                                                                                                                                                                                                                                                                           | Remarks on<br>Implementation                                                                      |
| At<br>flowerin<br>g/<br>fruiting<br>stage          | 1.FS-I<br>(Agri+Hort+AH+Fis<br>heries)<br>Low altitude areas<br>Elevation (0-600m<br>msl).Very High and<br>heavy rainfall(more<br>than 8000mm)very<br>steep slope (25-<br>33%),rain fed. | a.Rice<br>b.maize<br>c.soybean                                                     | Thinning,mulching,supple<br>mental irrigation                                                                                                                                                                                                                                                                                                               | Ridging,conservationfur<br>row,dust mulch                                                                                                                                                                                                                                                                                                                                   | Construction of<br>Farm ponds<br>through<br>NREGS,RKVY<br>Linkage with<br>MRDS,NHM,NA<br>BARD etc |
|                                                    |                                                                                                                                                                                          | Rice                                                                               | <ul style="list-style-type: none"> <li>Spray Malathion<br/>against Gundhi bug</li> </ul>                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                   |
|                                                    |                                                                                                                                                                                          | Maize                                                                              | <ul style="list-style-type: none"> <li>Spray Dimethoate<br/>against aphid</li> </ul>                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                   |
|                                                    |                                                                                                                                                                                          | Soyabean                                                                           | <ul style="list-style-type: none"> <li>Application of phorate<br/>for control of stem fly,<br/>blue beetle</li> <li>Spray Methomyl for<br/>defoliators,<br/>semiloopers etc</li> <li>Spray mancozeb<br/>against foliar diseases</li> </ul>                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                   |
|                                                    |                                                                                                                                                                                          | Cropping<br>system 2 :<br>Horticulture<br>basedcropping<br>system<br>a. Citru<br>s | <ul style="list-style-type: none"> <li>Irrigation at critical<br/>stages</li> <li>Foliar spray of urea 1%</li> <li>Spray Neem oil against<br/>Citrus butterfly</li> <li>Plugging holes made<br/>by trunk borer and<br/>application of<br/>fumigants</li> <li>Spraying of Copper<br/>fungicides against pink<br/>diseases, powdery<br/>mildew,etc</li> </ul> | Construction of half<br>moon trenches for<br>citrus and litchi <ul style="list-style-type: none"> <li>Organic mulching with<br/>previous crop residues</li> <li>Follow intercropping<br/>in rolling topography<br/>for moisture<br/>conservation.</li> <li>Follow ridge and<br/>furrow method of<br/>planting</li> <li>Lifesaving irrigation<br/>should be given</li> </ul> | Construction of<br>water harvesting<br>structures                                                 |
|                                                    |                                                                                                                                                                                          | b. Tom<br>ato                                                                      | <ul style="list-style-type: none"> <li>Spray bio pesticide<br/><i>Trichoderma viridaefor</i><br/>management<br/>of lateblightdisease</li> <li>Spray NPV or Neem<br/>oilagainst<i>Helicoverpaa</i><br/><i>rmigera</i></li> </ul>                                                                                                                             | -do-                                                                                                                                                                                                                                                                                                                                                                        | -do-                                                                                              |
|                                                    |                                                                                                                                                                                          | c. Cab<br>bage                                                                     | <ul style="list-style-type: none"> <li>Release of bio agents<br/><i>Trichogramma</i><br/><i>brassicacae</i> against <i>Pieris</i><br/><i>brassicacae</i></li> <li>Spray Neem oil for<br/>management<br/>of lepidopteranpests</li> </ul>                                                                                                                     | -do-                                                                                                                                                                                                                                                                                                                                                                        | -do-                                                                                              |



|  |                                                                                                                                                                             |                                                                                                             |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                      |                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  |                                                                                                                                                                             |                                                                                                             | <ul style="list-style-type: none"> <li>Spray Mancozeb against black spot</li> </ul>                                                                   |                                                                                                                                                                                                                                                                                                      |                                                                                   |
|  |                                                                                                                                                                             | d. Black pepper                                                                                             | <ul style="list-style-type: none"> <li>Remove infected vines</li> <li>Apply Bordeaux paste to stem from the ground level upto 50 cm height</li> </ul> | -do-                                                                                                                                                                                                                                                                                                 | -do-                                                                              |
|  |                                                                                                                                                                             | e. Litchi                                                                                                   | <ul style="list-style-type: none"> <li>Spray Malathion against Litchi bug</li> </ul>                                                                  | -do-                                                                                                                                                                                                                                                                                                 | -do-                                                                              |
|  |                                                                                                                                                                             | f. Arecanut                                                                                                 | <ul style="list-style-type: none"> <li>Drench the crown with Bordeaux mixture 1% against bud rot and fruit rot</li> </ul>                             | -do-                                                                                                                                                                                                                                                                                                 | -do-                                                                              |
|  | 2. FS-II<br>(Agri+Hort+AH+Seri)<br>Mid altitude areas. Elevation more than (600-1200m msl) heavy rainfall (less than 4000-8000mm)<br>Moderately-strongly sloping, rain fed. | Rice, maize, soybean                                                                                        | Thinning, mulching, supplemental irrigation                                                                                                           | Ridging, conservation furrow, dust mulch                                                                                                                                                                                                                                                             | Construction of Farm ponds through NREGS, RKVY Linkage with MRDS, NHM, NABARD etc |
|  |                                                                                                                                                                             | Cropping system 2 : Horticulture based cropping system<br>Pineapple, banana                                 | <ul style="list-style-type: none"> <li>Irrigation at critical stages</li> <li>Foliar spray of urea 1%</li> </ul>                                      | <ul style="list-style-type: none"> <li>Organic mulching with previous crop residues</li> <li>Follow intercropping in rolling topography for moisture conservation.</li> <li>Follow ridge and furrow method of planting</li> <li>Life saving irrigation should be given at critical stages</li> </ul> | Construction of water harvesting structures                                       |
|  |                                                                                                                                                                             | Turmeric                                                                                                    | <ul style="list-style-type: none"> <li>Spray Chloropyrifos to manage stem borer &amp; <i>Trichoderma viridae</i> for soft rot</li> </ul>              | -do-                                                                                                                                                                                                                                                                                                 | -do-                                                                              |
|  |                                                                                                                                                                             | Ginger                                                                                                      | <ul style="list-style-type: none"> <li>Spray Chloropyrifos to manage stem borer &amp; <i>Trichoderma viridae</i> for soft rot</li> </ul>              | -do-                                                                                                                                                                                                                                                                                                 | -do-                                                                              |
|  | 3. FS-III<br>(Agri+Hort+AH)<br>High altitude areas. Elevation more 1200m msl+) Medium and heavy rainfall (4000-8000mm)<br>Moderately sloping, rain fed.                     | Rice, maize, soybean                                                                                        | Thinning, mulching, supplemental irrigation                                                                                                           | Ridging, conservation furrow, dust mulch                                                                                                                                                                                                                                                             | Construction of Farm ponds through NREGS, RKVY Linkage with MRDS, NHM, NABARD etc |
|  |                                                                                                                                                                             | Cropping system 2 : Horticulture based cropping system<br>Citrus, turmeric, ginger, potato, tomato, cabbage | <ul style="list-style-type: none"> <li>Thinning</li> <li>Irrigation at critical stages</li> <li>Foliar spray of urea 1%</li> </ul>                    | <ul style="list-style-type: none"> <li>Construction of half moon trenches for fruit crops</li> <li>Organic mulching with previous crop residues</li> <li>Follow intercropping in rolling topography for moisture conservation.</li> </ul>                                                            | Construction of water harvesting structures                                       |

|  |  |  |  |                                                                                                                                                                |  |
|--|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  |  |  | <ul style="list-style-type: none"> <li>Follow ridge and furrow method of planting</li> <li>Lifesaving irrigation should be given at critical stages</li> </ul> |  |
|--|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Contingency measures- End of the season**

| Condition                                       |                                                                                                                                                                      |                                                                                                                           | Suggested Contingency measures       |                                                                               |                                                                                |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Terminal drought ( early withdrawal of Monsoon) | Major farming situation                                                                                                                                              | Normal Crop/cropping system <sup>b</sup>                                                                                  | Crop management <sup>c</sup>         | Rabi Crop Planning                                                            | Remarks on Implementation <sup>e</sup>                                         |
| At vegetative stage                             | 1.FS-I<br>(Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | Rice,maize,soybean                                                                                                        | Harvesting at physiological maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                                                 |                                                                                                                                                                      | Cropping system 2 : Horticulture based cropping system<br>Citrus, arecanut, black pepper, potato, litchi, tomato, cabbage | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |
|                                                 | 2. FS-II<br>(Agri+Hort+AH+Seri)Mid altitude areas.Elevation more than (600-1200m msl)heavy rainfall (less than 4000-8000mm) Moderately-strongly sloping,rain fed.    | Rice,maize,soybean                                                                                                        | Harvesting at physiological maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                                                 |                                                                                                                                                                      | Cropping system 2 : Horticulture based cropping system<br>Pineapple, turmeric, ginger, banana                             | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |
|                                                 | 3. FS-III<br>(Agri+Hort+AH)High altitude areas.Elevation more 1200m msl+)Medium and heavy rainfall(4000-8000mm)Moderately sloping,rain fed.                          | Rice,maize,soybean                                                                                                        | Harvesting at physiological maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                                                 |                                                                                                                                                                      | Cropping system 2 : Horticulture based cropping system                                                                    | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |

|  |  |                                                         |  |  |  |
|--|--|---------------------------------------------------------|--|--|--|
|  |  | Citrus, turmeric,<br>ginger, Potato,<br>tomato, cabbage |  |  |  |
|--|--|---------------------------------------------------------|--|--|--|

#### Drought – Irrigated situation

| Condition                                                                      | Major Farming situation                                                                                                                                       | Normal Crop/cropping system                                                                                   | Suggested Contingency measures |                                                                                                                                                                                                                       |                                |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                                                                                |                                                                                                                                                               |                                                                                                               | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                    | Remarks on Implementation      |
| Delayed release of water in canals due to low rainfall for Irrigated situation | 1.FS-I (Agri+Hort+AH+Fishery)Low Altitude area Elevation (o-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland | 1.Rice-rice                                                                                                   | No change                      | <ul style="list-style-type: none"> <li>For High altitude Short duration of rice crop varieties (Luit,Vivekdhan) 90days duration for 3weeks delayed</li> <li>SRI practice</li> <li>Community nursery</li> </ul>        | NA                             |
|                                                                                |                                                                                                                                                               | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato- Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with organic materials</li> <li>Life saving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December- January |
|                                                                                |                                                                                                                                                               | b. Cabbage – MahycoHybrid 139, Wonderball                                                                     | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching</li> <li>Life saving irrigation should be given at head formation stage</li> </ul>                                 | Sowing time- November- January |
|                                                                                | 3. FS-III (Agri+Hort+AH) High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 – 8000mm) Moderately sloping, Lowland                 | a. Tomato- Hybrid 17, Jessica, Namdhari, Chiranjeevi                                                          | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with plant materials</li> <li>Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul>    | Sowing time- January- February |

|  |  |                                           |           |                                                                                                                                                                                            |                               |
|--|--|-------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|  |  | b. Cabbage – MahycoHybrid 139, Wonderball | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Lifesaving irrigation should be given at head formation stage</li> </ul> | Sowing time- October-December |
|--|--|-------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|

| Condition                                                                  | Major Farming situation                                                                                                                                        | Normal Crop/cropping system                                                                                   | Suggested Contingency measures |                                                                                                                                                                                                                            |                               |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                                                            |                                                                                                                                                                |                                                                                                               | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                         | Remarks on Implementation     |
| Non release of water in canals under delayed onset of monsoon in catchment | 1.FS-I (.Agri+Hort+AH+Fishery)Low Altitude area Elevation (o-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland | 1.Rice-rice                                                                                                   | No change                      | <ul style="list-style-type: none"> <li>• For High altitude Short duration of rice crop varieties (Luit,Vivekdhan) 90days duration for 3weeks delayed</li> <li>• SRI practice</li> <li>• Community nursery</li> </ul>       | NA                            |
|                                                                            |                                                                                                                                                                | b.Rice-potato                                                                                                 | No change                      | <ul style="list-style-type: none"> <li>• Medium duration Kharif rice variety(130 days)for 2weeks delay</li> <li>• Potato var:Kufrimegha</li> </ul>                                                                         |                               |
|                                                                            |                                                                                                                                                                | c..Rice-toria                                                                                                 | No change                      | <ul style="list-style-type: none"> <li>• Medium duration Kharif rice variety(130 days)</li> <li>• Late sown toria variety(TS-38,TS-46)</li> </ul>                                                                          |                               |
|                                                                            |                                                                                                                                                                | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato- Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with organic materials</li> <li>• Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December-January |

|  |                                                                                                                                               |                                                                                                              |           |                                                                                                                                                                                                                          |                               |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|  |                                                                                                                                               | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Lifesaving irrigation should be given at head formation stage</li> </ul>                               | Sowing time- November-January |
|  | 3. FS-III (Agri+Hort+AH) High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 – 8000mm) Moderately sloping, Lowland | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with plant materials</li> <li>• Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- January-February |
|  |                                                                                                                                               | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Lifesaving irrigation should be given at head formation stage</li> </ul>                               | Sowing time- October-December |

| Condition                                     |                                                                                                                                                                |                                                                                                              | Suggested Contingency measures |                                                                                                                                                                                                                            |                               |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                               | Major Farming situation                                                                                                                                        | Normal Crop/cropping system                                                                                  | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                         | Remarks on Implementation     |
| Insufficiency of surface water for irrigation | 1.FS-I ).Agri+Hort+AH+Fishery)Low Altitude area Elevation (o-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland | Rice- Ranjit, Bahadur, Pankaj                                                                                | SRI hybrid to be used          | <ul style="list-style-type: none"> <li>• Low seed rate</li> <li>• Critical irrigation of crops at critical stage</li> </ul>                                                                                                |                               |
|                                               |                                                                                                                                                                | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with organic materials</li> <li>• Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December-January |
|                                               |                                                                                                                                                                | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change                      | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Lifesaving irrigation should</li> </ul>                                                                  | Sowing time- November-January |

|  |                                                                                                                                                                    |                                                                                                               |                       |                                                                                                                                                                                                                          |                               |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|  |                                                                                                                                                                    |                                                                                                               |                       | be given at head formation stage                                                                                                                                                                                         |                               |
|  | 2. FS-II (Agri+ Hort+ AH+ Seri)Mid altitude areas. Elevation more than 600-1200 m msl) heavy rainfall (less than 4000-8000mm) Moderately-Strongly sloping, Lowland | Rice-Shah Sarang I, Lampnah I, RCPL 1-3 RCPL 3-3, Ngoba, Manipur                                              | Delayed transplanting | Direct sown under transplanting                                                                                                                                                                                          |                               |
|  | 3. FS-III (Agri+ Hort+ AH) High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 – 8000mm) Moderately sloping, Lowland                    | Rice-Megha Rice I, Megha Rice II, US I Local varieties                                                        | Delayed transplanting | Direct sown under transplanting                                                                                                                                                                                          |                               |
|  |                                                                                                                                                                    | Cropping system 2 : Horticulture based cropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change             | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with plant materials</li> <li>• Lifesaving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- January-February |
|  |                                                                                                                                                                    | b. Cabbage – MahycoHybrid 139, Wonderball                                                                     | No change             | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Lifesaving irrigation should be given at head formation stage</li> </ul>                               | Sowing time- October-December |

## Resource management technologies

### Jalkund – A boon for vegetable production

#### Background

The uncertain and erratic, high intense rains, lack of proper rainwater management leads to severe water scarcity, particularly during the post-monsoon season (November-April). This unavailability of adequate amount of water during the post rainy season (November-April) poses a serious problem for successful *rabi* vegetable cultivation. Hence, rainwater harvesting and storage is essential. Rainwater harvesting and efficient utilization hold promise in hilly areas and is a key to a sustainable livelihood.

#### Resilient technology

Jalkund, a micro low-cost rainwater harvesting structure is a suitable technology for providing climate resilience and improving the livelihood of small and marginal farmers. The water stored can be reused during moisture-stress periods. Jalkund is a water harvesting structure in which a pond of 5×4×1.5 m<sup>3</sup> is done at the selected site before the onset of the monsoon.

The Jalkunds are preferred on the hilltops and the upper portion of the slopes to divert water by the gravitational flow. A proper side slope is maintained for all four walls to provide stability and to hold the lining materials properly. The bottom and all sides of the Jalkund should be plastered with a slurry of clay and cow dung mixed in a ratio of 5:1 to avoid any damage to the lining material. After clay-plastering, about 3-5 cm thick cushioning should be done with locally available dry pine leaves, coir pith, paddy husk, thatch grass, *etc.* (@ 2–3 kg m<sup>-2</sup>) on the walls and bottom, to avoid any kind of damage to the lining material from any sharp or conical gravel, *etc.* This pit is lined with a Silpaulin lining film. This Jalkund has a storage capacity of 30,000 liters for harvesting rainwater during the rainy season and its subsequent use during dry periods to provide critical irrigation to high value winter vegetables.

The capacity of Jalkund can differ. Each Jalkund can harvest one and half times its original capacity considering its replenishment by intermittent rains and consequent evaporation loss of about 10%. A trench of 25×25 cm<sup>2</sup> has to be made around the Jalkund to bury the edges of lining materials and to hold the sheet firmly from all the corners.

### **Paddy cum fish - A sustainable integrated farming system in Jaintia Hills**

#### **Climate vulnerability: Drought, dry spells, frost, low temperature and hailstorms**

##### **Resilient technology**

Integrated model of paddy-fish farming was conceived as climate resilient technology in NICRA villages to enhance the productivity and profitability as the two crops i.e. paddy and fish can be ensured from a unit of cultivable area and secures the living of small and marginal farmers whose livelihood are under the intimidation of climate change. The paddy -fish integrated farming system requires, a low-lying area which retains water for 4-6 months under mid hill condition. The rice fish system (500 m<sup>2</sup>) was designed with canal of size 1m width and 0.5m depth for rearing improved variety of common carp called Amur carp and local common carp at a stocking density of 4000 ha<sup>-1</sup>. Paddy (local variety) was transplanted in the 2nd week of July and after 21 days of transplantation an Amur carp and local common carp of size 10-15 cm length were released in the ratio of 1:1. A total of 200 fingerlings were released.

##### **Performance and impact of technology**

The fishes were harvested in November at the time of harvesting of paddy. Amur carp has grown to average weight of 250 g and the average growth of local common carp was 190 g after 120 days. The survival percentage of fish was 90-95%. This technology provided the farmer with better livelihood, efficient use of available resources and also recorded the BC ratio of 2.10 (Table 2.1.15). This technology has mutual symbiotic relationship. Rice is benefited in the form of additional nutrients which comes from fish waste. The aquatic weeds and pests in rice is also reduced due to fish. Besides this the movement of fish causes aeration. In turn fish gets food and shelter. and also provided the farmer with better livelihood and efficient use of available resources.

### **Low-cost pig pen model**

#### **Climate vulnerability: Drought, frost, low temperature and hailstorms**

##### **Background**

Pig housing is very important, since the poor housing reduces the growth and increases the mortality rate of the pigs. Many smallholder farmers face difficulty in maintaining higher standards of pigpens since they are costly, which often hampers their capacity to increase productivity. To address this challenge cost effective innovative solutions which maintains animal health are required. A low-cost pig pen model is one which not only helps in reducing the financial burden on farmers but also encourages better pig management practices, leading to improved health, growth rates, and overall productivity.

##### **Resilient technology**

Construction of low-cost environment affinitive pen using locally available raw materials is the solution. The shed was constructed at 12 feet in length with a width of 7 feet. The bedding area was 5 feet and the outdoor area was 7 feet for feeding, saw dust was used as flooring material and defecating purposes. The average temperature of the shed recorded during peak winter months was 20-23 °C.

##### **Performance and impact of technology**

After the adoption of low-cost pig pen model, the number of piglets per year increased by 4 no. over the farmers traditional piggery unit. The production and economics of piggery were higher compared to the farmers' practice before the NICRA demonstration. Reduction in lameness, skin diseases, diarrhoea and respiratory problems by 6.6%, 25.5%, 15.2% and 7.2 % respectively (Table 2.3.4).

### **Jalkund at Mukhnang village of Jaintia Hills**

#### **Climate vulnerability: Drought, dry spells, frost and hailstorms**

##### **Performance and impact of technology**

A Jalkund was constructed as per the design at Mukhnang village in the Jaintia Hills. Water harvesting through Jalkund and supplemental irrigation to different crops such as cabbage and tomato was given. The net income and BC ratio of cultivation of cabbage and tomato with supplemental irrigation from Jalkund was ₹ 3,98,700 ha<sup>-1</sup> and 3.12 respectively. Whereas, in farmers' practice it was ₹ 1,16,000 ha<sup>-1</sup> and 2.1 respectively (Table 2.1.1).

### **Ridge and furrow in maize**

#### **Climate vulnerability: Moisture stress, frost, erratic and intensive rainfall**

**Details of technology**

Ridges of 60 cm bottom width and 30 cm top width were prepared with 20 cm height. Unit cost for implementation of ridges and furrows was ₹ 4,500 ha<sup>-1</sup>.

**Performance and impact of technology**

Good germination percentage (91%) and higher plant stand was observed at harvest (87%) by adoption of ridges and furrows technology. The yield, net returns and BC ratio increased by 43%, 90% and 21% respectively (Table 2.1.10).

**Scope for upscaling**

Ridge and furrow technology has a potential for upscaling in rainfed terraces in collaboration with the concerned agriculture department.

**Black polythene mulch: A strategy for *in-situ* moisture conservation****Climate vulnerability: Drought, dry spell and cyclone****Background**

In North East region of India, rainfed farming is predominant. Rainfall is erratic and ill distribution hence, moisture stress is common. This soil moisture stress reduces crop growth, in addition to this the weed infestation and soil temperature is a major concern as it affects crop growth and germination.

**Resilient technology**

Black plastic mulch can be adopted as a low-cost and climate-smart agricultural technology, particularly suited to the hilly and high-rainfall areas of the North Eastern (NE) region of India. Plastic mulch moderates the soil temperature, reduces evaporation, and holds moisture in the soil. It also controls weeds, reduces soil erosion, protects plants from pests, and enhance crop resilience under variable climatic conditions which helps to increase both crop yield and quality. The black plastic film absorbs solar energy during the day, heating up and transferring warmth to the soil through conduction, especially when in close contact. This results in increased soil temperature, which supports early seed germination, vigorous root growth, and improved nutrient uptake, crucial in the cooler microclimates of NE hill states. At night, when temperatures drop especially under clear skies and dry air, the mulch helps to retain soil warmth, reducing thermal stress on crops. This diurnal temperature regulation is particularly beneficial for temperature sensitive vegetables like cabbage, cauliflower, broccoli and tomato.

**Performance and impact of technology**

The black plastic mulch (100 micron) is laid just before sowing the crop. Crops grow through slits and holes in thin plastic sheet. Plastic mulch showed a positive impact on yield and water use efficiency of plants. The mulching techniques are being used widely in irrigated crop production worldwide. It can also be implemented in summer vegetable production. Black plastic mulching produced higher weight of cabbage. The use of this technology improved crop yields and income of the farming community by 43% and 52% respectively (Table 2.1.11). The beneficiaries plan to increase the area under tomato and cabbage for sustainable production.



# Actionable Comprehensive Plans for Contingency

|       |           |          |                  |
|-------|-----------|----------|------------------|
| State | MEGHALAYA | District | EAST KHASI HILLS |
|-------|-----------|----------|------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 4380.1               | More than 19%          | Less than 3547.881     |
| June         | 1298.2               |                        |                        |
| July         | 1470.4               |                        |                        |
| August       | 840.7                |                        |                        |
| September    | 770.8                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 11567 | Gross irrigated area: | 13034 |
| Net Rainfed area    | 24139 | Gross rainfed area    | 51441 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net   | Gross |
|----------------------|-------|-------|
| Canals               | 11567 | 13034 |
| 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     | 2117            |                     | 2117              |
| 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        | 80              |                     | 80                |
| 4    | Soyabean       | 381             |                     | 381               |
| 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                                     |  |  |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|--|--|
| <b>Delay by 4 weeks (upto 31<sup>st</sup> May, 2014)</b><br><b>Low Altitude (&lt;800m above msl)</b> | 1. Maize var.Vijay Comp., local, Hybrid, DA-61A<br>2. Lady's finger var. Pusa Sawani<br>3. Onion var. N-53<br>4. Brinjal var. Pusa Purple long<br>5. Chilli var. Pusa Jwala | <b>Maize+ Winter veg crops/Boro Rice</b> | Replace maize var. Vijay comp. with var. Navjot(Shorter duration). |  |  |

|                                              |                                                                                                                                                                                                                                              |                                                                               |  |                                                                                                                                                                      |                                                                                                                                                                                              |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | 6. Rice var. Ranjit, local, Hyb 6444(nursery)                                                                                                                                                                                                |                                                                               |  |                                                                                                                                                                      |                                                                                                                                                                                              |
| <b>Mid Altitude (800&gt;1300m above msl)</b> | 1. Rice var. local, Hyb 6444<br>2. Maize var.Vijay Comp., local, Hybrid, DA-61A<br>3. Tomato var. Avinash, Rocky, Hyb. 017<br>4. Potato var. Jyoti, Megha, Giridhari, Giriraj.<br>5. Ginger var. Nadia, vareda.<br>6. Chilli var. Pusa jwala | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+Maize/Tomato/chilli</b> |  | Insurance of all crops should be done by the farmers. Mulching in maize, tomato, ginger. Preventive irrigation. Nursery raising for SRI. Nursery Raising for tomato. | Maize var. Navjot seeds may be procured from Department of Agriculture, Govt. of Meghalaya and neighboring KVKs. National Agriculture Insurance Scheme, available in all nationalized banks. |
| <b>High Altitude (&gt;1300)</b>              | 1. Rice var. Meg 1,2.<br>2. Potato var. Jyoty, Megha, Giridhari, Giriraj, Local.<br>3. Tomato var. Avinash, Rocky, Hyb. 017<br>4. Cauliflower (Nursery)                                                                                      | <b>Potato/Maize/Pea+ Cole crops/Rice/Maize+ Cauliflower/Potato/Pea</b>        |  |                                                                                                                                                                      |                                                                                                                                                                                              |

| <b>Condition</b>                                                                  |                                          |                                                 |                                          | <b>Suggested Contingency measures</b>                             |                                                           |                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------|------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------|
| <b>Early season drought (Normal onset)</b>                                        |                                          | <b>Major Farming situation</b>                  | <b>Normal Crop/cropping system</b>       | <b>Crop management</b>                                            | <b>Soil nutrient &amp; moisture conservation measures</b> | <b>Remarks on Implementation</b>                           |
| <b>Normal onset followed by 15-20 days dry spell after sowing leading to poor</b> | <b>Low Altitude (&lt;800m above msl)</b> | 1. Maize var.Vijay Comp., local, Hybrid, DA-61A | <b>Maize+ Winter veg crops/Boro Rice</b> | If dry spell in between is forecasted, plant population for crops | Mulching in all crops. Construction of Jhalkund (water    | Leaflets and guide on mulching may be collected from KVKs. |

|                                     |                                                                    |                                                                                                                                                                                                                                                                                                                 |                                                                                        |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                |                                                                                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| germination/<br>crop stand,<br>etc. |                                                                    | 2. Lady's<br>finger var.<br>Pusa<br>Sawani<br>3. Onion<br>var. N-53<br>4. Brinjal<br>var. Pusa<br>Purple long<br>5. Chilli var.<br>Pusa Jwala                                                                                                                                                                   |                                                                                        | may be<br>increased<br>in case of<br>direct<br>sown<br>crops.<br>Protrays<br>should be<br>used for<br>vegetable<br>nurseries.<br>Medium<br>short<br>duration<br>varieties<br>like Vivek<br>Dhan-82,<br>Luit (local),<br>VL-dhan-<br>61.                                                                    | harvesting<br>structure).<br>Judicious<br>applicatio<br>n of K<br>fertilizers<br>in all<br>crops.                                                                              | Construction<br>materials for<br>Jhalkund<br>may be<br>procured<br>from<br>concerned<br>KVKs.                                                                              |
|                                     | <b>Mid<br/>Altitude<br/><br/>(800&gt;130<br/>0m above<br/>msl)</b> | 1. Rice var.<br>local, Hyb<br>6444<br>2. Maize<br>var.Vijay<br>Comp.,<br>local,<br>Hybrid, DA-<br>61A<br>3. Tomato<br>var.<br>Avinash,<br>Rocky, Hyb.<br>017<br>4.Potato<br>var. Jyoti,<br>Megha,<br>Giridhari,<br>Giriraj.<br>5. Ginger<br>var. Nadia,<br>vareda.<br>6. Chilli var.<br>Pusa jwala<br>(Nursery) | <b>Tomato/Potato/Ginger/ Maize +<br/>Rice(Nursery)/Tomato+Maize/To<br/>mato/chilli</b> | If dry spell<br>in between<br>is<br>forecasted,<br>plant<br>population<br>for crops<br>may be<br>increased<br>in case of<br>direct<br>sown<br>crops.<br>Shading<br>with shade<br>net or poly<br>tunnels for<br>nursery<br>beds of<br>rice.<br>Protrays<br>should be<br>used for<br>vegetable<br>nurseries. | Mulching<br>in all<br>crops.<br>Constructi<br>on of<br>Jhalkund<br>(water<br>harvesting<br>structure).<br>Judicious<br>applicatio<br>n of K<br>fertilizers<br>in all<br>crops. | Leaflets and<br>guide on<br>mulching<br>may be<br>collected<br>from KVKs.<br>Construction<br>materials for<br>Jhalkund<br>may be<br>procured<br>from<br>concerned<br>KVKs. |
|                                     | <b>High<br/>Altitude</b>                                           | 1. Rice<br>var.Meg<br>1,2.<br>2 Potato<br>var.<br>Jyoty,<br>Megha,<br>Giridhar<br>i, Giriraj,<br>Local.<br>Tomato var.<br>Avinash,                                                                                                                                                                              | <b>Potato/Maize/Pea+ Cole<br/>crops/Rice/Maize+Cauliflower/Pot<br/>ato/Pea</b>         | If dry spell<br>in between<br>is<br>forecasted,<br>plant<br>population<br>for crops<br>may be<br>increased<br>in case of<br>direct                                                                                                                                                                         | Mulching<br>in all<br>crops.<br>Constructi<br>on of<br>Jhalkund<br>(water<br>harvesting<br>structure).                                                                         | Leaflets and<br>guide on<br>mulching<br>may be<br>collected<br>from KVKs.<br>Construction<br>materials for<br>Jhalkund<br>may be<br>procured<br>from                       |

|                            |                                              |                                                                                                                                                                                                                                                          |                                                                               |                                                                                                                                                                                                  |                                                                                                                                                              |                                                                                                                                     |
|----------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|                            |                                              | Rocky, Hyb. 017<br>4. Pea var. Cherrapunji pea, Arkel, Azaad-1                                                                                                                                                                                           |                                                                               | sown crops. Shading with shade net or poly tunnels for nursery beds of rice. Pro-trays should be used for vegetable nurseries.                                                                   |                                                                                                                                                              | concerned KVKs.                                                                                                                     |
| <b>At vegetative stage</b> | <b>Low Altitude (&lt;800m above msl)</b>     | 1. Maize var. Vijay Comp., local, Hybrid, DA-61A                                                                                                                                                                                                         | <b>Maize+ Winter veg crops/Boro Rice</b>                                      | -                                                                                                                                                                                                | Mulching in all crops. Construction of Jhalkund (water harvesting structure). Protrays should be used for vegetable nurseries.                               | Leaflets and guide on mulching may be collected from KVKs. Construction materials for Jhalkund may be procured from concerned KVKs. |
|                            | <b>Mid Altitude (800&gt;1300m above msl)</b> | 1. Rice var. local, Hyb 6444.<br>2. Maize var. Vijay Comp., local, Hybrid, DA-61A<br>3. Tomato var. Avinash, Rocky, Hyb. 017<br>4. Potato var. Jyoti, Megha, Giridhari, Giriraj.<br>5. Ginger var. Nadia, vareda.<br>6. Chilli var. Pusa jwala (Nursery) | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+Maize/Tomato/chilli</b> | Shading with shade net or poly tunnels for nursery beds of chilli and rice. Earthing up of potato, chilli, tomato & ginger and use of anti-transpiration for controlling stomatal transpiration. | Mulching in all crops. Construction of Jhalkund (water harvesting structure). Protrays should be used for vegetable nurseries. Judicious use of K fertilizer | Leaflets and guide on mulching may be collected from KVKs. Construction materials for Jhalkund may be procured from concerned KVKs. |

|  |                                                      |                                                                                                                                                                                          |                                                                       |                                                                  |                                                                               |                                                                                                                                     |
|--|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>High<br/>Altitude<br/>Altitude<br/>(&gt;1300)</b> | <p>1 Rice var.Meg 1,2.</p> <p>2 Potato var. Jyoty, Megha, Giridhar i, Giriraj, Local.</p> <p>Tomato var. Avinash, Rocky, Hyb. 017</p> <p>4. Pea var. Cherrapunji pea, Arkel, Azaad-1</p> | <b>Potato/Maize/Pea+ Cole crops/Rice/Maize+Cauliflower/Potato/Pea</b> | Shading with shade net or poly tunnels for nursery beds of rice. | Mulching in all crops. Construction of Jhalkund (water harvesting structure). | Leaflets and guide on mulching may be collected from KVKs. Construction materials for Jhalkund may be procured from concerned KVKs. |
|--|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|

# Contingency measures- Mid season

| Condition                                                                                   | Major Farming situation                                                                 | Normal Crop / Cropping system                                                  | Suggested Contingency measures                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |                                                                              |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------|
|                                                                                             |                                                                                         |                                                                                | Change in crop / cropping system including variety                                                                                                                                                                                                                                                                                                                                                                          | Agronomic measures                                    | Remarks on Implementation                                                    |
| <b>Early season drought (delayed onset)</b>                                                 |                                                                                         |                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                       |                                                                              |
| <b>Delay by 6 weeks (upto 15<sup>th</sup> June, 2014) Low Altitude (&lt;800m above msl)</b> | 1. Maize var.Vijay Comp., local, Hybrid, DA-61A<br>2. Rice var. Ranjit, local, Hyb 6444 | <b>Maize+ Winter veg crops/Boro Rice</b>                                       | Medium short duration varieties like Vivek Dhan-82, Luit (local), VL-dhan-61 should replace other varieties of rice. Replace with pulses like green gram var. PDM 11 (65-75 days., blackgram T <sub>9</sub> Cover crops like bottle gourd var.local, Pusa summer prolific long, ridge gourd var. local, Pusa nasdar, sponge gourd var. chikni. pumpkin var. local can be replaced for rice which could not be transplanted. | Mulching and preventive irrigations in maize.         | Seeds may be procured from the Department of Agri., Govt. of Meghalaya, KVK. |
| <b>Mid Altitude (800&gt;1300 m above msl)</b>                                               | 1. Rice var. local, Hyb 6444<br>2. Maize var.Vijay                                      | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+Maize/Tomato/c hilli</b> | Replacement of rice (could not be transplanted.                                                                                                                                                                                                                                                                                                                                                                             | Insurance of all crops should be done by the farmers. | Seeds may be procured from the Department of Agri., Govt. of                 |

|                                                                                                    |                                                                                                                                                                                                                                                      |                                                                               |                                                                                                                                                                                                                                                        |                                                                                                                        |                                                                                                    |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|                                                                                                    | <p>Comp., local, Hybrid, DA-61A</p> <p>3. Tomato var. Avinash, Rocky, Hyb. 017</p> <p>4. Potato var. Jyoti, Megha, Giridhari, Giriraj.</p> <p>5. Ginger var. Nadia, vareda.</p> <p>6. Chilli var. Pusa jwala</p>                                     |                                                                               | <p>d) by vegetable crops like brinjal var. Pusa purple long, ladies finger var. Pusa sawani, bitter gourd var. Pusa Do Mausami, groundnut ICGS 76.</p>                                                                                                 | <p>Mulching in maize, tomato, ginger. Preventive irrigation.</p>                                                       | <p>Meghalaya, KVK. National Agriculture Insurance Scheme, available in all nationalized banks.</p> |
| <p><b>High Altitude Altitude (&gt;1300)</b></p>                                                    | <p>1. Rice var. Meg 1,2</p> <p>2. Tomato var. Avinash, Rocky, Hyb. 017Cauliflower (Nursery)</p>                                                                                                                                                      | <p><b>Potato/Maize/Pea+ Cole crops/Rice/Maize+ Cauliflower/Potato/Pea</b></p> | <p>Replace rice which could not be transplanted by vegetables like beetroot var. Detroit dark red, carrot var. kuroda super selection, chilli var. Pusa jwala, turnip var. purple top white globe, coriander var. summer queen, radish var. local.</p> | <p>Arrangements for Irrigation for all crops should be done. Insurance of all crops should be done by the farmers.</p> | <p>National Agriculture Insurance Scheme, available in all nationalized banks.</p>                 |
| <p><b>Delay by 8 weeks (upto 30<sup>th</sup> June, 2014) Low Altitude (&lt;800m above msl)</b></p> | <p>1. Maize var. Vijay Comp., local, Hybrid, DA-61A</p> <p>2. Bottle gourd var. local,</p> <p>3. Pusa Summer Prolific long,</p> <p>4. Ridge gourd var. local, Pusa Nasdar</p> <p>5. Sponge gourd var. Pusa Chikni.</p> <p>6. Pumpkin var. local.</p> | <p><b>Maize+ Winter veg crops/Boro Rice</b></p>                               |                                                                                                                                                                                                                                                        | <p>Preventive irrigation.</p>                                                                                          |                                                                                                    |



|                                               |                                                                                                                                          |                                                                                |                                                                                                                                                                                                                                                 |                                                                                                                 |                                                                                                                                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               | 7. Greengram<br>PDM 11<br>8. Blackgram<br>T <sub>9</sub>                                                                                 |                                                                                |                                                                                                                                                                                                                                                 |                                                                                                                 |                                                                                                                                                          |
| <b>Mid Altitude (800&gt;1300 m above msl)</b> | 1. Brinjal var. Pusa Purple Long,<br>2. Ladies finger var. Pusa Sawani,<br>3. Bitter gourd var. Pusa Do Mausami<br>4. Groundnut ICGS 76. | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+Maize/Tomato/c hilli</b> |                                                                                                                                                                                                                                                 | Insurance of all crops should be done by the farmers. Mulching in maize, tomato, ginger. Preventive irrigation. | Seeds may be procured from the Department of Agri., Govt. of Meghalaya, KVK. National Agriculture Insurance Scheme, available in all nationalized banks. |
| <b>High Altitude (&gt;1300)</b>               | 1. Rice var. Meg 1,2<br>2. Tomato var. Avinash, Rocky, Hyb. 017Cauliflower (Nursery)                                                     | <b>Potato/Maize/Pea+ Cole crops/Rice/Maize+ Cauliflower/Potato/Pea</b>         | Replace rice which could not be transplanted by vegetables like beetroot var. Detroit dark red, carrot var. kuroda super selection, chilli var. Pusa jwala, turnip var. purple top white globe, coriander var. summer queen, radish var. local. | Arrangements for Irrigation for all crops should be done. Insurance of all crops should be done by the farmers. | National Agriculture Insurance Scheme, available in all nationalized banks.                                                                              |

#### Contingency measures- End of the season

| Condition                                        |                                |                                                          |                                   | Suggested Contingency measures                                   |  |                                                      |
|--------------------------------------------------|--------------------------------|----------------------------------------------------------|-----------------------------------|------------------------------------------------------------------|--|------------------------------------------------------|
| Terminal Drought. (Early withdrawal of monsoon). |                                |                                                          |                                   |                                                                  |  |                                                      |
|                                                  | Low Altitude (<800m above msl) | 1.Maize var.Vijay Comp., local, Hybrid, DA-61A<br>2.Rice | Maize+ Winter veg crops/Boro Rice | In case of maize based cropping system, relay cropping of pulses |  | Pulse seeds like pea may be procured from the Deptt. |

|  |                                                             |                                                                                                                                                                                                                                                          |                                                                                |                                                                                                                 |                                                                          |                                                              |
|--|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------|
|  |                                                             |                                                                                                                                                                                                                                                          |                                                                                | (Early sowing).                                                                                                 |                                                                          | Of Agri. and KVKs.                                           |
|  | <b>Mid Altitude</b><br><br><b>(800&gt;1300 m above msl)</b> | 1. Rice var. local, Hyb 6444.<br>2. Maize var. Vijay Comp., local, Hybrid, DA-61A<br>3. Tomato var. Avinash, Rocky, Hyb. 017<br>4. Potato var. Jyoti, Megha, Giridhari, Giriraj.<br>5. Ginger var. Nadia, vareda.<br>6. Chilli var. Pusa jwala (Nursery) | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+ Maize/Tomato/chilli</b> | In case of rice and maize based cropping system, relay cropping of pulses (Early sowing). Dehaulmin g of potato | Irrigation in standing crop of tomato & chilli.                          |                                                              |
|  | <b>High Altitude</b><br><b>(&gt;1300)</b>                   | 1. Rice var. Meg1,2<br>2. Potato var. Jyoti, Megha, Giridhari, Giriraj, Local.<br>3. Tomato var. Avinash, Rocky, Hyb. 017<br>4. Pea var. Cherrapunji pea, Arkel, Azaad-1                                                                                 | <b>Potato/Maize/Pea+ Cole crops/Rice/Maize+ Cauliflower/Potato/Pea</b>         | Dehaulmin g in potato<br>Removal of dead and diseased plant and plant parts in tomato.                          | Preventiv e irrigation in tomato earthing up followed by mulching in pea | Leaflets and guide on mulchin g may be collecte d from KVKs. |

#### Drought - Irrigated situation

| 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 | <b>Low altitude:Cereals:</b> Rice, Boro Rice<br><b>Winter vegetables:</b> cabbage, | <b>Rice+ Boro rice/winter vegetables/lentil</b> | Replace rice variety with kharif short duration variety like luit& Vivek Dhaan -82<br>Replace with pulses like green gram var. PDM 11 (65-75 days., blackgram T-9 | Constructio n of Jhalkund (water harvesting structure) before hand | Construction materials for Jhalkund may be procured from concerned KVKs. |

| Condition                                                                  | Suggested Contingency measures                                                                                                                    |                                                |                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                    |                                                       |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
|                                                                            | Major Farming situation                                                                                                                           | Normal Crop/cropping system                    | Change in crop/cropping system                                                                                                                                                                                                                                                                                                                                                                         | Agronomic measures                                                                                                                                                                 | Remarks on Implementation                             |
|                                                                            | tomato, raddish, chilli, broccoli, pea<br><b>Pulse:</b> lentil                                                                                    |                                                | Cover crops like bottle gourd var.local, Pusa summer prolific long, ridge gourd var. local, Pusa nasdar, sponge gourd var. chikni. pumpkin var. local can be replaced for kharif rice which could not be transplanted.                                                                                                                                                                                 | and its utilization during dry periods.                                                                                                                                            |                                                       |
| Limited release of water in canals due to low rainfall                     | <b>Low altitude:Cereals:</b> Rice, Boro Rice<br><b>Winter vegetables:</b> cabbage, tomato, raddish, chilli, broccoli, pea<br><b>Pulse:</b> lentil | <b>Rice+Boro rice/winter vegetables/lentil</b> |                                                                                                                                                                                                                                                                                                                                                                                                        | Adopt SRI method of cultivation. Only life saving irrigation to be done. Construction of Jhalkund (water harvesting structure) before hand and its utilization during dry periods. | Leaflets and guide on SRI may be collected from KVKs. |
| Non release of water in canals under delayed onset of monsoon in catchment | <b>Low altitude:Cereals:</b> Rice, Boro Rice<br><b>Winter vegetables:</b> cabbage, tomato, raddish, chilli, broccoli, pea<br><b>Pulse:</b> lentil | <b>Rice+Boro rice/winter vegetables/lentil</b> | Replace rice variety with kharif short duration variety like luit& Vivek Dhaan -82<br>Replace with pulses like green gram var. PDM 11 (65-75 days., blackgram T <sub>9</sub><br>Cover crops like bottle gourd var.local, Pusa summer prolific long, ridge gourd var. local, Pusa nasdar, sponge gourd var. chikni. pumpkin var. local can be replaced for kharif rice which could not be transplanted. | Adopt SRI method of cultivation. Only life saving irrigation to be done. Construction of Jhalkund (water harvesting structure) before hand and its utilization during dry periods. | Leaflets and guide on SRI may be collected from KVKs. |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon   | NA                                                                                                                                                |                                                |                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                    |                                                       |

| Condition                                     |                                                                                                                                                    |                                                                               | Suggested Contingency measures                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                          |                                                       |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
|                                               | Major Farming situation                                                                                                                            | Normal Crop/cropping system                                                   | Change in crop/cropping system                                                                                                                                                                                                                                                                                   | Agronomic measures                                                                                                                                                                                                                       | Remarks on Implementation                             |
| Insufficiency of surface water for irrigation | <b>Low altitude:</b> Cereals: Rice, Boro Rice<br><b>Winter vegetables:</b> cabbage, tomato, raddish, chilli, broccoli, pea<br><b>Pulse:</b> lentil | <b>Rice+Boro rice/winter vegetables/lentil</b>                                | Replace with pulses like green gram var. PDM 11 (65-75 days., blackgram T <sub>9</sub><br>Cover crops like bottle gourd var.local, Pusa summer prolific long, ridge gourd var. local, Pusa nasdar, sponge gourd var. chikni. pumpkin var. local can be replaced for kharif rice which could not be transplanted. | Adopt SRI method of cultivation. Only life saving irrigation to be done. Construction of Jhalkund (water harvesting structure) before hand and its utilization during dry periods.                                                       | Leaflets and guide on SRI may be collected from KVKs. |
|                                               | <b>Mid altitude:</b> Cereals: Rice                                                                                                                 | <b>Tomato/Potato/Ginger/ Maize + Rice(Nursery)/Tomato+Maize/Tomato/chilli</b> | Replace rice by pea var. Arkel (zero tillage)                                                                                                                                                                                                                                                                    | Adopt SRI method of cultivation or late transplanting may be done with lesser spacing. Only life saving irrigation to be done. Construction of Jhalkund (water harvesting structure) before hand and its utilization during dry periods. | Leaflets and guide on SRI may be collected from KVKs. |
|                                               | <b>High altitude:</b> Cereals: Rice                                                                                                                | <b>Potato/Maize/Pea+ Cole crops/Rice/Maize+ Cauliflower/Potato/Pea</b>        | Replace rice by pea var. Arkel (zero tillage)                                                                                                                                                                                                                                                                    | Adopt SRI method of cultivation. Only life saving irrigation to be done. Construction of Jhalkund (water harvesting structure) before hand and its utilization during dry periods.                                                       | Leaflets and guide on SRI may be collected from KVKs. |

| Condition                                             |                         |                             | Suggested Contingency measures |                    |                           |
|-------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|--------------------|---------------------------|
|                                                       | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system | Agronomic measures | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | NA                      |                             |                                |                    |                           |

#### Resource management technologies

#### Jalkund – A boon for vegetable production

#### Background

The uncertain and erratic, high intense rains, lack of proper rainwater management leads to severe water scarcity, particularly during the post-monsoon season (November-April). This unavailability of adequate amount of water during the post rainy season (November-

April) poses a serious problem for successful *rab*i vegetable cultivation. Hence, rainwater harvesting and storage is essential. Rainwater harvesting and efficient utilization hold promise in hilly areas and is a key to a sustainable livelihood.

### **Resilient technology**

Jalkund, a micro low-cost rainwater harvesting structure is a suitable technology for providing climate resilience and improving the livelihood of small and marginal farmers. The water stored can be reused during moisture-stress periods. Jalkund is a water harvesting structure in which a pond of 5×4×1.5 m<sup>3</sup> is done at the selected site before the onset of the monsoon.

The Jalkunds are preferred on the hilltops and the upper portion of the slopes to divert water by the gravitational flow. A proper side slope is maintained for all four walls to provide stability and to hold the lining materials properly. The bottom and all sides of the Jalkund should be plastered with a slurry of clay and cow dung mixed in a ratio of 5:1 to avoid any damage to the lining material. After clay-plastering, about 3–5 cm thick cushioning should be done with locally available dry pine leaves, coir pith, paddy husk, thatch grass, *etc.* (@ 2–3 kg m<sup>-2</sup>) on the walls and bottom, to avoid any kind of damage to the lining material from any sharp or conical gravel, *etc.* This pit is lined with a Silpaulin lining film. This Jalkund has a storage capacity of 30,000 liters for harvesting rainwater during the rainy season and its subsequent use during dry periods to provide critical irrigation to high value winter vegetables.

The capacity of Jalkund can differ. Each Jalkund can harvest one and half times its original capacity considering its replenishment by intermittent rains and consequent evaporation loss of about 10%. A trench of 25×25 cm<sup>2</sup> has to be made around the Jalkund to bury the edges of lining materials and to hold the sheet firmly from all the corners.

### **Ridge and furrow in maize**

#### **Climate vulnerability: Moisture stress, frost, erratic and intensive rainfall**

#### **Details of technology**

Ridges of 60 cm bottom width and 30 cm top width were prepared with 20 cm height. Unit cost for implementation of ridges and furrows was ₹ 4,500 ha<sup>-1</sup>.

#### **Performance and impact of technology**

Good germination percentage (91%) and higher plant stand was observed at harvest (87%) by adoption of ridges and furrows technology. The yield, net returns and BC ratio increased by 43%, 90% and 21% respectively.

#### **Scope for upscaling**

Ridge and furrow technology has a potential for upscaling in rainfed terraces in collaboration with the concerned agriculture department.

### **Black polythene mulch: A strategy for *in-situ* moisture conservation**

#### **Climate vulnerability: Drought, dry spell and cyclone**

#### **Background**

In North East region of India, rainfed farming is predominant. Rainfall is erratic and ill distribution hence, moisture stress is common. This soil moisture stress reduces crop growth, in addition to this the weed infestation and soil temperature is a major concern as it affects crop growth and germination.

### **Resilient technology**

Black plastic mulch can be adopted as a low-cost and climate-smart agricultural technology, particularly suited to the hilly and high-rainfall areas of the North Eastern (NE) region of India. Plastic mulch moderates the soil temperature, reduces evaporation, and holds moisture in the soil. It also controls weeds, reduces soil erosion, protects plants from pests, and enhance crop resilience under variable climatic conditions which helps to increase both crop yield and quality. The black plastic film absorbs solar energy during the day, heating up and transferring warmth to the soil through conduction, especially when in close contact. This results in increased soil temperature, which supports early seed germination, vigorous root growth, and improved nutrient uptake, crucial in the cooler microclimates of NE hill states. At night, when temperatures drop especially under clear skies and dry air, the mulch helps to retain soil warmth, reducing thermal stress on crops. This diurnal temperature regulation is particularly beneficial for temperature sensitive vegetables like cabbage, cauliflower, broccoli and tomato.

**Performance and impact of technology**

The black plastic mulch (100 micron) is laid just before sowing the crop. Crops grow through slits and holes in thin plastic sheet. Plastic mulch showed a positive impact on yield and water use efficiency of plants. The mulching techniques are being used widely in irrigated crop production worldwide. It can also be implemented in summer vegetable production. Black plastic mulching produced higher weight of cabbage. The use of this technology improved crop yields and income of the farming community by 43% and 52% respectively (Table 2.1.11). The beneficiaries plan to increase the area under tomato and cabbage for sustainable production.

# Actionable Comprehensive Plans for Contingency

|       |           |          |                  |
|-------|-----------|----------|------------------|
| State | MEGHALAYA | District | NORTH GARO HILLS |
|-------|-----------|----------|------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1851.6               | More than 19%          | Less than 1499.796     |
| June         | 482.2                |                        |                        |
| July         | 550                  |                        |                        |
| August       | 394.6                |                        |                        |
| September    | 424.8                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 6838  | Gross irrigated area: | 7590  |
| Net Rainfed area    | 11571 | Gross rainfed area    | 15866 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 6838 | 7590  |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 1900            | 1611                | 289               |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 613             |                     | 613               |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |

## Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 51              |                     | 51                |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 79              |                     | 79                |
| 4    | Soyabean       | 110             |                     | 110               |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | 11              |                     |                   |

## Fibre

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Cotton    | 276             |                     | 276               |
| 2    | Jute      | 122             |                     | 122               |
| 3    | Mesta     | 29              |                     | 29                |
| 4    | Sunhemp   | -               |                     |                   |

## Other crops

| S.No | Crop name          | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|--------------------|-----------------|---------------------|-------------------|
| 1    | Sugarcane          | 23              |                     | 23                |
| 2    | Tobacco            | 138             |                     | 138               |
| 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 including variety                                                                                                                                                       | Agronomic measures                              | Remarks on Implementation |
| Delay by 4 weeks (July 1 <sup>st</sup> week) | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli + Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Paddy:</b> Bhalum-1, Bhalum-2<br><b>Maize:</b> Da61a, Vijay composite<br><b>Intercropping:</b> Maize+ cowpea, Maize+ Blackgram/ greengram<br><b>Turmeric:</b> Lakadang, RCT-1<br><b>Ginger:</b> Nadia | Conservation furrow, Intercultivation, mulching | -                         |
|                                              | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                    | <b>Paddy:</b> Sahsarang Swarna mahsuri                                                                                                                                                                   | SRI, ICM method for paddy cultivation           |                           |



|  |                 |                                                     |                                                          |                                                               |  |
|--|-----------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|--|
|  |                 | Maize (sole)                                        | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 | Mulching with weed spp. Adopt closer spacing 40x30cm in maize |  |
|  |                 | Maize-mustard/vegetable                             | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 |                                                               |  |
|  |                 | Cowpea, bhindi, amaranthus, chilli, banana, pumpkin |                                                          |                                                               |  |
|  | Rainfed lowland | Boropaddy                                           | <b>Boro paddy:</b> KRH-2, Jaymati, Naveen                |                                                               |  |

| Condition                                                                                                     |                         |                                                                                       | Suggested Contingency measures                                    |                                                                              |                           |
|---------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------|
| Early season drought (Normal onset)                                                                           | Major Farming situation | Normal Crop/cropping system                                                           | Crop management                                                   | Soilnutrient&moisture conservation measures                                  | Remarks on Implementation |
| <b>Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/crop stand etc.</b> | Rainfed upland          | Jhum land Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Thinning and gap filling of existing crop,                        | IPNS(Oragnc + inorganic+ BF), INM(Organic + inorganic), Weed mulching        |                           |
|                                                                                                               | Rainfed medium land     | Sali Paddy(sole) Sali paddy-mustard/vegetable                                         | Life saving irrigation, Resowing, if required Gap filling weeding | SRI, ICM method for paddy cultivation, Direct wet seeding of sprouted seeds, |                           |
|                                                                                                               |                         | Radish cowpea, palak and Coriander                                                    |                                                                   |                                                                              |                           |
|                                                                                                               | Rainfed lowland         | Boropaddy                                                                             |                                                                   |                                                                              |                           |

#### Contingency measures- Mid season

| Early and mid season drought Outbreak of pests and diseases due to unusual rains | Suggested contingency measures                                                                                                                                                                                                                              |                                          |                                                                                                                                                     |                                                                                                             |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|                                                                                  | Vegetative stage                                                                                                                                                                                                                                            | Flowering stage                          | Crop maturity                                                                                                                                       | Post harvest                                                                                                |
| Paddy                                                                            | 1.Weed control<br>2.For seed and root pests and stem borers, seedling maggots and locust suitable IPM measures should be followed<br>3.For Rhizoctonia root rot-cultural, chemical (mancozeb 3g/lit of water for foliar application) and biological control | Follow suitable crop protection measures | Spray with suitable insecticides to avoid cut worm infestation<br><br>Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole. | Harvest the crop at maturity, dry properly and store in gunny bags.                                         |
| Pulses                                                                           | 1.Remove weeds<br>2.seedling mortality can be reduced by delayed                                                                                                                                                                                            | Follow suitable crop                     | Rodent holes should be treated with Aluminium                                                                                                       | leave the harvested crop in small heaps for 2-3 days for curing. After curing collect the crop at one place |

|                                                    |                                                                                                                                                                                                                                                             |                                                     |                                                                                                          |                                                                                                        |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                                                    | planting until mid November<br>3.For powdery mildew disease spray the crop at the appearance of the disease with wettable sulphur like sulfex. Spray at 15 days interval.<br>4 For hairy caterpillars and loopers spray with phosphomedon 2ml/lit of water. | protection measures                                 | phosphide @ 6 pellets per hole.<br><br>After harvest collect the plants left in the field and burn them. | and detach the pods either by hand or using groundnut plucker for separating the pods from the plants. |
| Maize,pumpkin,tapioca,sweetpotato (mixed cropping) | Need based plant protection measures both IPM & IDM.                                                                                                                                                                                                        | Need based plant protection measures both IPM & IDM | Need based plant protection measures both IPM & IDM                                                      | -                                                                                                      |

| 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 |
| <b>Delay by 6 weeks</b> (July 3 <sup>rd</sup> week) | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Intercropping:</b><br>Maize+ cowpea(2:1),<br>Maize+Blackgram/ greengram(1:1)<br>Blackgram: T 9, kalindi<br>Green gram: K-851, samrat<br>Soybean: JS 80-21, JS 335 | Conservation furrow, mulching, harvest green cob of maize  |                           |
|                                                     | Rainfed medium land     | Sali Paddy<br>Sali paddy-mustard/vegetable                                               | <b>Paddy:</b> Satyaranjan, Basundhara<br>Frenchbean, Bhindi, Amaranthus                                                                                              | SRI/ICM method for Paddy cultivation, Zero tillage Mustard |                           |
|                                                     | Rainfed lowland         | Boropaddy                                                                                | <b>Boro paddy:</b> Jaymati, Kanaklata, Naveen                                                                                                                        |                                                            |                           |

| 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 |
| <b>Delay by 8 weeks</b> (August 1 <sup>st</sup> week) | Rainfed upland          | Jhum rice + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Sesamum:</b> AST-1<br>Short duration Blackgram (var. kalindi), Greengam (Samrat/K-851) | Adopt closer spacing 25x10cm                                                                                                                     |                           |
|                                                       | Rainfed medium land     | Sali Paddy (sole)<br>Sali paddy-mustard/vegetable                               | <b>Paddy:</b> Disang, Luit, Kapilee<br>Radish, Pumpkin. frenchbean                        | Direct seeding of rice ,<br>*SRI method for Paddy cultivation,<br>*Direct wet seeding of sprouted rice seeds,<br>*Zero tillage Mustard/greengram |                           |
|                                                       | Rainfed lowland         | Boropaddy                                                                       | <b>Boropaddy:</b> Jaymati, kanaklata, KRH-2,                                              |                                                                                                                                                  |                           |

|  |  |  |                                    |  |  |
|--|--|--|------------------------------------|--|--|
|  |  |  | chandrama, TRC<br>Borodhan, Naveen |  |  |
|--|--|--|------------------------------------|--|--|

| 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                                                                                                                               | Soilnutrient&moisture conservation measures                   | Remarks on Implementation |
| At vegetative stage                                                                | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Weeding, Life saving irrigation from Jalkund, farm pond                                                                                       | Jalkund, mulching, conservation furrow, repair bunds          |                           |
|                                                                                    | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Dual cropping of paddy with Azolla<br>Postponement of topdressing of Nitrogen, life saving irrigation, IPM, IDM for pest & disease management | Azolla, Compost, Vermicompost, Integrated nutrient management |                           |
|                                                                                    |                         | Maize (sole)                                                                             |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Maize- mustard/vegetable                                                                 |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Cowpea, French bean, coriander, radish, palak                                            |                                                                                                                                               |                                                               |                           |
|                                                                                    | Rainfed lowland         | Boropaddy                                                                                | No change                                                                                                                                     | -                                                             |                           |

| Condition                           |                                |                                                                                          | Suggested Contingency measures                |                                                       |                           |
|-------------------------------------|--------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|---------------------------|
| Mid season drought (long dry spell) | Major Farming situation        | Normal Crop/cropping system                                                              | Crop management                               | Soilnutrient&moisture conservation measures           | Remarks on Implementation |
| At flowering/ fruiting stage        | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Life saving irrigation from Jalkund, fam pond | Jalkund, Vermicompost @ 2t/ha,                        |                           |
|                                     | Rainfed medium to shallow land | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Weeding, life saving irrigation               | Vermicompost@ 2t/ha, FYM@ 5 t/ha, Mulching, farm pond |                           |
|                                     |                                | Maize (sole)                                                                             |                                               |                                                       |                           |
|                                     |                                | Maize- mustard/vegetable                                                                 | Earthing up for maize                         |                                                       |                           |
|                                     | Rainfed lowland                | Boropaddy                                                                                | Life saving irrigation                        |                                                       |                           |

#### Contingency measures- End of the season

| Condition                                      |                         |                             | Suggested Contingency measures |                            |                           |
|------------------------------------------------|-------------------------|-----------------------------|--------------------------------|----------------------------|---------------------------|
| Terminal drought (Early withdrawal of monsoon) | Major Farming situation | Normal Crop/cropping system | Crop management                | Rabi Crop planning         | Remarks on Implementation |
| Heavy uneven rainfall, mid                     | Rainfed upland          | Jhum land                   | Harvest mature crops           | Plan for Winter vegetables |                           |

|                                                 |                        |                                                                                         |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|-------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| season dry spell,<br>medium to<br>shallow soils |                        | Paddy + Maize +<br>Pumpkin + Chilli<br>+Tapioca + Sweet<br>Potato+ Ginger +<br>Turmeric | Damaged crops<br>may used as<br>fodder depending<br>on the suitability                       | ( cabbage,<br>cauliflower, tmato,<br>broccoli etc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|                                                 | Rainfed<br>medium land | Sali Paddy(sole)<br>Sali paddy-mustard                                                  |                                                                                              | Mustard, Pea<br>Vegetables<br>greengram                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
|                                                 |                        | Maize (sole)                                                                            | Harvest green cob                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|                                                 |                        | Maize-<br>mustard/vegetable                                                             |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|                                                 |                        | Cole crops, French bean,<br>radish, carrot,                                             | Cole crops nursery<br>under protected<br>polyhouse, Ridge<br>plot for French<br>bean, radish | - Rabi cropping<br>with cole crops<br>such as<br>Cauliflower (mid<br>season varieties –<br>Improved<br>japanesees, Pusa<br>Synthetic, Pusa<br>snowball etc. )<br>and Cabbage ( Varieties – Golden<br>acre, Pride of<br>india, Pusa Mukta<br>etc.), Knolkhol<br>(White viena)<br>etc.<br>- Growing of<br>Tomato, Brinjal,<br>pea, potato and<br>Leafy vegetables<br>like Spinach,<br>Radish etc. with<br>recommended<br>varieties and<br>package of<br>practices.<br>--Growing of rabi<br>field crops like<br>toria, lentil, |  |
|                                                 | Rainfed<br>lowland     | Boropaddy                                                                               |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |

#### Drought - Irrigated situation

| Condition                                                    | Major Farming<br>situation | Normal<br>Crop/cropping<br>system      | Suggested Contingency measures       |                                       |                              |
|--------------------------------------------------------------|----------------------------|----------------------------------------|--------------------------------------|---------------------------------------|------------------------------|
|                                                              |                            |                                        | Change in<br>crop/cropping<br>system | Agronomic<br>measures                 | Remarks on<br>Implementation |
| Delayed release of<br>water in canals due<br>to low rainfall | Medium to shallow<br>land  | Sali Paddy(sole)<br>Sali paddy-mustard | Boro paddy                           | Weeding, life<br>saving<br>irrigation | -                            |
|                                                              |                            | Maize (sole)                           | Intercropping                        | Earthing up for<br>maize,<br>Mulching |                              |
|                                                              |                            | Maize- mustard                         |                                      |                                       |                              |
|                                                              |                            | Cowpea and French<br>bean              |                                      |                                       |                              |

| Condition                                              |                                                                          |                                                   | Suggested Contingency measures |                                     |                           |
|--------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|-------------------------------------|---------------------------|
|                                                        | Major Farming situation                                                  | Normal Crop/cropping system                       | Change in crop/cropping system | Agronomic measures                  | Remarks on Implementation |
| Limited release of water in canals due to low rainfall | Medium to shallow land                                                   |                                                   | Boro paddy<br>Rice-fallow      | Life saving irrigation,<br>Mulching |                           |
|                                                        | Sali Paddy(sole)<br>Sali paddy-mustard<br>Maize (sole)<br>Maize- mustard | Bhindi, radish,<br>tomato, abbage,<br>cauliflower |                                |                                     |                           |

| Condition                                                                  |                         |                                     | Suggested Contingency measures |                                   |                           |
|----------------------------------------------------------------------------|-------------------------|-------------------------------------|--------------------------------|-----------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system         | Change in crop/cropping system | Agronomic measures                | Remarks on Implementation |
| Non release of water in canals under delayed onset of monsoon in catchment | Lateritic soils         | Fallow                              | Sali Paddy(sole late sown)     | Life saving irrigation<br>weeding |                           |
|                                                                            |                         | Tapioca, colocasia,<br>sweet potato |                                |                                   |                           |

| Condition                                                                |                         |                             | Suggested Contingency measures  |                                    |                           |
|--------------------------------------------------------------------------|-------------------------|-----------------------------|---------------------------------|------------------------------------|---------------------------|
|                                                                          | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system  | Agronomic measures                 | Remarks on Implementation |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon | Medium to shallow land  | Fallow                      | Boro paddy                      | Weeding,<br>life saving irrigation |                           |
|                                                                          |                         | Vegetables                  | Root crops,<br>onion, colocasia | Mulching                           |                           |

| Condition                                             |                            |                             | Suggested Contingency measures                       |                                                            |                           |
|-------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------------|------------------------------------------------------------|---------------------------|
|                                                       | Major Farming situation    | Normal Crop/cropping system | Change in crop/cropping system                       | Agronomic measures                                         | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | Low land shallow tube well | Cropping system 1: Fallow   | Boro paddy<br>Lentil, pea,<br>mustard,<br>vegetables | Limited irrigation at critical stages,<br>SRI & ICM method |                           |

### Resource management technologies

#### Jalkund – A boon for vegetable production

##### Background

The uncertain and erratic, high intense rains, lack of proper rainwater management leads to severe water scarcity, particularly during the post-monsoon season (November-April). This unavailability of adequate amount of water during the post rainy season (November-April) poses a serious problem for successful *rabi* vegetable cultivation. Hence, rainwater harvesting and storage is essential. Rainwater harvesting and efficient utilization hold promise in hilly areas and is a key to a sustainable livelihood.

### **Resilient technology**

Jalkund, a micro low-cost rainwater harvesting structure is a suitable technology for providing climate resilience and improving the livelihood of small and marginal farmers. The water stored can be reused during moisture-stress periods. Jalkund is a water harvesting structure in which a pond of 5×4×1.5 m<sup>3</sup> is done at the selected site before the onset of the monsoon. The Jalkunds are preferred on the hilltops and the upper portion of the slopes to divert water by the gravitational flow. A proper side slope is maintained for all four walls to provide stability and to hold the lining materials properly. The bottom and all sides of the Jalkund should be plastered with a slurry of clay and cow dung mixed in a ratio of 5:1 to avoid any damage to the lining material. After clay-plastering, about 3-5 cm thick cushioning should be done with locally available dry pine leaves, coir pith, paddy husk, thatch grass, *etc.* (@ 2–3 kg m<sup>-2</sup>) on the walls and bottom, to avoid any kind of damage to the lining material from any sharp or conical gravel, *etc.* This pit is lined with a Silpaulin lining film. This Jalkund has a storage capacity of 30,000 liters for harvesting rainwater during the rainy season and its subsequent use during dry periods to provide critical irrigation to high value winter vegetables.

The capacity of Jalkund can differ. Each Jalkund can harvest one and half times its original capacity considering its replenishment by intermittent rains and consequent evaporation loss of about 10%. A trench of 25×25 cm<sup>2</sup> has to be made around the Jalkund to bury the edges of lining materials and to hold the sheet firmly from all the corners.

### **Ridge and furrow in maize**

**Climate vulnerability: Moisture stress, frost, erratic and intensive rainfall**

#### **Details of technology**

Ridges of 60 cm bottom width and 30 cm top width were prepared with 20 cm height. Unit cost for implementation of ridges and furrows was ₹ 4,500 ha<sup>-1</sup>.

#### **Performance and impact of technology**

Good germination percentage (91%) and higher plant stand was observed at harvest (87%) by adoption of ridges and furrows technology. The yield, net returns and BC ratio increased by 43%, 90% and 21% respectively.

#### **Scope for upscaling**

Ridge and furrow technology has a potential for upscaling in rainfed terraces in collaboration with the concerned agriculture department.

### **Black polythene mulch: A strategy for *in-situ* moisture conservation**

**Climate vulnerability: Drought, dry spell and cyclone**

#### **Background**

In North East region of India, rainfed farming is predominant. Rainfall is erratic and ill distribution hence, moisture stress is common. This soil moisture stress reduces crop growth, in addition to this the weed infestation and soil temperature is a major concern as it affects crop growth and germination.

### **Resilient technology**

Black plastic mulch can be adopted as a low-cost and climate-smart agricultural technology, particularly suited to the hilly and high-rainfall areas of the North Eastern (NE) region of India. Plastic mulch moderates the soil temperature, reduces evaporation, and holds moisture in the soil. It also controls weeds, reduces soil erosion, protects plants from pests, and enhance crop resilience under variable climatic conditions which helps to increase both crop yield and quality. The black plastic film absorbs solar energy during the day, heating up and transferring warmth to the soil through conduction, especially when in close contact. This results in increased soil temperature, which supports early seed germination, vigorous root growth, and improved nutrient uptake, crucial in the cooler microclimates of NE hill states. At night, when temperatures drop especially under clear skies and dry air, the mulch helps to retain soil warmth, reducing thermal stress on crops. This diurnal temperature regulation is particularly beneficial for temperature sensitive vegetables like cabbage, cauliflower, broccoli and tomato.

#### **Performance and impact of technology**

The black plastic mulch (100 micron) is laid just before sowing the crop. Crops grow through slits and holes in thin plastic sheet. Plastic mulch showed a positive impact on yield and water use efficiency of plants. The mulching techniques are being used widely in irrigated crop production worldwide. It can also be implemented in summer vegetable production. Black plastic mulching produced higher weight of cabbage. The use of this technology improved crop yields and income of the farming community by 43% and 52% respectively (Table 2.1.11). The beneficiaries plan to increase the area under tomato and cabbage for sustainable production.

# Actionable Comprehensive Plans for Contingency

|       |           |          |        |
|-------|-----------|----------|--------|
| State | MEGHALAYA | District | RIBHOI |
|-------|-----------|----------|--------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1633.5               | More than 19%          | Less than 1323.135     |
| June         | 370.7                |                        |                        |
| July         | 440.1                |                        |                        |
| August       | 348.8                |                        |                        |
| September    | 473.9                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 13358 | Gross irrigated area: | 14950 |
| Net Rainfed area    | 9111  | Gross rainfed area    | 12089 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net   | Gross |
|----------------------|-------|-------|
| Canals               | 13358 | 14950 |
| 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     | 3205            |                     | 3205              |
| 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        | 2               |                     | 2                 |
| 4    | Soyabean       | 265             | 53                  | 212               |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | 6               |                     |                   |

## 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 'including variety                  | Agronomic measures                                                                                                                                                                                                                                                        | Remarks on Implementation                                                                |
| Delay by 4 weeks (Specify month) July 1 <sup>st</sup> week | 1. Upland with moderate to high rainfall, no irrigation facility | Ginger<br><br>Ginger + Cucumber | Ginger Var: Nadia<br><br>Ginger Var: Nadia<br>Cucumber var- Malini | <ul style="list-style-type: none"> <li>• Application of recommended amount of organic manures before sowing &amp; deep ploughing 2-3 times.</li> <li>• Mulching with waste materials</li> <li>• Intercropping with Cucurbits</li> <li>• Frequent intercultural</li> </ul> | Divn. Of Horticulture, ICAR, Umiam. Deptt. Of Horticulture, Govt. of Meghalaya, Shillong |



|  |                    |                         |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|--|--------------------|-------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                    |                         |                                                                  | operation for conservation of moisture                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|  |                    | Turmeric                | Turmeric Var: Megha Turmeric-1                                   | <ul style="list-style-type: none"> <li>• Application of recommended amount of organic manures before sowing &amp; deep ploughing 2-3 times.</li> <li>• Mulching with waste materials</li> <li>• Frequent intercultural operation for conservation of moisture</li> </ul>                                                                                                                                                                 |  |
|  | 2. Medium land     | Sweet potato, Colocasia | No change                                                        | <ul style="list-style-type: none"> <li>• Normal sowing of sweet potato and colocasia</li> </ul>                                                                                                                                                                                                                                                                                                                                          |  |
|  | 3. Rainfed Lowland | Paddy                   | No change                                                        | <ul style="list-style-type: none"> <li>• Watering in nursery to be ensured</li> <li>• Mid altitude- Shasrang, Lampnah</li> <li>• Low alt- Ranjit, IR 64</li> <li>• Frequent intraculture operations for conservation of moisture</li> <li>• Closer spacing and increase seed rate and nitrogen fertilizer rate by 20-25%</li> <li>• Stock rice seedling (bundles) in corner of main field for gap filling after transplanting</li> </ul> |  |
|  |                    | Paddy                   | Short duration variety: e.g Vivek Dhan 82, VL Dhan 61, Luit etc. | <ul style="list-style-type: none"> <li>• Intercultural operations can be delayed after first ploughing</li> <li>• Sowing of paddy nursery at 15 days interval may be more area put under nursery</li> <li>• Mulching</li> <li>• Closer spacing and increase seed rate and nitrogen</li> </ul>                                                                                                                                            |  |

|  |  |  |  |                                                                                                                                                                         |  |
|--|--|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  |  |  | fertilizer rate by 20-25% <ul style="list-style-type: none"> <li>• Stock rice seedling (bundles) in corner of main field for gap filling after transplanting</li> </ul> |  |
|--|--|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

#### Contingency measures- Mid season

| 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 measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Remarks on Implementation        |
| At vegetative stage<br>June 3 <sup>rd</sup> wk                                    | 1. Upland with moderate to high rainfall, no irrigation facility | Ginger, Turmeric, Guava, Khasi mandarin, Cucurbitaceous crops | <ul style="list-style-type: none"> <li>• Weeding</li> <li>• Thinning the plant population</li> <li>• Spray of anti-transpirants</li> <li>• Mulching</li> <li>• Need based plant protection measures</li> </ul>                                                                                                  | <ul style="list-style-type: none"> <li>• Application of sufficient amount of organic manures before sowing</li> <li>• Balance fertilization</li> <li>• Lifesaving irrigation</li> <li>• Well conserve moisture through mulching</li> <li>• Wider spacing</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> <li>• Early sowing of winter vegetables</li> </ul> | -                                |
|                                                                                   | 2. Rainfed upland                                                | Paddy                                                         | <ul style="list-style-type: none"> <li>• Weeding</li> <li>• Thinning the plant population</li> <li>• Spray of anti-transpirants</li> <li>• Mulching</li> <li>• Need based plant protection measures</li> <li>• Growing of catch crop eg. Blackgram</li> <li>• Utilizing paddy fallow for second crop</li> </ul> | <ul style="list-style-type: none"> <li>• Conserve rain water by repairing field bunds</li> <li>• Undertake gap filling with conserve nursery of same age</li> <li>• 2% Urea spray</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> <li>• Early sowing of winter vegetables</li> </ul>                                                                        | Local variety in tillering stage |

|  |                                   |                   |                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                    |                           |
|--|-----------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|  |                                   | <b>Maize</b>      | <ul style="list-style-type: none"> <li>• Mulching</li> <li>• Need based plant protection measures</li> <li>• Thinning plant population</li> <li>• Early sowing of winter vegetables</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>• Weeding and mulching</li> <li>• Lifesaving irrigation</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> </ul>                                              |                           |
|  | <b>3. Lowland</b>                 | <b>Groundnut</b>  | <ul style="list-style-type: none"> <li>• Mulching</li> <li>• Need based plant protection measures</li> <li>• Thinning plant population</li> <li>• Early sowing of winter vegetables</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>• Weeding and mulching</li> <li>• Lifesaving irrigation</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> <li>• Early sowing of winter vegetables</li> </ul> |                           |
|  |                                   | <b>Black gram</b> | <ul style="list-style-type: none"> <li>• Mulching</li> <li>• Need based plant protection measures</li> <li>• Thinning plant population</li> <li>• Early sowing of winter vegetables</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>• Weeding and mulching</li> <li>• Lifesaving irrigation</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> <li>• Early sowing of winter vegetables</li> </ul> |                           |
|  | <b>4. Rainfed shallow lowland</b> | Rice based        | <ul style="list-style-type: none"> <li>• Mulching</li> <li>• Need based plant protection measures</li> <li>• Thinning plant population</li> <li>• Early sowing of winter vegetables</li> <li>• Spraying of Boron ( Borax) and Potassium (Potassium Chloride) increases drought tolerance</li> </ul> | <ul style="list-style-type: none"> <li>• Watering in nursery</li> <li>• Lifesaving irrigation</li> <li>• Frequent intercultural operation for conservation of moisture</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> <li>• Soil conservation measures to be followed</li> <li>• Early sowing of winter vegetables</li> </ul>  | Conserve in situ moisture |

|  |  |  |                                                                                           |  |  |
|--|--|--|-------------------------------------------------------------------------------------------|--|--|
|  |  |  | <ul style="list-style-type: none"> <li>Utilizing paddy fallows for second crop</li> </ul> |  |  |
|--|--|--|-------------------------------------------------------------------------------------------|--|--|

| Condition                           |                                                                 |                                                   | Suggested Contingency measures                                                                                             |                                                                                                                                                                                                                                                                                                               |                                        |
|-------------------------------------|-----------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Mid season drought (long dry spell) | Major Farming situation <sup>a</sup>                            | Normal Crop/cropping system <sup>b</sup>          | Crop management                                                                                                            | Soil nutrient & moisture conservation measures <sup>d</sup>                                                                                                                                                                                                                                                   | Remarks on Implementation <sup>e</sup> |
| At flowering/ fruiting stage        | 1 Upland with moderate to high rainfall, no irrigation facility | Cucurbitaceous crops, okra, guava, Khasi mandarin | <ul style="list-style-type: none"> <li>Need based plant protection measures</li> <li>Spray of anti-transpirants</li> </ul> | <ul style="list-style-type: none"> <li>Moisture conservation practices like ridging, mulching.</li> <li>Frequent intercultural operation for conservation of moisture</li> <li>Lifesaving irrigation</li> <li>Soil conservation measures to be followed</li> </ul>                                            |                                        |
|                                     | 2. Rainfed shallow Lowland                                      | Rice based                                        | <ul style="list-style-type: none"> <li>Alternate Wetting and Drying technology can be utilized</li> </ul>                  | <ul style="list-style-type: none"> <li>Lifesaving irrigation can be provided to crop at critical stages</li> <li>Moisture conservation practices like ridging, mulching.</li> <li>Frequent intercultural operation for conservation of moisture</li> <li>Soil conservation measures to be followed</li> </ul> |                                        |

#### Contingency measures- End of the season

| Condition        |                         |                             | Suggested Contingency measures                                                                                                                                                                                                                                                                                                                                        |
|------------------|-------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminal drought | Major Farming situation | Normal Crop/cropping system | Crop management                                                                                                                                                                                                                                                                                                                                                       |
| July-August      | Upland                  | Maize                       | <ul style="list-style-type: none"> <li>Harvest for fodder/green cob</li> <li>Life saving irrigation</li> <li>Sow French bean in upland immediately after harvest</li> <li>Mulching with greens/dry leaves</li> <li>Cover cropping with main crop</li> <li>Furrow application of FYM</li> <li>Frequent intercultural operation for conservation of moisture</li> </ul> |

|                                                                    |                                                                 |                                                                    |                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>September-October</b><br><br><br><br><br><br><br><b>Oct-Nov</b> | 1 Upland with moderate to high rainfall, no irrigation facility | Ginger, Turmeric, Fruit crops, Cucurbitaceous crops, Brinjal, Okra | <ul style="list-style-type: none"> <li>• Appropriate pest and disease management</li> <li>• Harvest for fodder/green cob</li> <li>• Life saving irrigation</li> <li>• Sow French bean in upland immediately after harvest</li> <li>• Mulching with greens/dry leaves</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> </ul> |
|                                                                    | 2. Rainfed shallow Lowland                                      | Boro rice (var. TRC-Borodhan-1, Naveen, Ranjit)                    | <ul style="list-style-type: none"> <li>• Harvest for fodder/green cob</li> <li>• Life saving irrigation</li> <li>• Sow French bean in upland immediately after harvest</li> <li>• Mulching with greens/dry leaves</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> </ul>                                                    |
|                                                                    | Lowland rice                                                    | Boro Rice(var. TRC-Borodhan-1, Naveen, Ranjit)                     | <ul style="list-style-type: none"> <li>• Life saving irrigation</li> <li>• Harvest at physiological maturity</li> <li>• Harvest for fodder/green cob</li> <li>• Sow French bean in upland immediately after harvest</li> <li>• Mulching with greens/dry leaves</li> <li>• Cover cropping with main crop</li> <li>• Furrow application of FYM</li> </ul>       |

## 2.1.2 Drought - Irrigated situation

| Condition                                              | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                       |                                                                                                           |
|--------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------|
|                                                        |                         |                             | Change crop/cropping system    | Agronomic measures    | Remarks on Implementation                                                                                 |
| Delayed release of water in canals due to low rainfall | Lowland                 | Rice                        | No change                      | Late duration variety | Assistance of NFSM, RKVY schemes may be taken. For seeds contact with nearest ICAR Research Centers, SAUs |

| Condition                                              | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                        |                                                                                                             |
|--------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------|
|                                                        |                         |                             | Change crop/cropping system    | Agronomic measures     | Remarks on Implementation                                                                                   |
| Limited release of water in canals due to low rainfall | Lowland                 | Rice                        | No change                      | Late duration variety  | Assistance of NFSM, RKVY schemes may be taken. For seeds contact with nearest ICAR Research Centres, SAUs . |
|                                                        | Lowland                 | Rice                        | SRI nursery to be used         | 8-10 days old seedling |                                                                                                             |

| Condition                                                                  | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                    |                                                                                                             |
|----------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------|
|                                                                            |                         |                             | Change crop/cropping system    | Agronomic measures | Remarks on Implementation <sup>f</sup>                                                                      |
| Non release of water in canals under delayed onset of monsoon in catchment | Lowland                 | Rice                        | SRI hybrids to be used         | low seed rate      | Assistance of NFSM, RKVY schemes may be taken. For seeds contact with nearest ICAR Research Centres, SAUs . |

|  |         |      |                       |                                 |  |
|--|---------|------|-----------------------|---------------------------------|--|
|  | Lowland | Rice | Delayed transplanting | Direct sown under transplanting |  |
|--|---------|------|-----------------------|---------------------------------|--|

| Condition                                                              | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                                       |                                                                                                           |
|------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                                                        |                         |                             | Change crop/cropping system    | Agronomic measures                    | Remarks on Implementation                                                                                 |
| Lack of inflow into tanks due to insufficient/delayed onset of monsoon | Lowland                 | Rice                        | Delayed transplanting          | Direct sown under unpuddled condition | Assistance of NFSM,RKVY schemes may be taken.For seeds contact with nearest ICAR Research Centres, SAUs . |

| Condition                                             | Major Farming situation | Normal Crop/cropping system | Suggested Contingency measures |                                       |                                                                                                           |
|-------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                                       |                         |                             | Change crop/cropping system    | Agronomic measures                    | Remarks on Implementation                                                                                 |
| Insufficient groundwater recharge due to low rainfall | Lowland                 | Rice                        | Late duration                  | Direct sown under unpuddled condition | Assistance of NFSM,RKVY schemes may be taken.For seeds contact with nearest ICAR Research Centres, SAUs . |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                  |
|-------|-----------|----------|------------------|
| State | MEGHALAYA | District | SOUTH GARO HILLS |
|-------|-----------|----------|------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1851.6               | More than 19%          | Less than 1499.796     |
| June         | 482.2                |                        |                        |
| July         | 550                  |                        |                        |
| August       | 394.6                |                        |                        |
| September    | 424.8                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 8001  | Gross irrigated area: | 8608  |
| Net Rainfed area    | 14404 | Gross rainfed area    | 24107 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 8001 | 8608  |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 2333            | 2333                | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 1241            |                     | 1241              |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |

## Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 144             |                     | 144               |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 225             |                     | 225               |
| 4    | Soyabean       | 25              |                     | 25                |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | -               |                     |                   |

## Fibre

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Cotton    | 15              |                     | 15                |
| 2    | Jute      | 445             |                     | 445               |
| 3    | Mesta     | 410             |                     | 410               |
| 4    | Sunhemp   | -               |                     |                   |

## Other crops

| S.No | Crop name          | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|--------------------|-----------------|---------------------|-------------------|
| 1    | Sugarcane          | 10              |                     | 10                |
| 2    | Tobacco            | 126             |                     | 126               |
| 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 including variety                                                                                                                                                       | Agronomic measures                               | Remarks on Implementation |
| Delay by 4 weeks (July 1 <sup>st</sup> week) | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Paddy:</b> Bhalum-1, Bhalum-2<br><b>Maize:</b> Da61a, Vijay composite<br><b>Intercropping:</b> Maize+ cowpea, Maize+ Blackgram/ greengram<br><b>Turmeric:</b> Lakadang, RCT-1<br><b>Ginger:</b> Nadia | Conservation furrow, Inter cultivation, mulching | -                         |



|  |                     |                                                     |                                                          |                                                               |  |
|--|---------------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|--|
|  | Rainfed medium land | Sali Paddy(sole)<br>Sali paddy-mustard              | <b>Paddy:</b> Sahsarang<br>Swarna mahsuri                | SRI, ICM method for paddy cultivation                         |  |
|  |                     | Maize (sole)                                        | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 | Mulching with weed spp. Adopt closer spacing 40x30cm in maize |  |
|  |                     | Maize-mustard/vegetable                             | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 |                                                               |  |
|  |                     | Cowpea, bhendi, amaranthus, chilli, banana, pumpkin |                                                          |                                                               |  |
|  | Rainfed lowland     | Boropaddy                                           | <b>Boro paddy:</b> KRH-2, Jaymati, Naveen                |                                                               |  |

| Early and mid season drought<br>Outbreak of pests and diseases due to unusual rains | Suggested contingency measures                                                                                                                                                                                                                                                                                             |                                                     |                                                                                                                                                        |                                                                                                                                                                                                                   |  |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                     | Vegetative stage                                                                                                                                                                                                                                                                                                           | Flowering stage                                     | Crop maturity                                                                                                                                          | Post harvest                                                                                                                                                                                                      |  |
| Paddy                                                                               | 1.Weed control<br>2.For seed and root pests and stem borers,seedling maggots and locust suitable IPM measures should be followed<br>3.For Rhizoctonia root rot-cultural,chemical (mancozeb 3g/lit of water for foliar application) and biological control                                                                  | Follow suitable crop protection measures            | Spray with suitable insecticides to avoid cut worm infestation<br><br>Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.    | Harvest the crop at maturity,dry properly and store in gunny bags.                                                                                                                                                |  |
| Pulses                                                                              | 1.Remove weeds<br>2.seedling mortality can be reducedby delayed planting until mid November<br>3.For powdery mildew disease spray the crop at he appearance of the disease with wettable sulphur like sulfex.Spray at 15 days interval.<br>4 For hairy caterpillars and loopers spray with phosphomed on 2ml/lit of water. | Follow suitable crop protection measures            | Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.<br><br>After harvest collect the plants left in the field and burn them. | leave the harvested crop in small heaps for 2-3 days for curing.After curing collect the crop at one place and detach the pods either by hand or using groundnut plucker for separating the pods from the plants. |  |
| Maize,pumpkin,tapioca,sweet potato(mixed cropping)                                  | Need based plant protection measures both IPM & IDM.                                                                                                                                                                                                                                                                       | Need based plant protection measures both IPM & IDM | Need based plant protection measures both IPM & IDM                                                                                                    | -                                                                                                                                                                                                                 |  |

#### Contingency measures- Mid season

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

| ( <b>&lt;2.5 mm</b> )<br><b>period</b> ) |                     |                                                                                          |                                                                                                                                               |                                                               |  |
|------------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--|
| <b>At vegetative stage</b>               | Rainfed upland      | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Weeding, Life saving irrigation from Jalkund, farm pond                                                                                       | Jalkund, mulching, conservation furrow, repair bunds          |  |
|                                          | Rainfed medium land | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Dual cropping of paddy with Azolla<br>Postponement of topdressing of Nitrogen, life saving irrigation, IPM, IDM for pest & disease management | Azolla, Compost, Vermicompost, Integrated nutrient management |  |
|                                          |                     | Maize (sole)                                                                             |                                                                                                                                               |                                                               |  |
|                                          |                     | Maize-mustard/vegetable                                                                  |                                                                                                                                               |                                                               |  |
|                                          |                     | Cowpea, French bean, coriander, radish, palak                                            |                                                                                                                                               |                                                               |  |
|                                          | Rainfed lowland     | Boropaddy                                                                                | No change                                                                                                                                     | -                                                             |  |

| 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        | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Life saving irrigation from Jalkund, fam pond | Jalkund, Vermicompost @ 2t/ha,                        |                           |
|                                     | Rainfed medium to shallow land | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Weeding, life saving irrigation               | Vermicompost@ 2t/ha, FYM@ 5 t/ha, Mulching, farm pond |                           |
|                                     |                                | Maize (sole)                                                                             | Earthing up for maize                         |                                                       |                           |
|                                     |                                | Maize- mustard/vegetable                                                                 |                                               |                                                       |                           |
|                                     | Rainfed lowland                | Boropaddy                                                                                | Life saving irrigation                        |                                                       |                           |

#### Contingency measures- End of the season

| Contingency measures - End of the season                             |                         |                                                                                          |                                                                                           |                                                                         |                           |
|----------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------|
| Condition                                                            |                         |                                                                                          | Suggested Contingency measures                                                            |                                                                         |                           |
| Terminal drought<br>(Early withdrawal of monsoon)                    | Major Farming situation | Normal Crop/cropping system                                                              | Crop management                                                                           | Rabi Crop planning                                                      | Remarks on Implementation |
| Heavy uneven rainfall, mid season dry spell, medium to shallow soils | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Harvest mature crops<br><br>Damaged crops may used as fodder depending on the suitability | Plan for Winter vegetables ( cabbage, cauliflower, tmato, broccoli etc) |                           |
|                                                                      | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   |                                                                                           | Mustard, Pea Vegetablesgreengram                                        |                           |
|                                                                      |                         | Maize (sole)                                                                             | Harvest green cob                                                                         |                                                                         |                           |
|                                                                      |                         | Maize- mustard/vegetable                                                                 |                                                                                           |                                                                         |                           |
|                                                                      |                         |                                                                                          |                                                                                           |                                                                         |                           |

|  |                 |                                        |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|--|-----------------|----------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                 | Cole crops,frenchbean, radish, carrot, | Cole crops nursery under protected polyhouse, Ridge plot for french bean, radish | - Rabi cropping with cole crops such as Cauliflower (mid season varieties – Improved japaneses, Pusa Synthetic, Pusa snowball etc. ) and Cabbage ( Varieties – Golden acre, Pride of india, Pusa Mukta etc.), Knolkhol (White viena) etc.<br>- Growing of Tomato, Brinjal, pea, potato and Leafy vegetables like Spinach, Radish etc. with recommended varieties and package of practices.<br>--Growing of rabi field crops like toria, lentil, |  |
|  | Rainfed lowland | Boropaddy                              |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |

## 2.1.2 Drought - Irrigated situation

| Condition                                              | Major Farming situation | Normal Crop/cropping system            | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------|-------------------------|----------------------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                        |                         |                                        | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Delayed release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard | Boro paddy                     | Weeding, life saving irrigation | -                         |
|                                                        |                         | Maize (sole)                           | Intercropping                  | Earthing up for maize, Mulching |                           |
|                                                        |                         | Maize- mustard                         |                                |                                 |                           |
|                                                        |                         | Cowpea and frenchbean                  |                                |                                 |                           |

| Condition                                              | Major Farming situation | Normal Crop/cropping system                                              | Suggested Contingency measures |                                  |                           |
|--------------------------------------------------------|-------------------------|--------------------------------------------------------------------------|--------------------------------|----------------------------------|---------------------------|
|                                                        |                         |                                                                          | Change in crop/cropping system | Agronomic measures               | Remarks on Implementation |
| Limited release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard<br>Maize (sole)<br>Maize- mustard | Boro paddy<br>Rice-fallow      | Life saving irrigation, Mulching |                           |
|                                                        |                         | Bhendi, radish, tomato, cabbage, cauliflower                             |                                |                                  |                           |

| Condition                                                                  |                         |                                  | Suggested Contingency measures |                                |                           |
|----------------------------------------------------------------------------|-------------------------|----------------------------------|--------------------------------|--------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system      | Change in crop/cropping system | Agronomic measures             | Remarks on Implementation |
| Non release of water in canals under delayed onset of monsoon in catchment | Lateritic soils         | Fallow                           | Sali Paddy(sole late sown)     | Life saving irrigation weeding |                           |
|                                                                            |                         | Tapioca, colocasia, sweet potato |                                |                                |                           |

| Condition                                                                |                         |                             | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                                          | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon | Medium to shallow land  | Fallow                      | Boro paddy                     | Weeding, life saving irrigation |                           |
|                                                                          |                         | Vegetables                  | Root crops, onion, colocasia   | Mulching                        |                           |

| Condition                                             |                            |                             | Suggested Contingency measures                 |                                                         |                           |
|-------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------|
|                                                       | Major Farming situation    | Normal Crop/cropping system | Change in crop/cropping system                 | Agronomic measures                                      | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | Low land shallow tube well | Cropping system 1: Fallow   | Boro paddy<br>Lentil, pea, mustard, vegetables | Limited irrigation at critical stages, SRI & ICM method |                           |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                       |
|-------|-----------|----------|-----------------------|
| State | MEGHALAYA | District | SOUTH WEST GARO HILLS |
|-------|-----------|----------|-----------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1851.6               | More than 19%          | Less than 1499.796     |
| June         | 482.2                |                        |                        |
| July         | 550                  |                        |                        |
| August       | 394.6                |                        |                        |
| September    | 424.8                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 9731  | Gross irrigated area: | 12176 |
| Net Rainfed area    | 22111 | Gross rainfed area    | 23688 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 9731 | 12176 |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 2250            | 1679                | 571               |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 1502            |                     | 1502              |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |

## Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 328             |                     | 328               |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 552             |                     | 552               |
| 4    | Soyabean       | 175             |                     | 175               |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | 20              |                     |                   |

## Fibre

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Cotton    | 12              |                     | 12                |
| 2    | Jute      | 852             |                     | 852               |
| 3    | Mesta     | 798             |                     | 798               |
| 4    | Sunhemp   | -               |                     |                   |

## Other crops

| S.No | Crop name          | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|--------------------|-----------------|---------------------|-------------------|
| 1    | Sugarcane          | 12              |                     | 12                |
| 2    | Tobacco            | 154             |                     | 154               |
| 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 including variety                                                                                                                                                       | Agronomic measures                               | Remarks on Implementation |
| Delay by 4 weeks (July 1 <sup>st</sup> week) | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli + Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Paddy:</b> Bhalum-1, Bhalum-2<br><b>Maize:</b> Da61a, Vijay composite<br><b>Intercropping:</b> Maize+ cowpea, Maize+ Blackgram/ greengram<br><b>Turmeric:</b> Lakadang, RCT-1<br><b>Ginger:</b> Nadia | Conservation furrow, Inter cultivation, mulching | -                         |
|                                              | Rainfed medium land            | Sali Paddy(sole)<br>Sali paddy-mustard                                                    | <b>Paddy:</b> Sahsarang Swarna mahsuri                                                                                                                                                                   | SRI, ICM method for paddy cultivation            |                           |

|  |                 |                                                     |                                                          |                                                                  |  |
|--|-----------------|-----------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------|--|
|  |                 | Maize (sole)                                        | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 | Mulching with weed spp.<br>Adopt closer spacing 40x30cm in maize |  |
|  |                 | Maize-mustard/vegetable                             | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 |                                                                  |  |
|  |                 | Cowpea, bhindi, amaranthus, chilli, banana, pumpkin |                                                          |                                                                  |  |
|  | Rainfed lowland | Boropaddy                                           | <b>Boro paddy:</b> KRH-2, Jaymati, Naveen                |                                                                  |  |

| Early and mid-season drought<br>Outbreak of pests and diseases due to unusual rains | Suggested contingency measures                                                                                                                                                                                                                                                                                                |                                                     |                                                                                                                                                        |                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | Vegetative stage                                                                                                                                                                                                                                                                                                              | Flowering stage                                     | Crop maturity                                                                                                                                          | Post harvest                                                                                                                                                                                                       |
| Paddy                                                                               | 1.Weed control<br>2.For seed and root pests and stem borers, seedling maggots and locust suitable IPM measures should be followed<br>3.For Rhizoctonia root rot-cultural, chemical (mancozeb 3g/lit of water for foliar application) and biological control                                                                   | Follow suitable crop protection measures            | Spray with suitable insecticides to avoid cut worm infestation<br><br>Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.    | Harvest the crop at maturity, dry properly and store in gunny bags.                                                                                                                                                |
| Pulses                                                                              | 1.Remove weeds<br>2.seedling mortality can be reduced by delayed planting until mid November<br>3.For powdery mildew disease spray the crop at the appearance of the disease with wettable sulphur like sulfex. Spray at 15 days interval.<br>4 For hairy caterpillars and loopers spray with phosphomed on 2ml/lit of water. | Follow suitable crop protection measures            | Rodent holes should be treated with Aluminium phosphide @ 6 pellets per hole.<br><br>After harvest collect the plants left in the field and burn them. | leave the harvested crop in small heaps for 2-3 days for curing. After curing collect the crop at one place and detach the pods either by hand or using groundnut plucker for separating the pods from the plants. |
| Maize, pumpkin, tapioca, sweet potato(mixed cropping)                               | Need based plant protection measures both IPM & IDM.                                                                                                                                                                                                                                                                          | Need based plant protection measures both IPM & IDM | Need based plant protection measures both IPM & IDM                                                                                                    | -                                                                                                                                                                                                                  |

#### Contingency measures- Mid season

| Condition                                                                          | Major Farming situation | Normal Crop/cropping system                                    | Suggested Contingency measures                          |                                                      |                           |
|------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------|---------------------------|
| Mid-season drought (long dry spell, consecutive 2 weeks rainless (<2.5 mm) period) |                         |                                                                | Crop management                                         | Soil nutrient & moisture conservation measures       | Remarks on Implementation |
| At vegetative stage                                                                | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet | Weeding, Life saving irrigation from Jalkund, farm pond | Jalkund, mulching, conservation furrow, repair bunds |                           |

|  |                     |                                               |                                                                                                                                               |                                                               |  |
|--|---------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--|
|  |                     | Potato+ Ginger + Turmeric                     |                                                                                                                                               |                                                               |  |
|  | Rainfed medium land | Sali Paddy(sole)<br>Sali paddy-mustard        | Dual cropping of paddy with Azolla<br>Postponement of topdressing of Nitrogen, life saving irrigation, IPM, IDM for pest & disease management | Azolla, Compost, Vermicompost, Integrated nutrient management |  |
|  |                     | Maize (sole)                                  |                                                                                                                                               |                                                               |  |
|  |                     | Maize-mustard/vegetable                       |                                                                                                                                               |                                                               |  |
|  |                     | Cowpea, French bean, coriander, radish, palak |                                                                                                                                               |                                                               |  |
|  | Rainfed lowland     | Boropaddy                                     | No change                                                                                                                                     | -                                                             |  |

| 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        | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Life saving irrigation from Jalkund, fam pond | Jalkund, Vermicompost @ 2t/ha,                        |                           |
|                                     | Rainfed medium to shallow land | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Weeding, life saving irrigation               | Vermicompost@ 2t/ha, FYM@ 5 t/ha, Mulching, farm pond |                           |
|                                     |                                | Maize (sole)                                                                             | Earthing up for maize                         |                                                       |                           |
|                                     |                                | Maize- mustard/vegetable                                                                 |                                               |                                                       |                           |
|                                     | Rainfed lowland                | Boropaddy                                                                                | Life saving irrigation                        |                                                       |                           |

#### 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                                                                           | Rabi Crop planning                                                                   | Remarks on Implementation |
| <b>Terminal drought</b><br>(Early withdrawal of monsoon)             |                         |                                                                                          |                                                                                           |                                                                                      |                           |
| Heavy uneven rainfall, mid season dry spell, medium to shallow soils | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Harvest mature crops<br><br>Damaged crops may used as fodder depending on the suitability | Plan for Winter vegetables ( cabbage, cauliflower, tomato, broccoli etc)             |                           |
|                                                                      | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   |                                                                                           | Mustard, Pea Vegetables greengram                                                    |                           |
|                                                                      |                         | Maize (sole)                                                                             | Harvest green cob                                                                         |                                                                                      |                           |
|                                                                      |                         | Maize- mustard/vegetable                                                                 |                                                                                           |                                                                                      |                           |
|                                                                      |                         | Cole crops, frenchbean, radish, carrot,                                                  | Cole crops nursery under protected polyhouse, Ridge plot for frenchbean, radish           | - Rabi cropping with cole crops such as Cauliflower (mid season varieties – Improved |                           |



|  |                 |           |  |                                                                                                                                                                                                                                                                                                                                                            |  |
|--|-----------------|-----------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                 |           |  | japaneese, Pusa Synthetic, Pusa snowball etc. ) and Cabbage ( Varieties – Golden acre, Pride of india, Pusa Mukta etc.), Knolkhol (White viena) etc.<br>- Growing of Tomato, Brinjal, pea, potato and Leafy vegetables like Spinach, Radish etc. with recommended varieties and package of practices.<br>--Growing of rabi field crops like toria, lentil, |  |
|  | Rainfed lowland | Boropaddy |  |                                                                                                                                                                                                                                                                                                                                                            |  |

## 2.1.2 Drought - Irrigated situation

| Condition                                              | Major Farming situation | Normal Crop/cropping system            | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------|-------------------------|----------------------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                        |                         |                                        | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Delayed release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard | Boro paddy                     | Weeding, life saving irrigation | -                         |
|                                                        |                         | Maize (sole)                           | Intercropping                  | Earthing up for maize, Mulching |                           |
|                                                        |                         | Maize- mustard                         |                                |                                 |                           |
|                                                        |                         | Cowpea and frenchbean                  |                                |                                 |                           |

| Condition                                              | Major Farming situation | Normal Crop/cropping system                                              | Suggested Contingency measures |                                  |                           |
|--------------------------------------------------------|-------------------------|--------------------------------------------------------------------------|--------------------------------|----------------------------------|---------------------------|
|                                                        |                         |                                                                          | Change in crop/cropping system | Agronomic measures               | Remarks on Implementation |
| Limited release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard<br>Maize (sole)<br>Maize- mustard | Boro paddy<br>Rice-fallow      | Life saving irrigation, Mulching |                           |
|                                                        |                         | Bhendi, radish, tomato, cabbage, cauliflower                             |                                |                                  |                           |

| Condition                                                                  |                         |                                  | Suggested Contingency measures |                                |                           |
|----------------------------------------------------------------------------|-------------------------|----------------------------------|--------------------------------|--------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system      | Change in crop/cropping system | Agronomic measures             | Remarks on Implementation |
| Non release of water in canals under delayed onset of monsoon in catchment | Lateritic soils         | Fallow                           | Sali Paddy(sole late sown)     | Life saving irrigation weeding |                           |
|                                                                            |                         | Tapioca, colocasia, sweet potato |                                |                                |                           |

| Condition                                                                |                         |                             | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                                          | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon | Medium to shallow land  | Fallow                      | Boro paddy                     | Weeding, life saving irrigation |                           |
|                                                                          |                         | Vegetables                  | Root crops, onion, colocasia   | Mulching                        |                           |

| Condition                                             |                            |                             | Suggested Contingency measures                 |                                                         |                           |
|-------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------|
|                                                       | Major Farming situation    | Normal Crop/cropping system | Change in crop/cropping system                 | Agronomic measures                                      | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | Low land shallow tube well | Cropping system 1: Fallow   | Boro paddy<br>Lentil, pea, mustard, vegetables | Limited irrigation at critical stages, SRI & ICM method |                           |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                      |
|-------|-----------|----------|----------------------|
| State | MEGHALAYA | District | SOUTH WEST KHASI HI* |
|-------|-----------|----------|----------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1851.6               | More than 19%          | Less than 1499.796     |
| June         | 482.2                |                        |                        |
| July         | 550                  |                        |                        |
| August       | 394.6                |                        |                        |
| September    | 424.8                |                        |                        |

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

## Irrigation info:

|                     |      |                       |       |
|---------------------|------|-----------------------|-------|
| Net irrigated area: | 2380 | Gross irrigated area: | 2520  |
| Net Rainfed area    | 5145 | Gross rainfed area    | 11705 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net  | Gross |
|----------------------|------|-------|
| Canals               | 2380 | 2520  |
| Wells                | -    | -     |
| Tanks                | -    | -     |
| Other sources        | -    | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 54              | 54                  | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 1376            |                     | 1376              |
| 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        | 8               |                     | 8                 |
| 4    | Soyabean       | 8               |                     | 8                 |
| 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

| Condit ion                           |                                |                             | 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 (July 2nd week)     | 1 ) Farming situation: Rainfed | Cropping system 1: Rice     | Follow water conservation and management practices.<br>At higher altitude rice will be replaced by other vegetable crops such as cabbage or<br>Possibility of taking a catch crop<br>Conserving moisture for 'rabi' sowing | Use of short duration variety which are tolerant to drought<br>Seeds should be sown in nursery<br>SRI method can be followed during |                           |

|  |                                                                                        |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                       |  |
|--|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                                                                                        |                                                                                                                                                                                                                                                                                             | Utilizing paddy fallows for second crop                                                                                                                                                                                                                                                                           | drought at lower /mid altitudes                                                                                                                                                                                                                       |  |
|  |                                                                                        | Cropping system 2: Maize<br>Maize + Finger Millet (intercropping, Higher Altitude)<br>Maize + Soyabean (intercropping, higher elevation)<br>d. Maize + Ginger ( Mid altitude region)<br>e. Maize + Vegetables<br>f. Rabi Maize + Vegetables/ Mustard/Toria<br>g. Maize + Potato/ Vegetables | Finger millet : Indaf- 5, 8, 9, local<br>Maize :local yellow,local white, HQPM-1,DA61A<br>Vivek- 15, Vivek -9, Vivek-23<br>Soybean: Bragg,Hill, PK-1042, 1024, PK-262, local ( black bold) , VL-soya-47<br>Ginger : Nadia.<br>Topoica : Local<br>Horticultural crops<br>Potato: Kufri Jyoti, K. Giriraj, K. Megha | Delay the seedling raising of finger millet<br>Wider spacing (60 X 30) cm for maize<br>Frequent interculture operation for conservation of moisture<br>Mulching in ginger<br>Management of soil acidity<br>Timely thinning to maintain proper spacing |  |
|  | Rainfed 1 )<br><b>Farming situation:</b><br>Rainfed upland - (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/ carrot/cauliflower/onion/peas/lettuce/cabbage/broccoli<br><br>Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/ bitter gourd/ brinjal/Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/cabbage/broccoli                          | No change<br><br>No change                                                                                                                                                                                                                                                                                        | Recommended package of practices<br>Recommended package of practices                                                                                                                                                                                  |  |
|  | 2)<br>Farming situation: Rainfed medium land/medium low land (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/cabbage/broccoli                                                                                                                                                                                                        | No change                                                                                                                                                                                                                                                                                                         | Recommended package of practices                                                                                                                                                                                                                      |  |
|  |                                                                                        |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                       |  |

#### Contingency measures- Mid season

| Condition                                                              |                         |                             | Suggested Contingency measures |                                                |                           |
|------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|------------------------------------------------|---------------------------|
|                                                                        |                         |                             | Crop management                | Soil nutrient & moisture conservation measures | Remarks on Implementation |
| Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 | Major Farming situation | Normal Crop/cropping system |                                |                                                |                           |

| mm)<br>period)             |                                                                                        |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                             |                                                                                                                                                                                                                                   |  |
|----------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>At vegetative stage</b> | Rainfed :<br>with moderate to high rainfall and no irrigation facilities               | Cropping system 1:Rice                                                                                                                                                                                                                                                                  | No change                                                                                                                                                                   | Nursery raising of seedling<br>Weeding at regular intervals<br>Wider spacing                                                                                                                                                      |  |
|                            |                                                                                        | Cropping system 2:Maize based<br>Maize + Finger Millet (intercropping, Higher Altitude)<br>Maize + Soyabean (intercropping, higher elevation)<br>Maize + Ginger ( Mid altitude region)<br>Maize + Vegetables<br>Rabi Maize + Vegetables/<br>Mustard/Toria<br>Maize + Potato/ Vegetables | Thinning to maintain optimum plant population.<br>Life saving irrigation by using water of Dug-out ponds and rain water harvesting structure.<br>Weeding and weed mulching. | FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30) cm for maize, followed with intercropping<br>In-situ soil moisture conservation measures<br>Frequent intercultural operation for moisture conservation |  |
|                            | 1 ) <b>Farming situation:</b><br>Rainfed upland (Sandy loam to clay loam)              | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/bitter gourd/brinjal/Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/broccoli                                                                                                                    | No change                                                                                                                                                                   | Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>-Application of sufficient quantity of FYM or compost in the main field.                                                                         |  |
|                            |                                                                                        | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/bitter gourd/brinjal/Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/broccoli                                                                                                                    |                                                                                                                                                                             | -Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>- Application of sufficient quantity of FYM or compost in the main field<br>- Thinning to maintain optimum plant population.                    |  |
|                            | 2) Farming situation:<br>Rainfed medium land/medium low land (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                                  | No change                                                                                                                                                                   | Gap filling if required<br>Life saving supplemental irrigation at critical stages of crop growth                                                                                                                                  |  |

| Condi<br>on                         |                                                                |                                                                                                                                                                                                                                                                                      | Suggested Contingency measures                                                                                                                                              |                                                                                                                                                                                                                                   |                               |
|-------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                     |                                                                |                                                                                                                                                                                                                                                                                      | Crop management                                                                                                                                                             | Soil nutrient & moisture conservation measures                                                                                                                                                                                    | Remarks on Implementation     |
| Mid season drought (long dry spell) | Major Farming situation                                        | Normal Crop/cropping system                                                                                                                                                                                                                                                          |                                                                                                                                                                             |                                                                                                                                                                                                                                   |                               |
| At flowering/ fruiting stage        |                                                                | Cropping system 1:Rice                                                                                                                                                                                                                                                               | Need based plant protection measures should be followed<br>Spray of antitranspirants<br>Moisture conservation practices such as ridging and mulching can be followed        | Weeding should be done at regular interval<br>water harvesting structures can be constructed so as to provide irrigation during the critical stages                                                                               |                               |
|                                     |                                                                | Cropping system 2:Maize based<br>Maize + Finger Millet (intercropping, Higher Altitude)<br>Maize + Soyabean (intercropping, higher elevation)<br>Maize + Ginger ( Mid altitude region)<br>Maize + Vegetables<br>Rabi Maize + Vegetables/ Mustard/Toria<br>Maize + Potato/ Vegetables | Thinning to maintain optimum plant population.<br>Life saving irrigation by using water of Dug-out ponds and rain water harvesting structure.<br>Weeding and weed mulching. | FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30) cm for maize, followed with intercropping<br>In-situ soil moisture conservation measures<br>Frequent intercultural operation for moisture conservation |                               |
|                                     | Rainfed upland (Sandy                                          | Potato// turnip/beetroot/tomato/carrot /cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                            | No change                                                                                                                                                                   | -Life saving supplemental irrigation                                                                                                                                                                                              | - Water harvesting structures |
|                                     |                                                                | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/ bitter gourd/ brinjal/Potato///turnip/beetroot/tomato/carrot/cauliflower/ onion/peas/lettuce/ cabbage/ broccoli                                                                                                           | No change                                                                                                                                                                   | - Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>- Thinning to maintain optimum population.<br>- Mulching with crop residues                                                                    |                               |
|                                     | Rainfed medium land/ Medium low land (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                               | No change                                                                                                                                                                   | -Life saving supplemental irrigation at critical stages of cropgrowth                                                                                                                                                             |                               |

**Contingency measures- End of the season**

| Condition                                         |                                                                              |                                                                                                                                                                                                                                                                           | Suggested Contingency measures                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                   |                           |
|---------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Terminal drought<br>(Early withdrawal of monsoon) | Major Farming situation                                                      | Normal Crop/cropping system                                                                                                                                                                                                                                               | Crop management                                                                                                                                                                                                                                                            | Rabi Crop planning                                                                                                                                                                                                                                                                                                                                | Remarks on Implementation |
|                                                   | 1 )<br><b>Farming situation:</b><br>Rainfed                                  | Cropping system 1: rice<br>Rice based<br>Rice - Mustard/Vegetables                                                                                                                                                                                                        | Follow water conservation and management practices.<br>Efficient use of stored water for life saving irrigation<br>Short duration varieties of pulses, oilseeds, minor millets<br>Harvesting the crop at physiological maturity.<br>Prepare for the ensuing 'rabi' season. | Water harvesting structures for irrigating rabi crops                                                                                                                                                                                                                                                                                             |                           |
|                                                   |                                                                              | Cropping system 2: Maize based cropping system :<br>1. Maize - rice/soybean - potato/vegetables/ wheat/mustard<br>2. Maize - Maize + French Beans(Local)/vegetables<br>3. Ginger + Maize<br>4. Maize - Finger Millet/ Rice Bean (Relay) + vegetable<br>Ginger<br>Turmeric | Maize: HQPM-I, RCM 1-1, RCM 1-2,<br>Soybean: Ahilya-1,bragg,hill.                                                                                                                                                                                                          | Conservation measures<br>Furrow application of FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30 cm) for maize<br>Frequent intercultural operation for moisture conservation                                                                                                                                              |                           |
|                                                   | 1 )<br><b>Farming situation:</b><br>Rainfed upland (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/cauliflower/onion/peas/lettuce/ cabbage/ brocolli                                                                                                                                                                                           | Lifesaving supplemental irrigation<br>- Pre-sowing irrigation for nursery raising and life saving irrigation after transplanting                                                                                                                                           | - Growing of Tomato, Brinjal, and Leafy vegetables like Spinach, Radish etc. with improved package of practices<br>- Growing of mid seasoncole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa Mukta etc.), Knolkhol (White Vienna) etc. |                           |



|  |                                                                                         |                                                                                                                                                                          |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                 |  |
|--|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                                                                                         | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/ bitter gourd/ brinjal//Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli | Life saving supplemental irrigation<br>-Harvesting of kharif crops at physiological maturity stage.<br>- Pre-sowing irrigation for nursery raising and life saving irrigation after transplanting   | Growing of Tomato, Brinjal, and Leafy vegetables like Spinach, Radish etc. with improved package of practices<br>- Growing of mid seasoncole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa Mukta etc.), Knolkhol (White Vienna) etc. |  |
|  | 2)<br>Farming situation: Rainfed medium land/ Medium low land (Sandy loam to clay loam) | Potato/ turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                  | -Life saving supplemental -irrigation<br>- Pre-sowing irrigation for nursery raising and life saving irrigation after transplanting<br>- Harvesting of kharif crops at physiological maturity stage | - Growing of mid seasoncole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa Mukta etc.), Knolkhol (White Vienna) etc. Mulching in Rabi crops                                                                                           |  |

### 2.1.2 Drought - Irrigated situation

| 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 | Lower altitudes                | Rice                        | No change                      | <ul style="list-style-type: none"> <li>Medium or short duration variety can be grown if water is delayed by 15days</li> <li>Rice seeds should be replaced by Short duration variety such as luitvivekdhan 82 etc</li> <li>Rice should be replaced by other crops</li> </ul> |                           |

| Condition                                                                  |                         |                             | Suggested Contingency measures                        |                                                                             |                           |
|----------------------------------------------------------------------------|-------------------------|-----------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system                        | Agronomic measures                                                          | Remarks on Implementation |
|                                                                            |                         |                             |                                                       | such as pulses<br>If the water in canals is delayed by 90 days              |                           |
| Limited release of water in canals due to low rainfall                     | Lower altitudes         | Rice                        | Rice sowing nursery delayed<br>SRI nursery to be used | Late duration varieties<br>8-10 days old seedling is used for transplanting |                           |
| Non release of water in canals under delayed onset of monsoon in catchment | Lower altitudes         | Rice                        | SRI hybrids can be used<br>Delayed transplanting      | Low seed rate<br>Direct sown under transplanting                            |                           |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon   | Lower altitudes         | Rice                        | Delayed transplanting                                 | Direct sown under unpuddled condition                                       |                           |
| Insufficient groundwater recharge due to low rainfall                      | Lower altitudes         | Rice                        | Late duration                                         | Direct sown under unpuddled condition                                       |                           |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                 |
|-------|-----------|----------|-----------------|
| State | MEGHALAYA | District | WEST GARO HILLS |
|-------|-----------|----------|-----------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 1868.1               | More than 19%          | Less than 1513.161     |
| June         | 546.5                |                        |                        |
| July         | 530.4                |                        |                        |
| August       | 371.8                |                        |                        |
| September    | 419.4                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 15878 | Gross irrigated area: | 18389 |
| Net Rainfed area    | 51605 | Gross rainfed area    | 63626 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net   | Gross |
|----------------------|-------|-------|
| Canals               | 15878 | 18389 |
| Wells                | -     | -     |
| Tanks                | -     | -     |
| Other sources        | -     | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 5000            | 2481                | 2519              |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 2726            |                     | 2726              |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |

## Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 598             |                     | 598               |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 1100            |                     | 1100              |
| 4    | Soyabean       | 260             |                     | 260               |
| 5    | Sunflower      | -               |                     |                   |
| 6    | Castor         | 16              |                     |                   |

## Fibre

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Cotton    | 515             |                     | 515               |
| 2    | Jute      | 1885            |                     | 1885              |
| 3    | Mesta     | 1160            |                     | 1160              |
| 4    | Sunhemp   | -               |                     |                   |

## Other crops

| S.No | Crop name          | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|--------------------|-----------------|---------------------|-------------------|
| 1    | Sugarcane          | 28              |                     | 28                |
| 2    | Tobacco            | 232             |                     | 232               |
| 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 including variety                                                                                                                                                       | Agronomic measures                              | Remarks on Implementation |
| Delay by 4 weeks (July 1 <sup>st</sup> week) | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli + Tapioca + Sweet Potato+ Ginger + Turmeric | <b>Paddy:</b> Bhalum-1, Bhalum-2<br><b>Maize:</b> Da61a, Vijay composite<br><b>Intercropping:</b> Maize+ cowpea, Maize+ Blackgram/ greengram<br><b>Turmeric:</b> Lakadang, RCT-1<br><b>Ginger:</b> Nadia | Conservation furrow, Intercultivation, mulching | -                         |
|                                              | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                    | <b>Paddy:</b> Sahsarang Swarna mahsuri                                                                                                                                                                   | SRI, ICM method for paddy cultivation           |                           |

|  |                 |                                                     |                                                          |                                                               |  |
|--|-----------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|--|
|  |                 | Maize (sole)                                        | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 | Mulching with weed spp. Adopt closer spacing 40x30cm in maize |  |
|  |                 | Maize-mustard/vegetable                             | <b>Maize:</b> Vivek hybrid, RCM-1-1, RCM-1-2 and RCM-1-3 |                                                               |  |
|  |                 | Cowpea, bhendi, amaranthus, chilli, banana, pumpkin |                                                          |                                                               |  |
|  | Rainfed lowland | Boropaddy                                           | <b>Boro paddy:</b> KRH-2, Jaymati, Naveen                |                                                               |  |

#### Contingency measures- Mid season

| Contingency measures- mid season                                                   |                         |                                                                                          |                                                                                                                                               |                                                               |                           |
|------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------|
| 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 measures                | Remarks on Implementation |
| At vegetative stage                                                                | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Weeding, Life saving irrigation from Jalkund, farm pond                                                                                       | Jalkund, mulching, conservation furrow, repair bunds          |                           |
|                                                                                    | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   | Dual cropping of paddy with Azolla<br>Postponement of topdressing of Nitrogen, life saving irrigation, IPM, IDM for pest & disease management | Azolla, Compost, Vermicompost, Integrated nutrient management |                           |
|                                                                                    |                         | Maize (sole)                                                                             |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Maize-mustard/vegetable                                                                  |                                                                                                                                               |                                                               |                           |
|                                                                                    |                         | Cowpea, French bean, coriander, radish, palak                                            |                                                                                                                                               |                                                               |                           |
|                                                                                    | Rainfed lowland         | Boropaddv                                                                                | No change                                                                                                                                     | -                                                             |                           |

| 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        | Rainfed upland                 | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Life saving irrigation from Jalkund, fam pond | Jalkund, Vermicompost @ 2t/ha,                        |                           |
|                                     | Rainfed medium to shallow land | Sali Paddy(sole)                                                                         | Weeding, life saving irrigation               | Vermicompost@ 2t/ha, FYM@ 5 t/ha, Mulching, farm pond |                           |
|                                     |                                | Sali paddy-mustard                                                                       |                                               |                                                       |                           |
|                                     |                                | Maize (sole)                                                                             | Earthing up for maize                         |                                                       |                           |
|                                     |                                | Maize-mustard/vegetable                                                                  |                                               |                                                       |                           |
|                                     | Rainfed lowland                | Boropaddy                                                                                | Life saving irrigation                        |                                                       |                           |

**Contingency measures- End of the season**

| Contingency measures- End of the season                              |                         |                                                                                          |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
|----------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Condition                                                            |                         |                                                                                          | Suggested Contingency measures                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
| Terminal drought<br>(Early withdrawal of monsoon)                    | Major Farming situation | Normal Crop/cropping system                                                              | Crop management                                                                           | Rabi Crop planning                                                                                                                                                                                                                                                                                                                                                                                                                              | Remarks on Implementation |
| Heavy uneven rainfall, mid season dry spell, medium to shallow soils | Rainfed upland          | Jhum land<br>Paddy + Maize + Pumpkin + Chilli +Tapioca + Sweet Potato+ Ginger + Turmeric | Harvest mature crops<br><br>Damaged crops may used as fodder depending on the suitability | Plan for Winter vegetables ( cabbage, cauliflower, tmato, broccoli etc)                                                                                                                                                                                                                                                                                                                                                                         |                           |
|                                                                      | Rainfed medium land     | Sali Paddy(sole)<br>Sali paddy-mustard                                                   |                                                                                           | Mustard, Pea<br>Vegetables greengram                                                                                                                                                                                                                                                                                                                                                                                                            |                           |
|                                                                      |                         | Maize (sole)                                                                             | Harvest green cob                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
|                                                                      |                         | Maize-<br>mustard/vegetable                                                              |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
|                                                                      |                         | Cole crops, French bean, radish, carrot,                                                 | Cole crops nursery under protected polyhouse, Ridge plot for French bean, radish          | - Rabi cropping with cole crops such as Cauliflower (mid season varieties – Improved japaneses, Pusa Synthetic, Pusa snowball etc. ) and Cabbage ( Varieties – Golden acre, Pride of india, Pusa Mukta etc.), Knolkhol (White viena) etc.<br>- Growing of Tomato, Brinjal, pea, potato and Leafy vegetables like Spinach, Radish etc. with recommended varieties and package of practices.<br>--Growing of rabi field crops like toria, lentil, |                           |
|                                                                      | Rainfed lowland         | Boropaddy                                                                                |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |

**2.1.2 Drought - Irrigated situation**

| Condition                                              | 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 | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard | Boro paddy                     | Weeding, life saving irrigation | -                         |
|                                                        |                         | Maize (sole)                           | Intercropping                  | Earthing up for maize, Mulching |                           |
|                                                        |                         | Maize- mustard                         |                                |                                 |                           |
|                                                        |                         | Cowpea and French bean                 |                                |                                 |                           |

| Condition                                              |                         |                                                                          | Suggested Contingency measures |                                  |                           |
|--------------------------------------------------------|-------------------------|--------------------------------------------------------------------------|--------------------------------|----------------------------------|---------------------------|
|                                                        | Major Farming situation | Normal Crop/cropping system                                              | Change in crop/cropping system | Agronomic measures               | Remarks on Implementation |
| Limited release of water in canals due to low rainfall | Medium to shallow land  | Sali Paddy(sole)<br>Sali paddy-mustard<br>Maize (sole)<br>Maize- mustard | Boro paddy<br>Rice-fallow      | Life saving irrigation, Mulching |                           |
|                                                        |                         | Bhendi, radish, tomato, cabbage, cauliflower                             |                                |                                  |                           |

| Condition                                                                  |                         |                                  | Suggested Contingency measures |                                |                           |
|----------------------------------------------------------------------------|-------------------------|----------------------------------|--------------------------------|--------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system      | Change in crop/cropping system | Agronomic measures             | Remarks on Implementation |
| Non release of water in canals under delayed onset of monsoon in catchment | Lateritic soils         | Fallow                           | Sali Paddy(sole late sown)     | Life saving irrigation weeding |                           |
|                                                                            |                         | Tapioca, colocasia, sweet potato |                                |                                |                           |

| Condition                                                                |                         |                             | Suggested Contingency measures |                                 |                           |
|--------------------------------------------------------------------------|-------------------------|-----------------------------|--------------------------------|---------------------------------|---------------------------|
|                                                                          | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system | Agronomic measures              | Remarks on Implementation |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon | Medium to shallow land  | Fallow                      | Boro paddy                     | Weeding, life saving irrigation |                           |
|                                                                          |                         | Vegetables                  | Root crops, onion, colocasia   | Mulching                        |                           |

| Condition                                             |                            |                             | Suggested Contingency measures                 |                                                         |                           |
|-------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------|
|                                                       | Major Farming situation    | Normal Crop/cropping system | Change in crop/cropping system                 | Agronomic measures                                      | Remarks on Implementation |
| Insufficient groundwater recharge due to low rainfall | Low land shallow tube well | Cropping system 1: Fallow   | Boro paddy<br>Lentil, pea, mustard, vegetables | Limited irrigation at critical stages, SRI & ICM method |                           |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                    |
|-------|-----------|----------|--------------------|
| State | MEGHALAYA | District | WEST JAINTIA HILLS |
|-------|-----------|----------|--------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 4490.6               | More than 19%          | Less than 3637.386     |
| June         | 1191.4               |                        |                        |
| July         | 1555.4               |                        |                        |
| August       | 882                  |                        |                        |
| September    | 861.8                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 14306 | Gross irrigated area: | 14513 |
| Net Rainfed area    | 5950  | Gross rainfed area    | 8624  |

## Source wise irrigation area details (ha)

| Source of irrigation | Net   | Gross |
|----------------------|-------|-------|
| Canals               | 14306 | 14513 |
| Wells                | -     | -     |
| Tanks                | -     | -     |
| Other sources        | -     | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 70              | 70                  | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 2934            | 1753                | 1181              |
| 4    | Bajra     | -               |                     |                   |
| 5    | Ragi      | -               |                     |                   |



### Pulses& Oilseeds

| S.No | Crop name      | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|----------------|-----------------|---------------------|-------------------|
| 1    | Arhar/ Redgram | 7               |                     | 7                 |
| 2    | Groundnut      | -               |                     |                   |
| 3    | Sesamum        | 39              |                     | 39                |
| 4    | Soyabean       | 631             | 398                 | 233               |
| 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          | 7               |                     | 7                 |
| 2    | Tobacco            | -               |                     |                   |
| 3    | Guar seed          | -               |                     |                   |
| 4    | Other Fodder crops | -               |                     |                   |

### Crop Plan- Beginning of the season

| 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<br>July 1 <sup>st</sup> week | 1.FS-I<br>(Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | Cropping System:1<br>Rice based Cropping System<br><br>a. Rice-Ranjit,Bahadur,Pankaj | No Change                                          | Normal recommended practice of sowing | Sowing time-<br>June to July |

|  |  |                                                                                                   |           |                                       |                                               |
|--|--|---------------------------------------------------------------------------------------------------|-----------|---------------------------------------|-----------------------------------------------|
|  |  | b. Maize-Vijay,Ganga-101,Ranjit,Deccan,Ganga-5,Gangasafed,Ganga-4,Amber,Sona,Kisan,Jawahar,Vikram | No Change | Normal recommended practice of sowing | Sowing time- April to May                     |
|  |  | c. Soyabean-Clark-63,BraggHill,Punjab-1,Hardee,Lee,Local                                          | No Change | Normal recommended practice of sowing | Sowing time- June to July/August to September |

#### Contingency measures- Mid season

| Condition                                                                       |                                                                                                                                                                 |                             | Suggested Contingency measures                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                        |                               |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Mid-season drought (long dry spell consecutive 2 weeks rainless,(>2.5mm) period | Major Farming situation                                                                                                                                         | Normal Crop/cropping system | Crop management & Plant protection measures                                                                                                                                                                                                                                                                                                                                | Soil nutrient & moisture conservation measures                                                                                                                                                                                                                                                                                                                                                                         | Remarks on Implementation     |
| At vegetative stage                                                             | 1.FS-I (Agri+Hort+AH+Fisheri es)<br>Low altitude areas Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | Rice                        | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray Tricyclazole against blast</li> <li>Spray Carbendazim or Edinophos or Mancozeb against brown spot</li> <li>Release of bio agents <i>Trichogramma</i> spp or spraying of Chloropyriphos, Regent against stem borer and leaf folder</li> </ul> | <ul style="list-style-type: none"> <li>Weed out the field.</li> <li>Strengthen the field bunds &amp; close the holes</li> <li>Provide life saving irrigation.</li> <li>Inter-cultivation(Soil mulching)</li> <li>Open conservation furrow(give distance/interval)</li> <li>Organic mulching with previous crop residues.</li> <li>Compartmental bunding</li> <li>Follow ridge and furrow method of planning</li> </ul> | Sowing of good quality seeds. |
|                                                                                 |                                                                                                                                                                 | Maize                       | <ul style="list-style-type: none"> <li>Application of <i>Metarrhizium anisopliae</i>, <i>Bacillus thuringiensis</i>, <i>Stenernemaspp</i> for management of cutworm</li> <li>Application of Carbofuran for control of borer, cutworm, thrips, termite &amp; Shoot fly.</li> </ul>                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |                               |
|                                                                                 |                                                                                                                                                                 | Soybean                     | <ul style="list-style-type: none"> <li>Application of phorate for control of stem fly, blue beetle.</li> <li>Application of Methomyl for controlling defoliators, semiloopers etc</li> </ul>                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                        |                               |

|  |  |                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |
|--|--|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|  |  | <p>Cropping system 2 : Horticulture based cropping system</p> <p>a. Citrus- Khasi mandarin</p> | <ul style="list-style-type: none"> <li>• Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>• Spray Imidacloprid against soft bodied insect viz, psylla, miners, scales, aphids, mealy bugs etc</li> <li>• Spray Neem oil against Citrus butterfly</li> <li>• Plugging holes made by trunk borer and application of fumigants</li> <li>• Spraying of Copper fungicides against pink diseases, powdery mildew, etc</li> </ul> | <ul style="list-style-type: none"> <li>• Construction of half moon trenches</li> <li>• Organic mulching with previous crop residues.</li> <li>• Follow intercropping in rolling topography for moisture conservation.</li> <li>• Follow ridge and furrow method of planting</li> <li>• Application of organic manure</li> <li>• Life saving irrigation should be given at critical stages</li> </ul> | Constructions of water harvesting structures |
|  |  | b. Litchi                                                                                      | <ul style="list-style-type: none"> <li>• Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>• Spray Malathion against Litchi bug</li> </ul>                                                                                                                                                                                                                                                                                  | -do-                                                                                                                                                                                                                                                                                                                                                                                                 | -do-                                         |
|  |  | c. Arecanut                                                                                    | <ul style="list-style-type: none"> <li>• Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>• Drench the crown with Bordeaux mixture 1% against bud rot and fruit rot</li> </ul>                                                                                                                                                                                                                                             | -do-                                                                                                                                                                                                                                                                                                                                                                                                 | -do-                                         |
|  |  | d. Black pepper                                                                                | <ul style="list-style-type: none"> <li>• Remove infected vines</li> <li>• Spray Bordeaux mixture 1% against Phytophthora Foot rot</li> </ul> <p>Apply Bordeaux paste to stem from the ground level upto 50 cm height</p>                                                                                                                                                                                                                                   | -do-                                                                                                                                                                                                                                                                                                                                                                                                 | -do-                                         |
|  |  | e. Tomato                                                                                      | <ul style="list-style-type: none"> <li>• Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>• Spray bio pesticide Trichoderma viridae or Indofil or Dithane M-45 alternate with Blue copper for management of late blight disease</li> <li>• Spray NPV or Neem oil against Helicoverpa armigera</li> </ul> <p>Soil drenching with COC or Streptocycline against bacterial wilt-</p>                                          | -do-                                                                                                                                                                                                                                                                                                                                                                                                 | -do-                                         |

|  |                                                                                                                                                                    |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                        |                                              |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|  |                                                                                                                                                                    | f. Cabbage                                                             | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Release of bio agents Trichogramma brassicae against Pieris brassicae</li> <li>Spray Neem oil for management of lepidopteran pests</li> <li>Application of Metarrhizium anisopliae, Bacillus thuringiensis, Stenotaphyrum or Carbofuran for management of cutworm and white grub</li> <li>Spray Mancozeb against black spot</li> </ul> | -do-                                                                                                                                                                                                                   | -do-                                         |
|  |                                                                                                                                                                    | g. Potato                                                              | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Spray bio pesticide Trichoderma viridae or Indofil or Dithane M-45 alternate with Blue copper for management of late blight disease</li> <li>Spray NPV or Neem oil against Helicoverpa armigera</li> <li>Soil drenching with COC or Streptocycline against bacterial wilt</li> </ul>                                                   | -do-                                                                                                                                                                                                                   | -do-                                         |
|  | 2. FS-II (Agri+Hort+AH+Seri) Mid altitude areas. Elevation more than (600-1200m msl) heavy rainfall (less than 4000-8000mm) Moderately-strongly sloping, rain fed. | Rice                                                                   | -do-                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -do-                                                                                                                                                                                                                   | -do-                                         |
|  |                                                                                                                                                                    |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                        |                                              |
|  |                                                                                                                                                                    | Maize                                                                  | -do-                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -do-                                                                                                                                                                                                                   | -do-                                         |
|  |                                                                                                                                                                    | Soyabean                                                               | -do-                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -do-                                                                                                                                                                                                                   | -do-                                         |
|  |                                                                                                                                                                    | Cropping system 2 : Horticulture based cropping system<br>a. Pineapple | <ul style="list-style-type: none"> <li>Application of organic manure</li> <li>Foliar application of nutrients 1% urea</li> </ul>                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Organic mulching with previous crop residues.</li> <li>Follow ridge and furrow method of planting</li> <li>Life saving irrigation should be given at critical stages</li> </ul> | Constructions of water harvesting structures |
|  |                                                                                                                                                                    | b. Turmeric-                                                           | -do-                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -do-                                                                                                                                                                                                                   | -do-                                         |
|  |                                                                                                                                                                    | c. Ginger                                                              | -do-                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -do-                                                                                                                                                                                                                   | -do-                                         |

|  |                                                                                                                                          |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                |      |      |
|--|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|
|  |                                                                                                                                          | g. Banana-                                                                           | <ul style="list-style-type: none"> <li>Foliar application of nutrients 2% urea or 2% DAP or 1% KNO<sub>3</sub></li> <li>Intercropping with leguminous vegetables</li> <li>Regular removal of old, dried and infested leaves</li> <li>Manual collection and killing of Pseudostem and Rhizome adult weevil</li> <li>Inject Carbaryl@ 2g/l in the infested pseudostem</li> </ul> | -do- | -do- |
|  | 3. FS-III (Agri+Hort+AH)High altitude areas.Elevation more 1200m msl+)Medium and heavy rainfall(4000-8000mm)Moderately sloping,rain fed. | Rice                                                                                 | -do-                                                                                                                                                                                                                                                                                                                                                                           | -do- | -do- |
|  |                                                                                                                                          | Maize                                                                                | -do-                                                                                                                                                                                                                                                                                                                                                                           | -do- | -do- |
|  |                                                                                                                                          | Soyabean                                                                             | -do-                                                                                                                                                                                                                                                                                                                                                                           | -do- | -do- |
|  |                                                                                                                                          | Horticulture basedcropping system<br>Citrus Potato, tomato,cabbage, turmeric, ginger | -do-                                                                                                                                                                                                                                                                                                                                                                           | -do- | -do- |

| Condition                           |                                                                                                                                                                   |                                                                    | Suggested Contingency measures                                                                                                                                                                                         |                                                                                                            |                                                                                |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Mid season drought (long dry spell) | Major Farming situation                                                                                                                                           | Normal Crop/cropping system                                        | Crop management &Plant protection measures                                                                                                                                                                             | Soil nutrient & moisture conservation measures                                                             | Remarks on Implementation                                                      |
| At flowering/ fruiting stage        | 1.FS-I (Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | a.Rice<br>b.maize<br>c.soybean                                     | Thinning,mulching,supplemental irrigation                                                                                                                                                                              | Ridging,conservation furrow,dust mulch                                                                     | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                                     |                                                                                                                                                                   | Rice                                                               | <ul style="list-style-type: none"> <li>Spray Malathion against Gundhi bug</li> </ul>                                                                                                                                   |                                                                                                            |                                                                                |
|                                     |                                                                                                                                                                   | Maize                                                              | <ul style="list-style-type: none"> <li>Spray Dimethoate against aphid</li> </ul>                                                                                                                                       |                                                                                                            |                                                                                |
|                                     |                                                                                                                                                                   | Soyabean                                                           | <ul style="list-style-type: none"> <li>Application of phorate for control of stem fly, blue beetle</li> <li>Spray Methomyl for defoliators, semiloopers etc</li> <li>Spray mancozeb against foliar diseases</li> </ul> |                                                                                                            |                                                                                |
|                                     |                                                                                                                                                                   | Cropping system 2 : Horticulture basedcropping system<br>g. Citrus | <ul style="list-style-type: none"> <li>Irrigation at critical stages</li> <li>Foliar spray of urea 1%</li> <li>Spray Neem oil against Citrus butterfly</li> </ul>                                                      | <ul style="list-style-type: none"> <li>Construction of half moon trenches for citrus and litchi</li> </ul> | Construction of water harvesting structures                                    |

|  |                                                                                                                                                                             |                                                                             |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                           |                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  |                                                                                                                                                                             |                                                                             | <ul style="list-style-type: none"> <li>• Plugging holes made by trunk borer and application of fumigants</li> <li>• Spraying of Copper fungicides against pink diseases, powdery mildew, etc</li> </ul>                               | <ul style="list-style-type: none"> <li>• Organic mulching with previous crop residues</li> <li>• Follow intercropping in rolling topography for moisture conservation.</li> <li>• Follow ridge and furrow method of planting</li> <li>• Life saving irrigation should be given</li> </ul> |                                                                                   |
|  |                                                                                                                                                                             | h. Tomato                                                                   | <ul style="list-style-type: none"> <li>• Spray bio pesticide Trichoderma viridae for management of late blight disease</li> <li>• Spray NPV or Neem oil against Helicoverpa armigera</li> </ul>                                       | -do-                                                                                                                                                                                                                                                                                      | -do-                                                                              |
|  |                                                                                                                                                                             | i. Cabbage                                                                  | <ul style="list-style-type: none"> <li>• Release of bio agents Trichogramma brassicae against Pieris brassicae</li> <li>• Spray Neem oil for management of lepidopteran pests</li> <li>• Spray Mancozeb against black spot</li> </ul> | -do-                                                                                                                                                                                                                                                                                      | -do-                                                                              |
|  |                                                                                                                                                                             | j. Black pepper                                                             | <ul style="list-style-type: none"> <li>• Remove infected vines</li> <li>• Apply Bordeaux paste to stem from the ground level upto 50 cm height</li> </ul>                                                                             | -do-                                                                                                                                                                                                                                                                                      | -do-                                                                              |
|  |                                                                                                                                                                             | k. Litchi                                                                   | <ul style="list-style-type: none"> <li>• Spray Malathion against Litchi bug</li> </ul>                                                                                                                                                | -do-                                                                                                                                                                                                                                                                                      | -do-                                                                              |
|  |                                                                                                                                                                             | l. Areca nut                                                                | <ul style="list-style-type: none"> <li>• Drench the crown with Bordeaux mixture 1% against bud rot and fruit rot</li> </ul>                                                                                                           | -do-                                                                                                                                                                                                                                                                                      | -do-                                                                              |
|  | 2. FS-II<br>(Agri+Hort+AH+Seri)<br>Mid altitude areas. Elevation more than (600-1200m msl) heavy rainfall (less than 4000-8000mm)<br>Moderately-strongly sloping, rain fed. | Rice, maize, soybean                                                        | Thinning, mulching, supplemental irrigation                                                                                                                                                                                           | Ridging, conservation furrow, dust mulch                                                                                                                                                                                                                                                  | Construction of Farm ponds through NREGS, RKVY Linkage with MRDS, NHM, NABARD etc |
|  |                                                                                                                                                                             | Cropping system 2 : Horticulture based cropping system<br>Pineapple, banana | <ul style="list-style-type: none"> <li>• Irrigation at critical stages</li> <li>• Foliar spray of urea 1%</li> </ul>                                                                                                                  | <ul style="list-style-type: none"> <li>• Organic mulching with previous crop residues</li> <li>• Follow intercropping in rolling topography</li> </ul>                                                                                                                                    | Construction of water harvesting structures                                       |

|  |                                                                                                                                               |                                                                                                          |                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                  |                                                                                 |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|  |                                                                                                                                               |                                                                                                          |                                                                                                                                    | for moisture conservation. <ul style="list-style-type: none"> <li>Follow ridge and furrow method of planting</li> <li>Life saving irrigation should be given at critical stages</li> </ul>                                                                                                                                                                       |                                                                                 |
|  |                                                                                                                                               | Turmeric                                                                                                 | <ul style="list-style-type: none"> <li>Spray Chloropyriphos to manage stem borer &amp; Trichoderma viridae for soft rot</li> </ul> | -do-                                                                                                                                                                                                                                                                                                                                                             | -do-                                                                            |
|  |                                                                                                                                               | Ginger                                                                                                   | <ul style="list-style-type: none"> <li>Spray Chloropyriphos to manage stem borer &amp; Trichoderma viridae for soft rot</li> </ul> | -do-                                                                                                                                                                                                                                                                                                                                                             | -do-                                                                            |
|  | 3. FS-III (Agri+Hort+AH) High altitude areas. Elevation more 1200m msl+) Medium and heavy rainfall (4000-8000mm) Moderately sloping,rain fed. | Rice,maize,soybean                                                                                       | Thinning,mulching,supplemental irrigation                                                                                          | Ridging,conservation furrow,dust mulch                                                                                                                                                                                                                                                                                                                           | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NAB ARD etc |
|  |                                                                                                                                               | Cropping system 2 : Horticulture based cropping system Citrus, turmeric, ginger, potato, tomato, cabbage | <ul style="list-style-type: none"> <li>Thinning</li> <li>Irrigation at critical stages</li> <li>Foliar spray of urea 1%</li> </ul> | <ul style="list-style-type: none"> <li>Construction of half moon trenches for fruit crops</li> <li>Organic mulching with previous crop residues</li> <li>Follow intercropping in rolling topography for moisture conservation.</li> <li>Follow ridge and furrow method of planting</li> <li>Life saving irrigation should be given at critical stages</li> </ul> | Construction of water harvesting structures                                     |

#### Contingency measures- End of the season

| Condition                                       |                         |                                          | Suggested Contingency measures |                    |                                        |
|-------------------------------------------------|-------------------------|------------------------------------------|--------------------------------|--------------------|----------------------------------------|
| Terminal drought ( early withdrawal of Monsoon) | Major farming situation | Normal Crop/cropping system <sup>b</sup> | Crop management <sup>c</sup>   | Rabi Crop Planning | Remarks on Implementation <sup>e</sup> |

|                     |                                                                                                                                                                       |                                                                                                                          |                                      |                                                                               |                                                                                |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| At vegetative stage | 1. FS-I<br>(Agri+Hort+AH+Fisheries)<br>Low altitude areas<br>Elevation (0-600m msl).Very High and heavy rainfall(more than 8000mm)very steep slope (25-33%),rain fed. | Rice,maize,soybean                                                                                                       | Harvesting at physiologicalmaturity  | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                     |                                                                                                                                                                       | Cropping system 2 : Horticulture basedcropping system<br>Citrus, arecanut, black pepper, potato, litchi, tomato, cabbage | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |
|                     | 2. FS-II<br>(Agri+Hort+AH+Seri)Mid altitude areas.Elevation more than (600-1200m msl)heavy rainfall (less than 4000-8000mm) Moderately-strongly sloping,rain fed.     | Rice,maize,soybean                                                                                                       | Harvesting at physiologicalmaturity  | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                     |                                                                                                                                                                       | Cropping system 2 : Horticulture basedcropping system<br>Pineapple, turmeric, ginger, banana                             | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |
|                     | 3. FS-III<br>(Agri+Hort+AH)High altitude areas.Elevation more 1200m msl+)Medium and heavy rainfall(4000-8000mm)Moderately sloping,rain fed.                           | Rice,maize,soybean                                                                                                       | Harvesting at physiologicalmaturity  | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Construction of Farm ponds through NREGS,RKVY Linkage with MRDS,NHM,NABARD etc |
|                     |                                                                                                                                                                       | Cropping system 2 : Horticulture basedcropping system<br>Citrus, turmeric, ginger, Potato, tomato, cabbage               | Harvesting at horticultural maturity | Utilization of residual moisture for early sowing of pre-rabi vegetable crops | Constructions of water harvesting structures                                   |

### 2.1.2

### Drought – Irrigated situation



| Condition                                                                      | Major Farming situation                                                                                                                                           | Normal Crop/cropping system                                                                                  | Suggested Contingency measures |                                                                                                                                                                                                                       |                               |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                                                                |                                                                                                                                                                   |                                                                                                              | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                    | Remarks on Implementation     |
| Delayed release of water in canals due to low rainfall for Irrigated situation | 1.FS-I<br>(.Agri+Hort+AH+Fishery)Low Altitude area Elevation (o-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland | 1.Rice-rice                                                                                                  | No change                      | <ul style="list-style-type: none"> <li>For High altitudeshort duration of rice crop varieties (Luit,Vivekdhan) 90days duration for 3weeksdelayed</li> <li>SRI practice</li> <li>Community nursery</li> </ul>          | NA                            |
|                                                                                |                                                                                                                                                                   | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with organic materials</li> <li>Life saving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December-January |
|                                                                                |                                                                                                                                                                   | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching</li> <li>Life saving irrigation should be given at head formation stage</li> </ul>                                 | Sowing time- November-January |
|                                                                                | 3. FS-III (Agri+Hort+AH) High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 – 8000mm) Moderately sloping, Lowland                     | a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi                                                          | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with plant materials</li> <li>Life saving irrigation should be given at flowering and fruit set stage</li> </ul>   | Sowing time- January-February |
|                                                                                |                                                                                                                                                                   | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching</li> <li>Life saving irrigation should be given at head formation stage</li> </ul>                                 | Sowing time- October-December |

| Condition                                                                  |                                                                                                                                                                   |                                                                                                               | Suggested Contingency measures |                                                                                                                                                                                                                      |                               |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                                                            | Major Farming situation                                                                                                                                           | Normal Crop/cropping system                                                                                   | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                   | Remarks on Implementation     |
| Non release of water in canals under delayed onset of monsoon in catchment | 1.FS-I<br>(.Agri+Hort+AH+Fishery)Low Altitude area Elevation (0-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland | 1.Rice-rice                                                                                                   | No change                      | <ul style="list-style-type: none"> <li>For High altitude Short duration of rice crop varieties (Luit,Vivekdhan) 90days duration for 3weeks delayed</li> <li>SRI practice</li> <li>Community nursery</li> </ul>       | NA                            |
|                                                                            |                                                                                                                                                                   | b.Rice-potato                                                                                                 | No change                      | <ul style="list-style-type: none"> <li>Medium duration Kharif rice variety(130 days)for 2weeks delay</li> <li>Potato var:Kufrimegha</li> </ul>                                                                       |                               |
|                                                                            |                                                                                                                                                                   | c.Rice-toria                                                                                                  | No change                      | <ul style="list-style-type: none"> <li>Medium duration Kharif rice variety(130 days)</li> <li>Late sown toria variety(TS-38,TS-46)</li> </ul>                                                                        |                               |
|                                                                            |                                                                                                                                                                   | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato- Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with organic materials</li> <li>Life savingirrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December-January |
|                                                                            |                                                                                                                                                                   | b. Cabbage – MahycoHybrid 139, Wonderball                                                                     | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching</li> <li>Life saving irrigation should be given at head formation stage</li> </ul>                                | Sowing time- November-January |
|                                                                            | 3. FS-III (Agri+Hort+AH)<br>High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 – 8000mm) Moderately sloping, Lowland                  | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato- Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>Apply recommended dose of organic manures</li> <li>Mulching with plant materials</li> <li>Life saving irrigation should be given at flowering and fruit set stage</li> </ul>  | Sowing time- January-February |
|                                                                            |                                                                                                                                                                   |                                                                                                               |                                |                                                                                                                                                                                                                      |                               |

|  |  |                                           |           |                                                                                                                                                                                             |                               |
|--|--|-------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|  |  | b. Cabbage – MahycoHybrid 139, Wonderball | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Life saving irrigation should be given at head formation stage</li> </ul> | Sowing time- October-December |
|--|--|-------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|

| Condition                                     | Suggested Contingency measures                                                                                                                                        |                                                                                                              |                                |                                                                                                                                                                                                                             |                               |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|                                               | Major Farming situation                                                                                                                                               | Normal Crop/cropping system                                                                                  | Change in crop/cropping system | Agronomic measures                                                                                                                                                                                                          | Remarks on Implementation     |
| Insufficiency of surface water for irrigation | 1.FS-I<br>(.Agri+Hort+AH+Fishery)Low Altitude area Elevation (o-600 m msl). Very High and heavy rainfall ( more than 8000 mm) Very steep slope (2.5-33%). Lowland     | Rice- Ranjit, Bahadur, Pankaj                                                                                | SRI hybrid to be used          | <ul style="list-style-type: none"> <li>• Low seed rate</li> <li>• Critical irrigation of crops at critical stage</li> <li>•</li> </ul>                                                                                      |                               |
|                                               |                                                                                                                                                                       | Cropping system 2 : Horticulture basedcropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change                      | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with organic materials</li> <li>• Life saving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- December-January |
|                                               |                                                                                                                                                                       | b. Cabbage – MahycoHybrid 139, Wonderball                                                                    | No change                      | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Life saving irrigation should be given at head formation stage</li> </ul>                                 | Sowing time- November-January |
|                                               | 2. FS-II<br>(Agri+ Hort+ AH+ Seri)Mid altitude areas. Elevation more than 600-1200 m msl) heavy rainfall (less than 4000-8000mm) Moderately-Strongly sloping, Lowland | Rice-Shah Sarang I, Lampnah I, RCPL 1-3 RCPL 3-3, Ngoba, Manipur                                             | Delayed transplanting          | Direct sown under transplanting                                                                                                                                                                                             |                               |
|                                               | 3. FS-III (Agri+Hort+AH) High altite areas. Elevation more 1200 m msl+) Medium and heavy rainfall (4000 –                                                             | Rice-Megha Rice I,Megha Rice II, US I Local varieties                                                        | Delayed transplanting          | Direct sown under transplanting                                                                                                                                                                                             |                               |

|  |                                     |                                                                                                               |           |                                                                                                                                                                                                                           |                               |
|--|-------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|  | 8000mm) Moderately sloping, Lowland | Cropping system 2 : Horticulture based cropping system<br>a. Tomato-Hybrid 17, Jessica, Namdhari, Chiranjeevi | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching with plant materials</li> <li>• Life saving irrigation should be given at flowering and fruit set stage</li> </ul> | Sowing time- January-February |
|  |                                     | b. Cabbage – MahycoHybrid 139, Wonderball                                                                     | No change | <ul style="list-style-type: none"> <li>• Apply recommended dose of organic manures</li> <li>• Mulching</li> <li>• Life saving irrigation should be given at head formation stage</li> </ul>                               | Sowing time- October-December |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation

# Actionable Comprehensive Plans for Contingency

|       |           |          |                  |
|-------|-----------|----------|------------------|
| State | MEGHALAYA | District | WEST KHASI HILLS |
|-------|-----------|----------|------------------|

## Rainfall info (mm)

| Month/season | Normal rainfall (mm) | Expected deficiency, % | Expected rainfall (mm) |
|--------------|----------------------|------------------------|------------------------|
| June-Sep     | 2641.7               | More than 19%          | Less than 2139.777     |
| June         | 642.7                |                        |                        |
| July         | 972.2                |                        |                        |
| August       | 530.3                |                        |                        |
| September    | 496.5                |                        |                        |

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

## Irrigation info:

|                     |       |                       |       |
|---------------------|-------|-----------------------|-------|
| Net irrigated area: | 12459 | Gross irrigated area: | 13417 |
| Net Rainfed area    | 6098  | Gross rainfed area    | 12521 |

## Source wise irrigation area details (ha)

| Source of irrigation | Net   | Gross |
|----------------------|-------|-------|
| Canals               | 12459 | 13417 |
| Wells                | -     | -     |
| Tanks                | -     | -     |
| Other sources        | -     | -     |

## Crop Profile (Kharif)

### Cereals

| S.No | Crop name | Total area (ha) | Irrigated area (ha) | Rainfed area (ha) |
|------|-----------|-----------------|---------------------|-------------------|
| 1    | Rice      | 16              | 16                  | 0                 |
| 2    | Jowar     | -               | -                   |                   |
| 3    | Maize     | 3103            |                     | 3103              |
| 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        | 37              |                     | 37                |
| 4    | Soyabean       | 49              | 6                   | 43                |
| 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            | 42              |                     | 42                |
| 3    | Guar seed          | -               |                     |                   |
| 4    | Other Fodder crops | -               |                     |                   |

#### Crop Plan- Beginning of the season

| 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 (July 2nd week)     | 1) Farming situation: Rainfed | Cropping system 1: Rice     | Follow water conservation and management practices.<br>At higher altitude rice will be replaced by other vegetable crops such as cabbage or Possibility of taking a catch crop<br>Conserving moisture for 'rabi' sowing<br>Utilizing paddy fallows for second crop | Use of short duration variety which are tolerant to drought<br>Seeds should be sown in nursery<br>SRI method can be followed during drought at lower /mid altitudes |                           |

|  |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                    |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                                                                                                                                     | Cropping system 2: Maize<br>Maize + Finger Millet<br>(intercropping, Higher<br>Altitude)<br>Maize + Soyabean<br>(intercropping, higher<br>elevation)<br>d. Maize + Ginger ( Mid<br>altitude<br>region)<br>e. Maize + Vegetables<br>f. Rabi Maize + Vegetables/<br>Mustard/Toria<br>g. Maize + Potato/<br>Vegetables | Finger millet : Indaf- 5, 8, 9, local<br>Maize :local yellow,local white, HQPM-<br>1,DA61A<br>Vivek- 15, Vivek -9, Vivek-23<br>Soybean: Bragg,Hill, PK-1042, 1024,<br>PK-262, local<br>( black bold) , VL-soya-47<br>Ginger : Nadia.<br>Topoica : Local<br>Horticultural crops<br>Potato: Kufri Jyoti, K. Giriraj, K. Megha | Delay the<br>seedlingraising of<br>finger millet<br>Wider spacing (60<br>X 30)cm for maize<br>Frequent<br>intercultureoperati<br>on for<br>conservation of<br>moisture<br>Mulching in<br>ginger<br>Management of<br>soilacidity<br>Timely thinning<br>tomaintain proper<br>spacing |  |
|  | Rainfed<br>1 )<br><b>Farming<br/>         situatio<br/>         n:</b><br>Rainfed<br>upland -<br>(Sandy<br>loam to<br>clay<br>loam) | Potato/turnip/beetroot/toma<br>to/carrot/cauliflower/onion/p<br>eas/lettuce/cabbage/broccoli<br><br>Chilli/turmeric/ginger/pumpk<br>in/radish/frenchbean/cucum<br>ber/ bitter gourd/<br>brinjal/Potato/turnip/beetroo<br>t/tomato/carrot/cauliflower/<br>onion/peas/lettuce/cabbage/<br>broccoli                    | No change<br><br>No change                                                                                                                                                                                                                                                                                                  | Recommended<br>package of<br>practices<br>Recommended<br>package of<br>practices                                                                                                                                                                                                   |  |
|  | 2)<br>Farming<br>situation<br>:<br>Rainfed<br>medium<br>land/me<br>dium<br>low land<br>(Sandy<br>loam to<br>clay<br>loam)           | Potato/<br>turnip/beetroot/tomato/carr<br>ot/cauliflower/onion/peas/let<br>tuce/cabbage/broccoli                                                                                                                                                                                                                    | No change                                                                                                                                                                                                                                                                                                                   | Recommended<br>package of<br>practices                                                                                                                                                                                                                                             |  |

#### Contingency measures- Mid season

| Condi<br>tion                                                                                                           |                               |                             | Suggested Contingency measures |                                                   |                                  |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|--------------------------------|---------------------------------------------------|----------------------------------|
| Mid<br>season<br>drought<br>(long<br>dry<br>spell,<br>consecu<br>tive 2<br>weeks<br>rainless<br>(>2.5<br>mm)<br>period) | Major<br>Farming<br>situation | Normal Crop/cropping system | Crop management                | Soil nutrient & moisture<br>conservation measures | Remarks on<br>Implementa<br>tion |
|                                                                                                                         |                               |                             |                                |                                                   |                                  |

|                                  |                                                                                           |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                             |                                                                                                                                                                                                                                   |                                  |
|----------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>At vegetative stage</b>       | Rainfed : with moderate to high rainfall and no irrigation facilities                     | Cropping system 1:Rice                                                                                                                                                                                                                                                                  | No change                                                                                                                                                                   | Nursery raising of seedling<br>Weeding at regular intervals<br>Wider spacing                                                                                                                                                      |                                  |
|                                  |                                                                                           | Cropping system 2:Maize based<br>Maize + Finger Millet (intercropping, Higher Altitude)<br>Maize + Soyabean (intercropping, higher elevation)<br>Maize + Ginger ( Mid altitude region)<br>Maize + Vegetables<br>Rabi Maize + Vegetables/<br>Mustard/Toria<br>Maize + Potato/ Vegetables | Thinning to maintain optimum plant population.<br>Life saving irrigation by using water of Dug-out ponds and rain water harvesting structure.<br>Weeding and weed mulching. | FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30) cm for maize, followed with intercropping<br>In-situ soil moisture conservation measures<br>Frequent intercultural operation for moisture conservation |                                  |
|                                  | 1 )<br><b>Farming situation :</b><br>Rainfed upland (Sandy loam to clay loam)             | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/bitter gourd/brinjal/Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/broccoli                                                                                                                    | No change                                                                                                                                                                   | Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>-Application of sufficient quantity of FYM or compost in the main field.                                                                         |                                  |
|                                  |                                                                                           | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/bitter gourd/brinjal/Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/broccoli                                                                                                                    |                                                                                                                                                                             | -Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>- Application of sufficient quantity of FYM or compost in the main field<br>- Thinning to maintain optimum plant population.                    |                                  |
|                                  | 2)<br>Farming situation:<br>Rainfed medium land/medium low land (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                                  | No change                                                                                                                                                                   | Gap filling if required<br>Life saving supplemental irrigation at critical stages of crop growth                                                                                                                                  |                                  |
|                                  | <b>Condition</b>                                                                          |                                                                                                                                                                                                                                                                                         | <b>Suggested Contingency measures</b>                                                                                                                                       |                                                                                                                                                                                                                                   |                                  |
| <b>Mid season drought (long)</b> | <b>Major Farming situation</b>                                                            | <b>Normal Crop/cropping system</b>                                                                                                                                                                                                                                                      | <b>Crop management</b>                                                                                                                                                      | <b>Soil nutrient &amp; moisture conservation measures</b>                                                                                                                                                                         | <b>Remarks on Implementation</b> |



| dry spell)                   |                                                               |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                             |                                                                                                                                                                                                                                   |                               |
|------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| At flowering/ fruiting stage |                                                               | Cropping system 1:Rice                                                                                                                                                                                                                                                                  | Need based plant protection measures should be followed<br>Spray of antitranspirants<br>Moisture conservation practices such as ridging and mulching can be followed        | Weeding should be done at regular interval water harvesting structures can be constructed so as to provide irrigation during the critical stages                                                                                  |                               |
|                              |                                                               | Cropping system 2:Maize based<br>Maize + Finger Millet (intercropping, Higher Altitude)<br>Maize + Soyabean (intercropping, higher elevation)<br>Maize + Ginger ( Mid altitude region)<br>Maize + Vegetables<br>Rabi Maize + Vegetables/<br>Mustard/Toria<br>Maize + Potato/ Vegetables | Thinning to maintain optimum plant population.<br>Life saving irrigation by using water of Dug-out ponds and rain water harvesting structure.<br>Weeding and weed mulching. | FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30) cm for maize, followed with intercropping<br>In-situ soil moisture conservation measures<br>Frequent intercultural operation for moisture conservation |                               |
|                              | Rainfed upland (Sandy                                         | Potato// turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                                | No change                                                                                                                                                                   | -Life saving supplemental irrigation                                                                                                                                                                                              | - Water harvesting structures |
|                              |                                                               | Chilli/turmeric/ginger/pumpkin/radish/frenchbean/cucumber/ bitter gourd/ brinjal/Potato///turnip/beetroot/tomato/carrot/cauliflower/onion/ peas/lettuce/ cabbage/ broccoli                                                                                                              | No change                                                                                                                                                                   | - Life saving supplemental irrigation<br>-Weeding at critical stages of growth.<br>- Thinning to maintain optimum population.<br>Mulching with crop residues                                                                      |                               |
|                              | Rainfed medium land/ Medium low land(Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                                  | No change                                                                                                                                                                   | -Life saving supplemental irrigation at critical stages of crop growth                                                                                                                                                            |                               |
|                              |                                                               |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                             |                                                                                                                                                                                                                                   |                               |

# Contingency measures- End of the season

| Condition                                         |                                                                              |                                                                                                                                                                                                                                                                           | Suggested Contingency measures                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                          |                           |
|---------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Terminal drought<br>(Early withdrawal of monsoon) | Major Farming situation                                                      | Normal Crop/cropping system                                                                                                                                                                                                                                               | Crop management                                                                                                                                                                                                                                                            | Rabi Crop planning                                                                                                                                                                                                                                                                                       | Remarks on Implementation |
|                                                   | 1 )<br><b>Farming situation:</b><br>Rainfed                                  | Cropping system 1: rice<br>Rice based<br>Rice - Mustard/Vegetables                                                                                                                                                                                                        | Follow water conservation and management practices.<br>Efficient use of stored water for life saving irrigation<br>Short duration varieties of pulses, oilseeds, minor millets<br>Harvesting the crop at physiological maturity.<br>Prepare for the ensuing 'rabi' season. | Water harvesting structures for irrigating rabi crops                                                                                                                                                                                                                                                    |                           |
|                                                   |                                                                              | Cropping system 2: Maize based cropping system :<br>1. Maize - rice/soybean - potato/vegetables/ wheat/mustard<br>2. Maize - Maize + French Beans(Local)/vegetables<br>3. Ginger + Maize<br>4. Maize - Finger Millet/ Rice Bean (Relay) + vegetable<br>Ginger<br>Turmeric | Maize: HQPM-I, RCM 1- 1, RCM 1- 2,<br>Soybean: Ahilya- 1,bragg,hill.                                                                                                                                                                                                       | Conservation measures<br>Furrow application of FYM<br>Mulching with green/dry leaves & grasses<br>Wider spacing (60 X 30 cm) for maize<br>Frequent intercultural operation for moisture conservation                                                                                                     |                           |
|                                                   | 1 )<br><b>Farming situation:</b><br>Rainfed upland (Sandy loam to clay loam) | Potato/turnip/beetroot/tomato/carrot/ cauliflower/onion/peas/lettuce/ cabbage/ broccoli                                                                                                                                                                                   | Life saving supplemental irrigation<br>- Pre-sowing irrigation for nursery raising and life saving irrigation after transplanting                                                                                                                                          | - Growing of Tomato, Brinjal, and Leafy vegetables like Spinach, Radish etc. with improved package of practices<br>- Growing of mid season cole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa |                           |

|  |                                                                                                                                       |                                                                                                                                                                            |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                  |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                                                                                                                                       |                                                                                                                                                                            |                                                                                                                                                                                                     | Mukta etc.), Knolkhol (White Vienna) etc.                                                                                                                                                                                                                                                                                                        |  |
|  |                                                                                                                                       | Chilli/turmeric/ginger/pumpkin/radish/ frenchbean/cucumber/ bitter gourd/ brinjal//Potato/turnip/beetroot/tomato /carrot/cauliflower/onion/peas/lettuce/ cabbage/ broccoli | Life saving supplemental irrigation<br>-Harvesting of kharif crops at physiological maturity stage.<br>- Pre-sowing irrigation for nursery raising and life saving irrigation after transplanting   | Growing of Tomato, Brinjal, and Leafy vegetables like Spinach, Radish etc. with improved package of practices<br>- Growing of mid season cole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa Mukta etc.), Knolkhol (White Vienna) etc. |  |
|  | 2)<br>Farmin<br>g<br>situatio<br>n:<br>Rainfed<br>mediu<br>m<br>land/<br>Mediu<br>m low<br>land<br>(Sandy<br>loam<br>to clay<br>loam) | Potato/<br>turnip/beetroot/tomato/carrot/cauliflo<br>wer/onion/peas/lettuce/ cabbage/<br>broccoli                                                                          | -Life saving supplemental - irrigation<br>- Pre-sowing irrigation for nursery raising and life saving irrigation aftertransplanting<br>- Harvesting of kharif crops at physiological maturity stage | - Growing of mid season cole crops such as Cauliflower (varieties – Improved Japanese, Pusa Synthetic, Pusa Snowball etc.) and Cabbage (Varieties – Golden Acre, Pride of India, Pusa Mukta etc.), Knolkhol (White Vienna) etc. Mulching in Rabi crops                                                                                           |  |

## 2.1.2 Drought - Irrigated situation

| 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 | Lower altitudes                | Rice                        | No change                      | Medium or short duration variety can be grown if water is delayed by 15days<br>Rice seeds should be replaced by Short duration variety such as luit vivek dhan 82 etc<br>Rice should be replaced by other crops such as pulses If the water in canals is delayed by 90 days |                           |

| Condition                                                                  |                         |                             | Suggested Contingency measures                        |                                                                             |                           |
|----------------------------------------------------------------------------|-------------------------|-----------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------|
|                                                                            | Major Farming situation | Normal Crop/cropping system | Change in crop/cropping system                        | Agronomic measures                                                          | Remarks on Implementation |
| Limited release of water in canals due to low rainfall                     | Lower altitudes         | Rice                        | Rice sowing nursery delayed<br>SRI nursery to be used | Late duration varieties<br>8-10 days old seedling is used for transplanting |                           |
| Non release of water in canals under delayed onset of monsoon in catchment | Lower altitudes         | Rice                        | SRI hybrids can be used<br>Delayed transplanting      | Low seed rate<br>Direct sown under transplanting                            |                           |
| Lack of inflows into tanks due to insufficient /delayed onset of monsoon   | Lower altitudes         | Rice                        | Delayed transplanting                                 | Direct sown under unpuddled condition                                       |                           |
| Insufficient groundwater recharge due to low rainfall                      | Lower altitudes         | Rice                        | Late duration                                         | Direct sown under unpuddled condition                                       |                           |

#### Resource management technologies

- Jalkund
- Life saving irrigation with harvested water of Jalkund
- Paddy straw mulching
- Protected cultivation
- Zero tillage
- In situ moisture conservation