MANUAL ON CONTINGENCY AGRICULTURAL PLAN

National Initiative on Climate Resilient Agriculture

ICAR-Zonal Project Directorate, Zone-V
CRIDA campus, Santoshnagar, Hyderabad-500 059
Preface

To make the Indian agriculture more climate resilient, there is an urgent need to demonstrate and disseminate already available best practices on farmers’ fields in the vulnerable regions. As the climate change and its consequences are beginning to impact agriculture and allied sectors in India, it is essential to evolve, demonstrate and upscale effective and innovative technologies for climate resilience.

Real time contingency plan implementation, rainwater harvesting (in-situ and ex-situ) and its efficient use, livestock management need to be focused in participatory mode besides demonstration of location specific climate resilient agricultural technologies. Major emphasis was given on managing various weather aberrations such as late onset of monsoon, midseason and terminal droughts and extreme weather events such as floods, hailstorm etc.

I am highly grateful to Dr. S. Ayyappan, Director General, ICAR and Secretary, DARE, Dr. A.K. Sikka, DDG (NRM) and DDG (Agril. Extension) for their guidance and support.

We thankfully acknowledge the efforts of scientists who documented the contingency crop planning of CRIDA, AICRPDA and Agro-Metrological centres and Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, for utilizing the information in this document.

I place on record my sincere thanks to Dr. G. Subba Reddy, Former Head Crop Science Division & Principal Scientist, CRIDA for his valuable input and technical support. I equally appreciate all my colleagues who are directly or indirectly involved in bringing out strategic research experiences in the form of a book, “Manual on Contingency Agriculture Plan”. I hope that the document will be helpful to those involved in planning and promoting contingency measures including the NICRA KVKs of Andhra Pradesh, Telangana and Maharashtra.

Dated the 7th October, 2014
Hyderabad
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1. INTRODUCTION

Agriculture is the source of livelihood for nearly two-thirds of the population in India. The impact of climate change and variability in the country on agricultural production is quite evident in recent years. The weather aberrations like drought and floods extreme events like high intense excess rainfall, frost, hail storm, heat wave, cold wave etc are becoming recurring phenomena in most parts of the country in the crop growing seasons.

The South-West monsoon accounts for nearly 75% of the natural precipitation received in the country and exerts a strong influence on the kharif food grain production and on the economy in terms of agricultural output and farmers’ income. The onset of South-West monsoon and the amount of rainfall and its distribution are crucial factors which influence the performance of agriculture. In rain fed areas, as a general rule early sowing of crops with the onset of monsoon is the best-bet practice that gives higher reliable yield. But the crop yield is affected due to delay in monsoon or prolonged breaks during cropping season and also with early withdrawal or continuation of monsoon for longer periods. These aberrant situations often lead to poor crop performance or total crop failures in major crops. There is a need to develop appropriate strategies to deal with such eventualities. Keeping these aberrations in view, Central Research Institute for Dryland Agriculture (CRIDA) developed contingency plans based on soils, rainfall and micro farming situations with association of network of AICRPDA and Agro met centers and Agricultural Universities.

Contingency crop planning refers to implementing a plan for making alternate crop or cultivar choices in tune with the actual rainfall situation and soils in a given location. However, any contingency intervention either technology related (land, water, soil, crop) or institutional and policy based, need to be implemented on real time basis during crop growing season. Brief technological options for implementing these plans on assessment mode for different NICRA centers located in the states of Andhra Pradesh, Telangana and Maharashtra are summarized below.
2. BRIEF PROFILE OF NICRA CENTRES UNDER ZONE-V

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3. CONTINGENCY CROP PLANNING FOR DIFFERENT NICRA CENTRES IN ANDHRA PRADESH, TELANGANA AND MAHARASHTRA
## Anantapur

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<th>Time period</th>
<th>Suggested contingency crops /Cropping systems/ Varieties</th>
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<tr>
<td><strong>July 2nd fortnight</strong></td>
<td>Groundnut + Pigeonpea (LRG-41) 7:1 (Shallow red soils)</td>
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<td><strong>August 1st fortnight</strong></td>
<td>Groundnut + Pigeonpea (LRG-41) 15:1 (Shallow red soils)</td>
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<td><strong>August 2nd fortnight</strong></td>
<td>Pure crop of Jowar (CSH-9, 13, CSV-12, 13, NTJ1-3)/Pearl millet (ICTP 8203, ICMV-221, ICMH-451)/Cowpea/Greengram (MGG-295, LGG-107)/Sunflower (APSH11, KBSH1)/Setaria (Lepakshi, Krishnadevaraya)</td>
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<tr>
<td><strong>Sept 1st fortnight</strong></td>
<td>Pure crop of Jowar (fodder) (PGH-1 &amp; 2)/Pearl millet (ICTP-8203, ICMV-221, ICMH-451)/Cowpea/Greengram (MGG-295, LGG-107)/Sunflower (Morden)</td>
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<tr>
<td><strong>Sept 2nd fortnight</strong></td>
<td>Horsegram</td>
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## Drought Management

**Rainfed conditions**

**Groundnut**

**Vegetative stage**
- Mulching with groundnut shells is advised
- Protect the crop from Thrips which act as vectors for PBND and PSND, Chlorpyriphos @ 2ml/L at 7-10 days interval

**Reproductive stage**
- Supplemental irrigation with harvested rain water in ponds (10 mm depth) by using micro-irrigation (Sprinklers)

**Maturity stage**
- Supplemental irrigation with harvested rain water in ponds (10 mm depth) by using micro-irrigation (Sprinklers)

**Irrigated conditions**

**Delayed/ limited release of water in canals due to low rainfall:**
- ID crops like groundnut (Oct 16th-Dec 31st) and Sunflower (Sep 1st FN-Jan 30th) instead of paddy

**Non release of water in canals under delayed onset of monsoon in catchment/ Tail end areas**
- Jowar/Greengram/Horsegram are recommended during September as rainfed
crops instead of Groundnut and sunflower.

**Lack of inflows into tanks due to insufficient/delayed onset of monsoon:**
- Sunflower and jowar instead of paddy

**Unusual Rains**

**Groundnut**

**Flowering stage**
- Draining of excess water, Timely plant protection measures are to be taken against Late Leaf Spot, rust and stem rot diseases

**Maturity stage**
- Weather based advisory to be followed for harvesting

**Horticultural crops**

**Sweet orange**

**Vegetative stage**
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times
- Foliar spray of micronutrient mixture is also to be taken up
- Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
- If age of the tree is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied
- Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

**Flowering stage**
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times
- Foliar spray of micronutrient mixture is also to be taken up
- Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
- If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the mature fruits in a clear sunny day
Banana

**Vegetative stage**
- Drain out excess water in the field
- Inter cultivation with gorru in between rows to be done for improved aeration
- Spray 0.5 % KNO\textsubscript{3} or Urea 2% solution 2-3 times
- Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
- Gap filling may be taken up if the plants are two weeks old

**Flowering stage**
- Preventive measures during vegetative stage are to be followed in flowering stage also
- If the age of the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months
- Staking with bamboos to prevent further lodging

**Maturity stage**
- Drain out excess water in the field
- Spray 0.5 % KNO\textsubscript{3} or Urea 2% solution 2-3 times for quick development of immature bunches
- Staking with bamboos to prevent further lodging
- Harvest the marketable bunches in a clear sunny day

Papaya

**Vegetative stage**
- Drain out excess water
- Control sucking pests
- Water logging near trunk should be prevented
- Drench the plants with copper fungicides to prevent collar rot

**Flowering stage**
- Drain out the excess water
- Outbreak of sucking pests (if any) should be controlled using systemic insecticides
- Water logging near trunk should be prevented
**Maturity stage**
- Drain out the excess water
- Harvest the marketable fruits in a clear sunny day
- Outbreak of any sucking pests should be controlled by using systemic insecticides
- Water logging near trunk should be prevented
- Micronutrient deficiencies should be corrected by foliar sprays of Fe, Mg, Zn, Bo and Mn

**Cyclones**

**Sweet orange**

**Vegetative stage**
- Spray Carbendazim 1 g or COC 3g per litre to prevent spread of diseases
- If the damage is severe, go for resowing

**Flowering and maturity stages**
- Trees fallen on ground may be lifted and earthed up
- Manuring and plant protection measures have to be taken up
- Broken and damaged branches may be pruned and applied with Bordeaux paste

**Papaya**

**Vegetative stage**
- Drain the excess water and drench the plants with any copper fungicide to prevent collar rot

**Flowering stage**
- Drain the excess water in the fields
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

**Maturity stage**
- Drain the excess water in the fields
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

**Heat waves**

**Sweet orange, Mango and Papaya**

**Seedling/nursery stage**
- Cover the juvenile plants with dry leaves
- Increase the frequency of irrigation.
**Vegetative stage**
- Mulch the plant basins with dried leaves
- Increase the frequency of irrigation

**Reproductive stage**
- Increase the frequency of irrigation
- Provide irrigation at critical stages viz., peanut size and marble size

**Maturity stage**
- Harvest the fruits either in the morning or in the evening
- Use ripening chambers for getting quality fruits
Chittoor

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<tr>
<th>Time period</th>
<th>Suggested contingency crops /Cropping systems/Varieties</th>
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<tr>
<td>June 2nd week</td>
<td>Groundnut, + Redgram intercropping (7:1) or (11:1) Rainfed shallow Red soils</td>
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<tr>
<td>July 1st fortnight</td>
<td>Groundnut, + Redgram intercropping (7:1) or (11:1)</td>
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<tr>
<td>July 2nd fortnight</td>
<td>Redgram (LRG-30,41) Jowar (CSH-5, ASH-1) Redgram + Tomato Field bean (TFB-5)maize (30V92) Green gram (LGG-407,420), Black gram (LBG-20,T-9, PBG-1)</td>
</tr>
<tr>
<td>August</td>
<td>Red gram (LRG-30,41) Jowar (CSH-5, ASH-1) Black gram (LBG-17,20) Green gram (LGG-407,460 (Protect against Shoot fly in Jowar, Use higher seed rate (30% more)</td>
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**Drought Management**

**Groundnut + Redgram (7:1 or 11:1) (Rainfed - shallow red soil)**

**Early vegetative stage**
- Take up hoeing to suppress weeds and to create dust mulch
- Life saving irrigation with harvested rain water in farm ponds (10 mm depth.) using sprinkler

**Vegetative stage**
- Life saving irrigation with harvested rain water in farm ponds (10 mm depth.) using sprinkler
- Foliar spray of urea @ 2%
- Take up hoeing to suppress weeds and to create dust mulch
- conservation furrow to retain rainwater

**Reproductive stage**
- Life saving irrigation with harvested rain water in farm ponds (10 mm depth.) using sprinkler
- Foliar spray of urea @ 2%
- Take up hoeing to suppress weeds and to create dust mulch

**Terminal drought**
- Life saving irrigation using run off harvesting water in farm ponds with micro irrigation
- Harvesting the crop with mechanical harvesters at physiological maturity
- Plan for sowing horsegram in Rabi
Irrigated situation
Lack of inflows into tanks due to insufficient inflows/delayed onset of monsoon in Irrigated uplands Wells/bore/open

• Sunflower (Sunbred) Tomato (NP-5005)

Insufficient groundwater recharge due to low rainfall Medium lands (Tube well irrigation)

• Redgram (LRG-30) Groundnut (K6) in place of Paddy-Vegetables system
• Supplemental irrigation at critical stage for both red gram and groundnut
• Tomato (NP 5005) in place of sugarcane
• Supplemental irrigation at critical stage for Tomato

Uplands (Tube well / well irrigation)

• Groundnut + Redgram in place of paddy

Problematic soils

• Salt tolerant Varieties NLR 145 (135 days), NLR 33641 (150 days) of paddy

Unusual Rains
Continuous high rainfall in a short span leading to water logging

Groundnut

Vegetative stage

• Provide drainage
• Resowing of the crop
• Suitable control measures to prevent disease outbreak
• Booster dose of 50 Kg N/ ha

Flowering stage

• Drain excess water

Maturity stage

• Take suitable measures to prevent disease outbreak

Post Harvest

• Shifting of produce immediately after drying
• Threshing immediately after harvest of groundnut crop

Paddy

Vegetative stage

• Provide drainage
**Maturity stage**
- Precautionary measures to be taken to avoid in-situ germination

**Post harvest**
- Spray 5% salt solution

**Sugarcane**

**Vegetative stage**
- Planting on ridges
- Draining excess water

**Maturity stage**
- Wrapping and propping and earthing-up to prevent lodging and Early harvesting

**Horticulture**

**Mango**

**Vegetative stage**
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

**Flowering stage**
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the mature produce in a clear sunny day

**Post harvest**
- Store the fruits in well ventilated place temporarily before it can be marketed.

**Banana**

**Vegetative stage**
- Drain the excess water as soon as possible
- Inter-cultivate the soil with gorru for aeration.
- Spray 0.5% KNO₃ or Urea 2% solution 2-3 times.
- Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals.
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
• If the age of the plant is less than three months and submergence up to three feet better to replant the garden.

**Flowering stage**

• Drain the excess water as soon as possible
• Spray 0.5 % KNO₃ or Urea 2% solution 2-3 times.
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals.
• If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take up fertilization at monthly intervals for four months.
• Staking with bamboos to prevent further lodging.

**Maturity stage**

• Drain the excess water as soon as possible
• Harvest the marketable bunches in a clear sunny day.
• Spray 0.5% KNO₃ or Urea 2% solution 2-3 times for quick development of immature bunches
• Staking with bamboo to prevent further lodging

**Post Harvest**

• Use ripening chambers for quick ripening
• Market the produce as soon as possible

**Tomato and Brinjal**

**Vegetative stage**

• Gap filling must be done immediately
• Spray Urea 2% solution 2-3 times
• Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.
• Spray COC 30 g in 10 liters of water, 2-3 times against leaf spots.

**Flowering stage**

• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times.
• Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible

**Maturity stage**
• Drain the excess water as soon as possible
• Harvest the marketable fruits in a clear sunny day

**Post harvest**
• Store the harvested fruits in well ventilated place temporarily before it can be marketed.
• Market the fruits as soon as possible.

**Chillies and potato**

**Vegetative stage**
• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times
• Top dressing of booster dose of 15 kg MOP +30 kg Urea per acre as soon as possible
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
• In case of severe damage (considered as complete economic loss) and the contingency period is between June to August, sowing the best alternative crop must be takenup.

**Reproductive stage**
• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times.
• Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.

**Maturity stage**
• Drain the excess water as soon as possible
• Harvest the matured fruits in a clear sunny day

**Post harvest**
• Dry the pods on concrete floor immediately after the appearance of sunlight or Use poly house solar driers for quick drying
• Grade the pods and market as soon as possible soon as possible.
• Do not store such produce for long periods.
**Manual on Contingency Agricultural Plan**

**Beans**

**Vegetative stage**
- Drain the excess water as soon as possible.
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.
- Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
- In case of severe damage (considered as complete economical loss), go for resowing of same crop or best alternative crop must be taken up.

**Reproductive stage**
- Drain the excess water as soon as possible.
- Store the produce in well ventilated place temporarily before it can be marketed.
- Spray KNO₃ 1% or Urea 2% solution 2-3 times.
- Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.

**Maturity stage**
- Drain the excess water as soon as possible.
- Spray KNO₃ 1% or Urea 2% solution 2-3 times.
- Harvest the mature produce as soon as possible.

**Post harvest**
- Store the produce in well ventilated place temporarily before it can be marketed.
- Market the produce as soon as possible.

**Extreme Events**

**CYCLONES**

**Mango**

**Seedling/Nursery stage**
- If the damage is severe, go for resowing.

**Vegetative stage**
- Trees fallen on ground may be lifted and earthed up.
- Broken and damaged branches may be pruned and applied with Bordeaux paste.
**Reproductive stage**

- Tress fallen on ground may be lifted and earthed up
- Broken and damaged branches may be pruned and applied with Bordeaux paste

**At harvest**

- Drain the excess water as soon as possible.
- Harvest the mature fruits as soon as possible.
- Collect the fallen fruits and sell immediately or go for preparation of processed products.
- If to store, store the produce in well ventilated place temporarily before it can be marketed

**Banana**

**Vegetative stage**

- Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
- Drain the excess water as soon as possible
- The fallen trees may be cut leaving two suckers
- Inter-cultivate the soil with gorru for aeration.
- Spray 0.5 % KNO3 or Urea 2% solution 2-3 times.
- Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals.
- Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
- If the age of the plant is less than three months and submergence up to three feet better to replant the garden

**Reproductive stage**

- Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
- Drain the excess water as soon as possible
- The fallen trees may be cut leaving two suckers
- Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
- Mature bunches on the completely damaged plants be covered with leaves and harvested within 15-20 days
**At harvest**

- Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste.
- Drain the excess water as soon as possible.
- Harvest the mature bunches as soon as possible. Use ripening chambers for quick and uniform ripening.
- Store the harvested bunches in a well-ventilated place temporarily before it can be marketed.
- Market the produce as soon as possible.
- 3-4 foliar application of KNO₃ on immature/developing bunches and leaves at weekly intervals.
- Staking with bamboo for support.

**Vegetables**

**Tomato**

**Seedling/Nursery stage**

- Grow the nursery on raised beds.
- Drench the nursery beds with COC 3g per litre to prevent damping off.
- If damage is more go for resowing.

**Vegetative stage**

- Uprooted plants may be lifted and earthed up.
- Drain the excess water as soon as possible.
- Gap filling must be done immediately.
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.
- If damage is more go for replanting.

**Reproductive stage**

- Uprooted plants may be lifted and earthed up.
- Drain the excess water as soon as possible.
- Gap filling must be done immediately.
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.
At harvest

- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily it can be marketed
- Market the produce as soon as possible

Chillies

Seedling/Nursery stage

- Grow nursery on nursery beds.

Vegetative stage

- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Gap filling must be done immediately
- If damage is more go for replanting, spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible

Reproductive stage

- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Gap filling must be done immediately
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.

At harvest

- Drain the excess water as soon as possible
- Dry the pods on concrete floors or tarpaulins immediately
- Use polyhouse solar driers for quick drying
- Remove the pest and disease affected pods

Brinjal

Nursery/seedling

- Grow nursery on raised beds.
- Drench the nursery beds with COC 3 g per litre to prevent damping off
- If damage is more go for replanting
Vegetative stage
- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Gap filling must be done immediately
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.
- If damage is more go for replanting

Reproductive stage
- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Gap filling must be done immediately
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.
- Spray COC 30 g in 10 liters of water, 2-3 times against leaf spots

At harvest
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible

Potato

Nursery/Seedling stage
- Grow nursery on raised beds.

Vegetative stage
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times.

Reproductive stage
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times

At harvest
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the produce as soon as possible
Beans

Vegetative stage

- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible.
- Gap filling must be done immediately
- If damage is more, go for resowing with the same crop or grow alternate crops.

Reproductive stage

- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Topdressing of booster dose of 12 kg MOP +30 kg Urea per acre as soon as possible.
- If damage is more, go for replanting

At harvest

- Drain the excess water as soon as possible
- Harvest the mature pods as soon as possible.
- Store the pods in well ventilated place temporarily before it can be marketed.
- Market the pods as soon as possible.
Kurnool

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops/Cropping systems/ Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1st week to 3rd week</td>
<td>Groundnut (or) Groundnut + Pigeonpea (5:1), Sunflower, Cotton, Pigeonpea, Castor (or) Castor + Pigeonpea (7:1), Jowar (or) Jowar + Groundnut (1:5)</td>
</tr>
<tr>
<td>August 1st week</td>
<td>Sunflower, Fox tail millet, Cowpea, Greengram, Horsegram, Fodder jowar, Pigeonpea with short duration varieties</td>
</tr>
</tbody>
</table>

**Drought Management**

**Rainfed conditions**

**Groundnut/Groundnut + Pigeonpea (11:1/7:1)**

**Vegetative stage**
- Conservation furrows at 3.6 m interval
- Protect the crop from thrips to avoid PBND and PSND Spraying of 2% urea
- Frequent Intercultivation to conserve soil moisture, mulching with groundnut shells

**Reproductive stage**
- Supplemental irrigation with harvested rain water in farm ponds (10 mm depth)
- 2% Urea spray
- Top dressing of urea with receipt of rains after dry spell

**Terminal drought**
- Supplemental irrigation with harvested rain water in farm ponds (10 mm depth.)

**Sunflower**

**Vegetative stage**
- Spray urea or DAP @ 2%
- Resowing of short duration varieties (Morden, DRSF-1)/NDSH-1

**Reproductive phase**
- Supplemental irrigation with harvested rain water in ponds (10 mm depth)
- Boron application @ 0.2%
- 2 % Urea spray

**Terminal drought**
- Protective irrigation through farm ponds
Cotton

Early season drought
- Conservation furrows in different rows or at every 2 rows

Vegetative stage
- Spray urea or DAP @ 2%
- Frequent inter cultivation to conserve soil moisture
- Formation of dead furrows at 3.6 m

Mid season drought
- 2% urea spray

Terminal drought
- Protective irrigation through farm ponds/other sources

Irrigated conditions

Delayed/limited release of water in canals due to low irrigated red soil
- Canal irrigated Black soils: paddy
- Tank fed areas: Direct sown paddy

Non release of water in canals under delayed onset of monsoon in catchment

Red and black soils under canals: Foxtail millet, Cowpea, Greengram, Horsegram, Bajra, Fodder jowar

Lack of inflows into tanks due to insufficient/delayed onset of monsoon
Insufficient groundwater recharge due to low rainfall

Bore wells in irrigated black soils:
Sunflower, Blackgram, Greengram, Fox tail millet, Bajra, Horsegram, cowpea instead of Paddy

Unusual Rains

Cotton

Vegetative stage
- Drain out excess water
- Spraying of Mancozeb to avoid Leaf blight

Flowering stage
- Drain out excess water
- Spraying of Dithane M-45 to avoid Leaf blight
- Application of 20 Kg urea & 15 kg MOP immediately after rain
**Maturity stage**
- Weather based advisory to be followed for harvesting.

**Pigeonpea/Sunflower**

**Vegetative stage**
- Drain out excess water

**Flowering stage**
- Drain out excess water
- Spraying of Dithane M-45 against Leaf blight of 20 Kg urea & 15 kg MOP immediately after rain

**Maturity stage**
- Weather based advisory to be followed for harvesting.

**Horticultural crops**

**Mango**

**Vegetative stage:**
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or 2% Urea solution 2-3 times
- Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

**Flowering stage**
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or 2% Urea solution 2-3 times

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the mature produce in a clear sunny day.

**Banana**

**Vegetative stage**
- Drain the excess water as soon as possible
- Inter-cultivate the soil with gorru for aeration
- Spray 0.5 % KNO₃ or Urea 2% solution 2-3 times
- Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
- Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop
• If the age of the plant is less than three months and submergence up to three feet better to replant the garden
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

**Flowering stage**

• 80 g MOP + 100 g Urea per plant at two to three times intervals Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop
• If the age of the plant is less than three months and submergence up to three feet better to replant the garden
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

**Maturity stage**

• Drain the excess water as soon as possible
• Harvest the marketable bunches in a clear sunny day
• Spray 0.5% KNO₃ or Urea 2% solution 2-3 times for quick development of immature bunches
• Staking with bamboos to prevent further lodging

**Orange & Batavian**

**Vegetative stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500g urea and 750 g MOP per tree should be applied
• Wind damaged branches should be pruned using infected secateurs and cut ends must be smeared with Bordeaux paste

**Flowering stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied.

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the mature fruits in a clear sunny day

**Onion**

**Vegetative stage**
- Drain the excess water as soon as possible Spray Urea 2% solution 2-3 times

**Flowering stage**
- Drain the excess water as soon as possible Spray Urea 2% solution 2-3 times.
- Top dressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the mature produce in a clear sunny day

**Tomato/Chillies**

**Vegetative phase**
- Drain the excess water as soon as possible spray Urea 2% solution 2-3 times
- Top dressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible
- Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop
- In case of severe damage (considered as complete economical loss) and the contingency period is between June to August, sowing of best alternative crop must be taken up

**Flowering stage**
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Top dressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible.

**Maturity stage**
- Drain the excess water as soon as possible
- Harvest the marketable fruits on a clear sunny day

**Jasmine/Crossandra/Coriander**

**Vegetative phase stage**
• Drain the excess water as soon as possible spray Urea 2% or 1% KNO₃ solution 2-3 times

Flowering stage
- Drain the excess water as soon as possible
- Spray Urea 2% or 1% KNO₃ solution 2-3 times

Maturity stage
- Drain the excess water as soon as possible
- Harvest the marketable flowers as soon as possible

Turmeric

Vegetative stage
- Drain the excess water as soon as possible
- Spray Urea 2% or 1% KNO₃ followed by Ferrous Sulphate 0.5% + Citric Acid 0.1 % solution 2-3 times
- Top dressing of booster dose of 40 kg MOP + 50 kg Urea along with 250 kg of Neem Cake per acre as soon as possible
- In case of severe damage (considered as complete economical loss or if inundation is more than for four days) and the contingency period is between June to August, sowing of best alternative crop must be taken up.

Flowering stage
- Drain the excess water as soon as possible
- Spray Urea 2% or 1% KNO₃ solution 2-3 times

Harvesting stage
- Drain the excess water as soon as possible Harvest the rhizomes when field comes to normal

Post harvest
- Dry the rhizomes on concrete floor or use boilers (if available) for processing immediately
- Grade and separate the rotten and mould affected rhizomes
- Pack the dried material in gunny bags infected with safe insecticides
- Store in a well ventilated room

Alternate crops to cotton

Farmers in the NICRA village normally growing desicotton, if on-set of monsoon is well in time. During last three years due to late receipt of rains, seteria, castor hybrid i.e. PCH-111 were taken up as alternate crops in place of desi cotton, which gave maximum yield and higher returns under harsh weather conditions. In view of its superior performance the crop area increased from 40 to 300 acres in the village during kharif 2013.
## Srikakulam

<table>
<thead>
<tr>
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<tr>
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<td></td>
</tr>
<tr>
<td>June 4&lt;sup&gt;th&lt;/sup&gt; week</td>
<td>Groundnut-Horsegram, Mesta-Horsegram, Sesamum, Green gram</td>
</tr>
<tr>
<td>July 2&lt;sup&gt;nd&lt;/sup&gt; week</td>
<td>Maize/Ragi/Greengram Direct sowing of Ragi, Red gram/Pigeonpea + Maize (1:2) Greengram</td>
</tr>
<tr>
<td>July 4&lt;sup&gt;th&lt;/sup&gt; week</td>
<td>Greengram (LGG-460)/ Plan for Early Rabi Horse gram, Ragi (VR-847)</td>
</tr>
<tr>
<td>August 2&lt;sup&gt;nd&lt;/sup&gt; week</td>
<td>Green gram (LGG-460,TM-96-2)/Horsegram</td>
</tr>
<tr>
<td><strong>Rain fed red sandy clay loam soils</strong></td>
<td></td>
</tr>
<tr>
<td>June 4&lt;sup&gt;th&lt;/sup&gt; week</td>
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</tr>
<tr>
<td>July 4&lt;sup&gt;th&lt;/sup&gt; week</td>
<td>Maize + Pigeonpea (2:1) Greengram/Ragi</td>
</tr>
<tr>
<td>August 2&lt;sup&gt;nd&lt;/sup&gt; week</td>
<td>Green gram (LGG-460)/Ragi (VR-847) Cow pea, Green gram Early rabi Horsegram Short duration Green varieties:LGG-460,TM-962, cowpea, horsegram</td>
</tr>
</tbody>
</table>

### Drought Management

**Rainfed conditions**

**Groundnut-horse gram/Mesta-horse gram**

- **Seedling stage** (If dry spell is of 15-20 days)
  - Re sowing in case of total crop failure with Groundnut/conservation furrows for every 3.5m distance if plant stand is satisfactory
  - Maintain weed free condition, Inter cultivation with hand hoe (shallow depth)
  - Foliar spray with 2% urea and 1% MOP to protect the Groundnut crop from moisture stress

- **Vegetative stage**
  - Life saving irrigation if water is available
  - Foliar spray with 2% urea and 1% MOP
  - Control sucking pest complex by spraying Dimethoate@2ml/Lt or Acephate @ 1.5 g per litre of water
  - Making conservation furrows at 3.5 m
  - Maintain weed free condition, Intercultivation with hand hoe (shallow depth)
**Reproductive stage**
- Life saving Irrigation if water is available
- Protect against sucking pest complex by spraying Acephate@1gm/l
- Maintain weed free condition
- Inter cultivation with hand hoe (shallow depth)
- Life saving irrigation through farm pond water

**Terminal drought**
- Supplemental irrigation
- Prolonged dry spell may flare up incidence of jassids/thrips/flea beetles hence need based application of Acephate@1gm/l has to be done

**Sesame/Green gram**

**Seedling stage**
- (Dry spell is 15-20 days) Foliar spray with 1% urea and 1% MOP to protect the crop conservation furrows for every 3.5 m distance if plant stands are satisfactory
- Maintain weed free condition, Inter cultivation with hand hoe (shallow depth)

**Vegetative stage**
- Life saving irrigation if water is available
- Foliar spray with 2% urea and 1% MOP
- Control sucking pest complex by spraying Dimethoate @ 2 ml/lt or Acephate @ 1.5 gm/l per litre of water.
- Making conservation furrows at 3.5 m
- Maintain weed free condition, Inter cultivation with hand hoe (shallow depth)

**Reproductive stage**
- Life saving Irrigation if water is available
- Maintain weed free condition
- Protect against sucking pest complex by spraying Acephate @ 1 gm/l

**Terminal drought**
- Supplemental irrigation Prolonged dry spell may flare up incidence of jassids/thrips/flea beetles hence need based application of Acephate@1gm/l

**Irrigated conditions**

**Delayed release of water in canals due to low rainfall**

**Tank fed sandy clay loams:**
- Crops: Paddy-Pulse Paddy-Groundnut/Sunflower, Paddy-Maize/Paddy- Sesame
Agronomic measures

- Medium or Short duration paddy varieties like, Jagtiala Sannalu, JGL-3844, NLR-3449 MTU-1010 and Tella hamsa
- Life saving irrigation to already sown nurseries
- Plating of aged seedlings with special management
- Close planting 44 pl/sq mt (4-5 plants/hill)
- Apply N in 2 splits instead of 3 splits (2/3 as basal)
- Direct sowing of paddy with paddy drum seeder or broad casting of sprouted seed
- Adopt preventive control measures for pest like gall midge.

Delayed release of water in canals due to low rainfall

Canal fed Red sandy clay loamy soils

Crops: Paddy-Groundnut, Paddy-Maize Paddy-Pulse

Agronomic measures:

- Direct seeding with Drum seeder with Medium or Short duration varieties like JGL-1798, NLR-3449, JGL-3844, MTU-1010
- Sowing of Greengram before paddy for green manure and seed
- Raising nurseries with medium duration Paddy varieties like, JGL-1798, NLR-34449, JGL-3844, MTU-1010 and Planting aged seedling
- During Rabi season select green gram varieties like LGG-460, 410, ML-267, TM-96-2 which are early maturing and suitable for delayed sowings.

Limited release of water in canals due to low rainfall

Canal fed Red sandy loam

Crops: Paddy-Pulse or irrigated maize/greengram, paddy-groundnut, paddy-maize, paddy-sesame

Agronomic measures

Paddy

Paddy in SRI method

- Direct seeding with drum seeder with Medium or Short duration varieties like JGL-1798, NLR-3449, JGL-3844, MTU-1010
- Sowing of Green gram before paddy for green manure and seed
- Raising nurseries with medium duration Paddy varieties like JGL-1798, NLR-34449, JGL-3844, MTU-1010
- Rotational irrigation should be followed
• Maize should be sown in ridge and furrow method.

Non release of water in canals under delayed onset of monsoon in catchment

Canal fed red sandy clay loam:

Green gram/Sorghum
Grow fodder crops for cattle, Pillipesara, Cowpea, Fodder Maize, sorghum and Stylo hemata for Sheep instead of paddy based sequences

Lack of inflows into tanks due to insufficient /delayed onset of monsoon

Tank fed Sandy clay loam
Greengram/Jowar /Grow fodder crops for cattle.

Pillipesara, Cowpea, Fodder Maize, Jowar and Stylo hemata for Sheep instead of paddy based sequences

Insufficient groundwater recharge due to low rainfall:

Irrigated Red clay and alluvial clay soils

Crops: Paddy - Pulse/Grow irrigated dry crops like maize, green gram in place of paddy Grow fodder crops for cattle If paddy is not grown

Agronomic measures

• SRI cultivation may be adopted alternate wetting and drying up to primordial initiation stage to save water
• Irrigate up to a depth of 3-5 cm from primordial initiation to maturity
• Take up effective weed control measures either mechanically or through herbicides
• Maize in ridges and furrow method so as to save water Plan for early rabi with green gram short duration varieties like LGG-460 or TM-96-2
• In Paddy-Maize, Paddy- Sesame, Sugarcane: Formation of ridges and furrows and irrigate the crop alternate row to save water If possible provide drip irrigation system

Irrigated Red sandy loamy

Groundnut–Groundnut/Maize

• Take up Maize in ridge and furrow method so as to save water, irrigate the maize crop in alternate rows.
• Micro irrigation for groundnut.
Unusual rains

Paddy

Vegetative stage
- Drain out excess water. In case of loss of plant population, survived hills are to be split into individual tillers and use for gap filling.
- Apply a booster dose of 20-25 kg of urea and 15 kg of MOP per acre, hastens the establishment and promotes more tillering.
- Pests like Leaf folder and swarming caterpillar may emerge so monitor the pest control measures like spraying of chloripyriphos 2.5 ml/l or cartap hydrochloride 2 gm/l may be taken up.

Flowering stage
- Drain out excess water.
- Monitor incidence of BPH and initiate control measures for BPH, Bufrofizin 1.6 ml/lt or Acephate 1.5 gm/lt. Spraying should be done in evening times only.

Maturity stage
- Drain out excess water.
- Control measures for BPH. Spraying of Bufrofizin 1.6 ml/lt or Acephate 1.5 gm/lt.

Post harvest
- Spraying of 5% salt solution to prevent germination and discoloration of grain.

Groundnut

Vegetative stage
- Drain out the water as early as possible. Inter cultivation as soon as possible for quick evaporation of excess moisture.
- Spraying with Poly feed 500 gm/acre to correct nutrient deficiencies and enhance growth.
- Spraying with carbendiazm 1 gm/ + Mancozeb 3 gm/l as prophylactic measure against fungal diseases.

Flowering stage
- Drain out the water as early as possible.
- Pests like Spodoptera may attack, the crop control measures like Thiodicarb 1gm/l may be sprayed.
- Spraying with Carbendiazm 1 gm/lt + Mancozeb 3 gm/lt as prophylactic measure against fungal diseases.

Maturity stage
- Drain out the water as early as possible.
• Spraying with carbendiazm 1 gm/ + Mancozeb 3 gm/l as prophylactic measure against fungal diseases
• Harvesting may be planned in case of advanced maturity.

Post harvest
• Drain out the excess water as early as possible. Pluck the pods from plants and drying should be done.

Horticultural crops

Mango

Vegetative stage
• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Wind damaged branches should be pruning with disinfected secateurs and cut ends must be smeared with Bordeaux paste

Flowering /Reproductive stage
• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

Maturity stage
• Drain the excess water as soon as possible
• Harvest the mature produce in a clear sunny day
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

Post harvest
• Store the fruits in well ventilated place temporarily before it can be marketed
• Market the fruits as soon as possible
• Grade the damaged or infected fruits
• Store the graded fruits in well ventilated place temporarily before it can be marketed

Chillies

Vegetative stage
• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times
• Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible
• Gap filling may be taken up if the plants are of two weeks old and sowing window is still available for the crop
• In case of severe damage (considered as complete economical loss) and the contingency period is between June to August, sowing of best alternative crop must be taken up.

Flowering /Reproductive stage
• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times
• Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible.

Maturity stage
• Drain the excess water as soon as possible
• Harvest the matured fruits in a clear sunny day

Post harvest
• Dry the pods on concrete floor immediately after the appearance of Sunlight (or) Use poly house solar driers for quick drying
• Grade the pods and market as soon as possible
• Do not store such produce for long periods

Areca nut, Oil palm and Coconut

Vegetative stage
• Planting should be done on mounts or bunds
• Drainage system, suited to local conditions may be provided to remove surplus water from root zone
• Relief drain [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface

Flowering stage
• Drain the excess water as soon as possible
• Apply booster dose of NPK fertilizer

Maturity stage
• Drain the excess water as soon as possible
• Apply booster dose of NPK fertilizers
• Harvest the mature nuts as soon as possible
Post harvest
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the nuts as soon as possible.

Cashew

Vegetative stage
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

Flowering stage
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times
- Maturity drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times

Maturity stage
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times
- Maturity drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times
- Harvest the mature fruits as soon as possible

Post harvest
- Separate seed from the fruits and dry the seeds separately
- Store the fruits in well ventilated place temporarily before it can be marketed
- Market the fruits as soon as possible or use for the preparation of processed products

Floods

Paddy

Nursery stage
- Drain out excess water and application of booster dose of 2-2.5 kg of urea and 1.5 kg of MOP per 10 cents hastens the growth of nursery

Vegetative stage
- Drain out excess water and apply a booster dose of 20-25 kg of urea and 15 kg of MOP per acre to hasten the establishment and to promote more tillering
- Pests like Leaf folder and swarming caterpillar may emerge so monitor the pests and control measures like spraying of chloropyriphos 2.5 ml/lt or cartap hydrochloride 2 g/lt may be taken up.
**Flowering stage**
- Drain out excess water
- Monitor the incidence of BPH (Brown Plant Hopper) and initiate control measures for BPH
- Bufrofizin 1.6 ml/lt or Acephate 1.5 gm/lt Spraying should be done in evening times only

**At harvest**
- Drain out excess water
- Spray 5% salt solution on paddy sheaves
- If the paddy crop is lost, fodder shortage would be severe, so fodder crops like pillipesara, cowpea etc may be grown
- Plan for *rabi* crops like oilseeds and pulses

**Mesta**

**Seedling stage**
- Drain out excess water
- Resowing may be done in case of loss of crop
- Spray 2% urea +1% Potash In case of foot and stem rot occurrence
- Drench and spray the crop with COC 3 gm/lt

**Vegetative stage**
- Drain out excess water and apply a booster dose of 20-25 kg of urea and 15 kg of MOP per acre or spray 2% urea +1% Potash
- In case of foot and stem rot occurrence Drench and spray the crop with COC 3 gm/lt

**Reproductive stage**
- Drain out the water as early as possible. Harvesting may be planned in case of advanced

**Maturity/harvest stage**
- Use the excess water for retting process
- Stack the sticks vertically to enhance retting of basal portion.

**Oil palm Coconut and Arecanut**

**Seedling stage**
- Planting should be done on mounts or bunds
- Drainage system suitable to local conditions may be provided to remove surplus water from root zone
- Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface

**Vegetative stage**
- Drain the excess water as soon as possible
• Apply booster dose of NPK fertilizers
• Harvest the mature nuts as soon as possible

**Reproductive stage**
• Drain the excess water as soon as possible
• Apply booster dose of NPK fertilizers
• Harvest the mature nuts as soon as possible

**At harvest**
• Store the fruits in well ventilated place temporarily before marketing
• Market the fruits as soon as possible
• Grade the damaged or infected fruits
• Store the graded fruits in well ventilated place temporarily before marketing

**Continuous submergence for more than 2 days**

**Paddy**

**Seedling stage**
• Drain out excess water and apply a booster dose of 2-2.5 kg of urea and 1.5 kg of MOP per 10 cents nursery hasten the growth of nursery
• Resowing of nurseries with medium to short duration varieties in areas prone to water logging
• Swarna or chaitanya varieties may grown, as these varieties withstand submergence for about one week

**Vegetative stage**
• Drain out excess water and apply a booster dose of 20-25 kg of urea and 15 kg of MOP per acre to hasten the establishment and promote more tillering
• Survived hills are to be split into individual tillers and used for gap filling
• Varieties Swarna and chaitanya withstand submergence for about one week and survive with 2-3 tillers
• Pests like Leaf folder and swarming caterpillar may emerge so monitor the pest and control measures like spraying of chloropyriphos 2.5 ml/lt or cartap hydrochloride 2 gm/lt may be taken up

**Reproductive stage**
• Drain out excess water and apply booster dose of nitrogen to recoup the growth
• Monitor incidence of BPH and initiate control measures for BPH i.e., Bufrozizin 1.6ml/lt or Acephate 1.5 gm/lt
• Spraying should be done in evening times only

**At harvest**
• Drain out excess water
• Spray urea 2% solution.
**West Godavari**

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<tr>
<th>Time period</th>
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**Drought Management**

**Rainfed conditions**

**Red sandy soils**

**Pigeonpea + Greengram (1:5)/Sole Pigeonpea/Greengram/Blackgram**

*Early vegetative stage (Poor plant stands)*

- Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21
- Inter cultivate periodically (7-10 days interval) to conserve soil moisture

*Vegetative stage*

- Spray urea 2% or KNO₃ 1% or other water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21@ 1% to supplement nutrition
- Intercultivation to conserve moisture, supplemental irrigation

*Reproductive stage*

- Spray urea 2 % or KNO₃ 1% or other water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21@ 1 % to supplement nutrition
- Intercultivation to conserve moisture

*Terminal drought*

- Spray 2% urea or KNO₃ 1% or other water soluble fertilizers 1% to supplement nutrition, supplemental irrigation

**Irrigated conditions**

**Delayed release of water in canals due to low rainfall**

**Godavari Delta Tail end Areas**

**Paddy-Paddy-Greengram**

- Over aged seedlings can be transplanted up to August
• Adopt closer spacing by planting 4-6 plants/hill
• Apply entire P and K and two third N as basal and remaining one third N in another split
• If nurseries are dried up, direct sown paddy can be taken up till August with short duration varieties
• If *rabi* Paddy harvesting is delayed, avoid blackgram in Paddy fallows. Instead, greengram or green manure crops can be taken up

**Godavari Delta Tail End Areas Saline/Alkaline soil**

**Sugarcane – Paddy**
• Short or medium duration varieties of sugarcane need to be taken up
• Adopt recommended plant protection practices for control of shoot borer
• Adopt crop rotation with pulse crop

**Limited release of water in canals due to low rainfall**

**Alluvial Soils – Canal irrigated**

**Green manure - Paddy - Black gram/Greengram/Jowar/Bajra**

**Paddy**
• Adopt alternate wetting and drying up to Primordial Initiation stage to save water
• Irrigate up to a depth of 3-5 cm from Primordial Initiation to maturity
• Take up effective weed control measures either mechanically or through herbicides as the problem of weeds is more under alternate wetting and drying method of irrigation

**Paddy fallows**
• Crops like Greengram, Blackgram, Jowar, Bajra etc. which require less water than Maize shall be grown
• Short duration varieties of crops shall be selected
• In crops like Bajra, Jowar water conservation practices like inter cultivation, earthing up, alternate row irrigation shall be practiced
• Water loss during conveyance can be reduced by using PVC/Metallic pipes instead of running water in open field channels

**Red sandy soils – Canal irrigated**

Green manure-Paddy-Greengram/Blackgram/Jowar/ Bajra/Fodder

For Paddy and Paddy fallow crops the agronomic measures as suggested for the above farming situation shall be followed
Pigeonpea + Greengram/Bajra/Jowar

Proper drainage facilities should be created to take up cropping systems as suggested

**Non release of water in canals under onset of monsoon in catchment black soils/Red soils-Canal irrigation**

Greengram/Green manure-Blackgram/Sunflower/Bengal gram-Blackgram/Greengram/Maize/Fodder crop Green manure/Greengram-Cotton Green manure/Greengram-Pigeonpea

- Sowing of ID crops can be taken from September second fortnight onwards
- Maize, Blackgram, Sunflower can be grown from December to February/March with two to three irrigations after the harvest of early Rabi crops

**Alluvial Soils (Irrigated)**

Green manure- Blackgram-Maize/Blackgram/Groundnut/Sunflower

Green manure crops followed by ID crops like maize, greengram, groundnut and safflower

**Lack of inflows into tanks due to insufficient/delayed onset of monsoon**

**Alluvial Soils irrigated**

Green manure-Blackgram-Maize/Blackgram/Groundnut/Sunflower

Green manure crops followed by ID crops like maize, greengram, groundnut and safflower

**In sufficient groundwater recharge due to low rainfall Black soils/Red soils-Canal irrigation**

Greengram/Greenmanure-Blackgram/Sunflower/Bengalgram-Blackgram/Greengram/Maize/Fodder/Green manure/Greengram-Cotton/Greengram-Pigeonpea

1. Sowing of ID crops can be taken from September second fortnight onwards
2. Maize, Blackgram, Sunflower can be grown from December to February/March with two to three irrigations after the harvest of early rabi crops

**Unusual Rains**

**Continuous high rainfall in a short span leading to water logging**

**Paddy**

**Vegetative stage**

- Drain the excess water as early as possible
- Apply 20 kg N + 10 kg K/acre after draining excess water
- Take up gap filling either with available nursery or by splitting the tillers from the surviving hills
• Take up proper weed control Measures
• Take up suitable plant protection Measures in anticipation of pest & disease out breaks

**Flowering stage**
• Drain the excess water as early as possible
• Apply 20 kg N + 10 kg K/acre after draining excess water
• Take up suitable plant protection Measures in anticipation of pest & disease out breaks

**Maturity stage**
• Drain the excess water as early as possible
• Take up suitable plant protection measures in anticipation of pest & disease out breaks

**Post harvest**
• Drain out water and spread sheaves loosely in field or field bunds where there is no water stagnation • Spray common salt at 3% on panicles to prevent germination and spoilage of straw from moulds
• Thresh after drying the sheaves properly
• Ensure proper grain moisture before storing

**Blackgram**

**Vegetative stage**
• Drain the excess water as early as possible
• Apply 4-5 kg N /acre after draining excess water
• To spray KNO₃ 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
• Spray fungicides like Copper oxy chloride 0.3 % or Carbendazim 0.1 % or Mancozeb 0.25% two to three times by rotating the chemicals
• Take up timely control measures against the outbreak of pests like *Spodoptera* etc.

**Flowering stage**
• Drain the excess water as early as possible
• Apply 20 kg N + 10 kg K/acre after draining excess water
• Take up suitable plant protection Measures in anticipation of pest & disease out breaks

**Maturity stage**
• Drain the excess water as early as possible
• Allow the crop to dry completely before harvesting
**Post harvest**
- Spread the bundles drenched in rain on field bunds or drying floors to quicken the drying
- Thresh the bundles after they are dried properly
- Dry the grain to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage

**Maize**

**Vegetative stage**
- Drain the excess water
- Apply 20 kg N + 10 kg K /acre after draining excess water
- Take up inter cultivation at optimum soil moisture condition to loosen and aerate the soil and to control weeds
- Earthen up the crop for anchorage
- To spray KNO$_3$ @1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Take up timely control measures for Pink stem borer, s sheath blight and Turcicum leaf blight

**Flowering stage**
- Drain the excess water as early as possible
- Apply 20 kg N + 10 kg K/acre after draining excess water
- Take up suitable plant protection measures in anticipation of pest & disease out breaks

**Maturity stage**
- Drain the excess water as early as possible
- Allow the crop to dry completely before harvesting

**Post harvest**
- Harvest the cobs after they are dried up properly
- Dry the grain to optimum moisture condition before storing

**Sugarcane**

**Vegetative stage**
- Drain the excess water as early as possible
- Apply 50 urea + 50 kg MOP/acre after draining excess water
- Take up inter cultivation at optimum soil moisture condition to loosen and aerate the soil and to control weeds
• Adopt timely plant protection measures.

**Grand Growth stage**
• Drain the excess water as early as possible
• Apply 50kg urea + 50 kg MOP/acre after draining excess water
• Take up timely control measures against the outbreak of pests

**Formative Phase**
• Drain the excess water as early as possible
• Apply 50kg MOP/acre in early season varieties and 50kg urea + 50 kg MOP in mid season and late season varieties
• Take up timely plant protection measures

**Maturity stage**
• Harvest the cane at appropriate time

**Floods**

**Transient water logging/partial inundation**

**Paddy**

**Nursery stage**
• Drain out the excess water at the earliest
• Apply booster dose of 0.2 kg N/40 sq. m
• Spray micronutrients like Zn, Fe two to three times at 4-5 days interval
• Take up proper weed control measures

**Vegetative stage**
• Drain out the excess water at the earliest
• Take up gap filling either with available nursery or by splitting the tillers from the surviving hills
• Apply a booster dose of 20 kg N/acre 4. Spray ZnSO4 0.2 % if it is less than 45 days after transplanting
• Take up need based plant protection measures

**Reproductive stage**
• Drain out the excess water at the earliest
• Take up need based plant protection measures

**At harvest**
• Drain out water
• Spread sheaves loosely in field or field bunds where there is no water stagnation
• Spray common salt at 3% on panicles to prevent germination and spoilage of straw from moulds
• Thresh after drying the sheaves properly
• Ensure proper grain moisture before storing

**Blackgram**

**Seedling stage**
- Drain out the excess water at the earliest
- Take up the gap filling at the earliest
- Take up weed control either mechanically or through weedicides
- Apply 4-5 kg N/acre after draining excess water
- Take up plant protection measures against possible pests and disease incidence

**Vegetative stage**
- Drain out the excess water at the earliest
- Take up weed control either mechanically or through weedicides
- Apply 4-5 kg N/acre after draining excess water
- Spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Take up plant protection measures against possible pests and disease incidence

**Reproductive stage**
- Drain out the excess water at the earliest
- Take up weed control either mechanically or through weedicides
- Apply 4-5 kg N/acre after draining excess water
- Spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Take up plant protection measures against possible pests and disease incidence

**At harvest**
- Drain out the excess water at the earliest
- Harvest the crop after drying up of the fields

**Maize**

**Seedling stage**
- Drain out the excess water at the earliest
- Take up weed control either mechanically or through weedicides
- Intercultivation and earthing up to be done
• Apply 20 kg N + 10 kg K/acre after draining excess water. Take up plant protection measures against possible pests and disease incidence.

**Vegetative stage**
• Drain out the excess water at the earliest
• Take up weed control either mechanically or through weedicides
• Intercultivation and earthing up to be done
• Apply 20 kg N + 10 kg K /acre after draining excess water
• Take up plant protection measures against possible pests and disease incidence

**Reproductive stage**
• Drain out the excess water at the earliest
• Take up plant protection measures against possible pests and disease incidence

**At harvest**
• To drain out the excess water at the earliest
• Cob picking to be done after they are dried fully

**Sugarcane**

**Seedling stage**
• Drain out the excess water at the earliest
• Inter cultivate at optimum field moisture condition
• Apply 50 kg urea + 50kg MOP/acre after draining excess water

**Grand growth stage**
• Same as previous column earthing up and propping by trash twisting is to be taken up to provide anchorage to plants.

**Formative stage**
• Same as previous column+50 kg MOP/acre in early varieties after draining excess water
• Take up plant protection measures against possible pests and disease incidence

**Maturity stage**
• Drain out the excess water at the earliest
• Harvest the crop when the field condition permits
Continuous submergence for more than 2 days

Paddy

**Seedling stage**
- Top dressing with 0.2 kg N/40 sq. m immediately after recede of flood water
- Spray of ZnSO₄, FeSO₄ to correct micronutrient deficiencies
- Weed control through mechanical or chemical measures

**Vegetative stage**
- Drain out the excess water at the earliest
- Take up gap filling either with available nursery or by splitting the tillers from the surviving hills if the gaps are < 30% if more go for replanting
- Apply 20 kg N + 10 kg K/acre after draining excess water
- Proper weed control measures has to be taken up
- Timely plant protection measures for pest and disease outbreak

**Reproductive stage**
- Drain out the excess water at the earliest
- Take up plant protection measures against possible pests and disease incidence

**At harvest**
- Drain out water spread sheaves loosely in field or field bunds where there is no water stagnation
- Spray common salt at 5% on panicles to prevent germination and spoilage of straw from moulds Thresh after drying the Sheaves properly
- Ensure proper grain moisture before storing

Blackgram

**Seedling stage**
- Drain out the excess water at the earliest
- Take up gap filling if the gaps are < 30 % and if more take up resowing
- Apply 4-5 kg N/acre after draining excess water

**Vegetative stage**
- Drain out the excess water at the earliest
- Apply 4-5 kg N/acre after draining excess water
- To spray KNO₃ 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Proper weed control measures to be taken up
• Need based plant protection measures to be taken up

**Reproductive stage**
• Drain out the excess water at the earliest
• Take up plant protection measures against possible pests and disease incidence

**At harvest**
• Drain out the excess water at the earliest
• Dry the bundles on field bunds and drying floors
• Dry the grain to optimum moisture content before storage drain out the excess water at the earliest

**Sugarcane**

**Seedling stage**
• Drain out excess water at the earliest
• Apply 50 kg urea + 50kg MOP/acre after draining excess water
• Adopt proper plant protection measures

**Vegetative stage**
• Take up inter cultivation to smother the weeds and to aerate the soil
• Earthing up is to be taken up to provide anchorage to plant
• Apply 50 kg urea + 50kg MOP/acre after draining excess water

**Grand growth stage**
• Drain out excess water from the field
• Earthing up is to be taken up to provide anchorage to plants Apply 50 kg urea + 50kg MOP/acre in late and mid season varieties and 50 kg MOP per acre in early season varieties after draining excess water need based plant protection measures to be taken up

**Maturity stage**
• Drain out excess water as early as possible
• Harvest the crop at appropriate time

**Horticultural crops**

**Cashew and Mango**

**Seedling stage**
• Drain the excess water as soon as possible
• Spray 1% KNO$_3$ or Urea 2% solution 2-3 times.
Vegetative stage
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times

Reproductive/flowering stage
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times

At harvest
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the produce as soon as possible.

Banana
Vegetative stage
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times. Topdressing of booster dose of 80 g MOP + 100 g Urea per plant in two to three splits at monthly intervals
- If the age the plant is more than three months and less than seven months allow one sword sucker for ratoon and take P fertilization at monthly intervals for four month

Flowering stage/Reproductive stage
- Drain the excess water as soon as possible
- Spray 1% KNO$_3$ or Urea 2% solution 2-3 times
- Stake the plants with bamboos to prevent further lodging.

At harvest
- Drain the excess water as soon as possible
- Harvest the mature bunches as soon as possible
- Use ripening chambers for quick and uniform ripening
- Store the harvested produce in well ventilated place temporarily before it can be marketed
- Market the fruits as soon as possible.

Lemon
Seedling stage
- Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Plant protection measures may be taken for control of insect vectors and diseases

**Seedling stage/Vegetative stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied

**Flowering/Reproductive stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times.

**At harvest**

• Drain the excess water as soon as possible
• Harvest the mature produce as soon as possible
• Store the produce in well-ventilated place temporarily before it can be marketed
• Market the produce as soon as possible

**Chillies**

**Seedling stage**

• Drain the excess water as soon as possible

**Vegetative stage**

• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times
• Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.

**Flowering/Reproductive stage**

• Drain the excess water as soon as possible
• Spray Urea 2% solution 2-3 times
• Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible
**At harvest**
- Drain the excess water as soon as possible
- Dry the pods on concrete floor/tarpaulins.
- Spray any drying oil after the pods are free from surface moisture for quick drying
- Use poly house solar driers for quick drying
- Market the produce as soon as possible

**Brinjal**

**Seedling stage**
- Drain the excess water as soon as possible

**Vegetative stage**
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times.
- Topdressing of booster dose of 10 kg MOP + 30 kg Urea per acre as soon as possible

**Flowering stage**
- Drain the excess water as soon as possible
- Spray Urea 2% solution once

**At harvest**
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the produce as soon as possible.

**Oil palm and Coconut**

**Seedling stage**
- Planting should be done on mounts or bunds
- Drainage system, suited to local conditions. May be provided to remove surplus water from root zone
- Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface

**Vegetative stage**
- Drain the excess water as soon as possible
- Apply booster dose of NPK fertilizers
**Flowering stage**
- Drain the excess water as soon as possible
- Apply booster dose of NPK fertilizer

**At harvest**
- Harvest the mature nuts as soon as possible
- Market the produce as soon as possible.

**Extreme events**

**Paddy**

**Seedling/Nursery stage**
- To drain out the excess water at the earliest
- Apply booster dose of 0.2 kg N/40 sq. m
- Spray micronutrients like Zn, Fe 2-3 times at 4-5 days interval
- Take up proper weed control measures

**Vegetative stage**
- To drain out the excess water at the earliest
- Apply booster dose of 0.2 kg N/40 sq. m
- Spray micronutrients like Zn, Fe 2-3 times at 4-5 days interval
- Take up proper weed control measures

**Reproductive stage**
- To drain out the excess water at the earliest
- Take up need based plant protection measures
- Lodged plants to be lifted and tied together to make them stand erect

**At harvest**
- Drain out water spread sheaves loosely in field or field bunds where there is no water stagnation
- Spray common salt at 3% to prevent germination of seed and spoilage of straw from moulds
- Thresh after drying the sheaves properly
- Ensure proper grain moisture before storing

**Blackgram**

**Seedling stage**
- Drain out the excess water at the earliest
- Take up weed control either mechanically or through weedicides
• Apply 4-5 kg N/acre after draining excess water

Vegetative stage
• To drain out the excess water at the earliest
• Take up weed control either mechanically or through weedicides
• Apply 4-5 kg N/acre after draining excess water
• To spray $\text{KNO}_3$ @1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 @ 1% to support nutrition
• Take up plant protection measures against possible pests and disease incidence

At harvest
• Drain out the excess water at the earliest
• Harvest the crop after the fields are dried up

Maize
Seedling stage
• To drain out the excess water at the earliest Intercultivation and earthing up to be done
• Apply 20 kg N + 10 kg K/acre after draining excess water
• Take up plant protection measures against possible pests and disease incidence

Vegetative stage
• To drain out the excess water at the earliest
• Take up weed control either mechanically or through weedicides
• Intercultivation and earthing up to be done
• Apply 20 kg N + 10 kg K/acre after draining excess water
• Take up plant protection measures against possible pests and disease incidence

Flowering stage
• To drain out the excess water at the earliest
• Take up plant protection measures against possible pests and disease incidence

At harvest
• To drain out the excess water at the earliest
• Cob picking to be done after they are dried fully

Sugarcane
Vegetative stage
• Drain out the excess water at the earliest
• Inter cultivate at optimum field moisture condition
• Apply 50 kg urea + 50 kg MOP/acre after draining excess water

Grand growth stage
• Drain out the excess water at the earliest
• Inter cultivate at optimum field moisture condition
• Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants
• Apply 50 kg urea + 50 kg MOP/acre after draining excess water
• Take up plant protection measures against possible pests and disease incidence

Reproductive stage
• Drain out the excess water at the earliest
• Earthing up and propping by trash twisting is to be taken up to provide anchorage to plants
• Apply 50 kg urea + 50 kg MOP/acre in late and mid season varieties and 50 kg MOP/acre in early varieties after draining excess water
• Take up plant protection measures against possible pests and disease incidence

Maturity stage
• Drain out the excess water at the earliest
• Harvest the crop when the field condition permits

Mango
• If the damage is severe, go for resowing seedling stage

Vegetative stage
• Trees fallen on ground may be lifted and earthed up
• Manuring and plant protection measures have to be taken up
• Broken and damaged branches may be pruned and applied with Bordeaux paste

Reproductive stage
• Trees fallen on ground may be lifted and earthed up
• Manuring and plant protection measures have to be taken up
• Broken and damaged branches may be pruned and applied with Bordeaux paste

At harvest
• Drain the excess water as soon as possible
• Harvest the mature fruits as soon as possible
• Collect the fallen fruits and sell immediately or go for preparation of processed products
• Marketed
• Broken and damaged branches may be pruned and applied with Bordeaux paste

**Banana**

**Vegetative stage**

• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• The fallen trees may be cut leaving two suckers
• Intercultivate the soil with gorru for aeration
• Spray 0.5 % KNO₃ or Urea 2% solution 2-3 times
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop
• If the age of the plant is less than three months and submergence up to three feet better to replant the garden

**Reproductive stage**

• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• The fallen trees may be cut leaving two suckers
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
• Mature bunches on the completely damaged plants be covered with leaves and harvested within 15-20 days

**At harvest**

• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste Drain the excess water as soon as possible
• Harvest the mature bunches as soon as possible
• Use ripening chambers for quick and uniform ripening
• If to store, store the produce in well-ventilated place temporarily before it can be Market the produce as soon as possible
• 3-4 foliar application of KNO₃ on immature/developing bunches and leaves at weekly
• Staking with bamboo for support
**Chillies and Brinjal**

**Seedling stage**
- Grow nursery on raised beds.

**Vegetative stage**
- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Gap filling must be done immediately
- If damage is more go for replanting Spray Urea 2% solution 2-3 times
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible

**Reproductive stage**
- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Spray 0.5\% KNO$_3$ or urea 2% solution 2-3 times
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible
- Spray COC 30 g in 10 litres of water, 2-3 times against leaf in respect of brinjal spots.

**At harvest**
- Drain the excess water as soon as possible
- Dry the pods on concrete floor/ tarpaulins immediately
- use poly house solar driers for quick drying
- Remove the pest and disease infected pods.

**Banana**

**Vegetative stage**
- Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
- Drain the excess water as soon as possible
- The fallen trees may be cut leaving two suckers
- Inter-cultivate the soil with gorru for aeration.
- Spray 0.5\% KNO$_3$ or Urea 2% solution 2-3 times.
- Topdressing of booster dose of 80 g MOP + 100 g Ureaper plant at two to three times intervals.
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
• If the age of the plant is less than three months and
• Submergence up to three feet better to replant the garden.

**Reproductive stage**
• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• The fallen trees may be cut leaving two suckers
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
• Mature bunches on the completely damaged plants be covered with Leaves and harvested within 15-20 days

**At harvest**
• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste Drain the excess water as soon as possible
• Harvest the mature bunches as soon as possible
• Use ripening chambers for quick and uniform ripening Market the produce as soon as possible
• 3-4 foliar application of KNO₃ on immature/developing bunches and leaves at weekly
• Staking with bamboo for support
Khammam

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops /Cropping systems/ Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th week of June</td>
<td>Cotton, Pearl millet/ Pearl millet + Pigeonpea, Pigeonpea, Maize</td>
</tr>
<tr>
<td>2nd week of July</td>
<td>Cotton, Prefer short duration varieties/hybrids or Cotton + Pigeonpea (BSMR-736, 853, BDN-708, 711) in 6:1 row proportion Pearl millet/ Pearl millet + Pigeonpea, Maize, Pigeonpea. Prefer varieties like BSMR-736, 853 BDN-708, 711</td>
</tr>
<tr>
<td>4th week of July</td>
<td>Cotton, Prefer short duration varieties/hybrids or Cotton + pigeonpea (BSMR-736, 853, BDN-708, 711) in 6:1 row proportion adopt 20-25% more seed rate than recommended and reduce fertilizer dose by 25 per cent in cotton Pearl millet/ Pearl millet + Pigeonpea Maize, Pigeonpea, prefer varieties like BDN 708, 711)</td>
</tr>
<tr>
<td>2nd week of August</td>
<td>Pearl millet (Sradha, Saburi, AIMP-92901), Sunflower (Morden, SS-56, LSFH-35, BSH-1) or fallow (plan for rabi) or Pearl millet + pigeonpea in 2:1 row proportion in place of cotton. Follow in situ soil moisture conservation measures like alternate furrow opening with Balaram plough intercropping with pigeonpea in 3:3 or 4:2 row proportion in place of sole Pearl millet, follow in situ soil conservation measures like alternate furrow opening with balram plough/fodder maize (African Tall), Castor (VI-9, Aruna, GCH-4, 5, 6 and DCH-117/32) in place of pigeonpea</td>
</tr>
</tbody>
</table>

Drought Management

Rainfed conditions

Rainfed Black and light soils

Cotton

- Gap filling with the seedlings of 7-10 days age grown in pots, if the crop stand is poor
- spray 2% urea solution or 1% Potassium nitrate solution
- Take up intercultivation

Vegetative stage
- Spray 2% urea solution, Intercultivation in between rows

Reproductive stage
- If possible, take up intercultivation to create soil mulch to conserve moisture
- Spray urea-2% or KNO₃ 1% or other water soluble fertilizers 1% to supplement nutrition
Terminal drought
- Spray urea-2% or KNO₃ 1% or other water soluble fertilizers 1% to supplement nutrition
- Topping to prevent formation of new vegetative and reproductive flush

Pigeonpea

Early vegetative stage
- Gap filling by sowing seeds at 9 to 10 days after sowing if the crop stand is poor
- Foliar spray of 2% urea to supplement nutrition
- Take up intercultivation

Vegetative stage
- Spray 2% urea solution, intercultivation in between rows

Reproductive stage
- Spray urea-2% or other water soluble fertilizers 1% to supplement nutrition

Terminal drought
- Spray urea-2%

Green gram

Early vegetative stage
- If crop stand is poor, go for resowing with the same variety take up intercultivation two weeks after sowing
- If plant stand is good foliar spray of 2% urea to supplement nutrition

Vegetative stage
- Spray Urea solution (2%)
- Intercultivation

Terminal drought
- Supplemental irrigation at least 5 cm from rain water collected in farm pond or any other source

Maize

Early vegetative stage
- Gap filling by sowing seeds within one week
- Foliar spray of 2% urea solution during drought period

Vegetative stage
- Spray 2% urea solution, intercultivation in between rows

Reproductive stage
- Supplementary irrigation if available from farm ponds/small tanks may be recommended, spray 2% urea solution,
Terminal drought

- Supplemental irrigation at least 5cm from rain water collected in farm pond or any other source irrigated conditions

Irrigated conditions

Delayed release of water in canals due to low rainfall

Black soils/Light soils–Canal irrigated

Green Manure (Dhaincha/greengram) - Paddy - Paddy
- Incorporate green manure crop (Dhaincha/greengram) and grow medium duration Paddy varieties
- Management of over aged seedlings in nursery
- Direct seeding of Paddy (MTU-1010, JGL-1798)

Paddy/Black gram/Maize/Chickpea/Red gram

- Grow medium duration Paddy varieties
- Management of over aged seedlings in nursery direct seeding of Paddy (MTU-1010, JGL-1798)

Limited release of water in canals due to low rainfall

Black soils-Canal irrigated

Paddy–Black gram instead of Paddy-Paddy

- Adopt alternate wetting and drying up to Primordial Initiation stage to save water
- Irrigate up to a depth of 3-5 cm from primordial initiation to maturity
- Take up effective weed control measures

Non release of water in canals under delayed onset of monsoon in catchment

- Rainfed crops like red gram/Maize Jowar in September Green manure (Green gramehinchia) crops should be incorporated in to the soil at right age and allow it to decompose
- Sowing of Maghi Jowar from September second fortnight onwards
- Maize, Red gram, Sesamum, Sunflower can be grown as rabi crops from September on wards

Lack of inflows into tanks due to insufficient/delayed onset of monsoon

Tank fed-light soils

ID crops like Vegetables (Bhendi, Cucumber)/Maize + Pigeonpea (1:2), blackgram instead of paddy
Floods

Paddy

*Nursery stage*

- Excess water from the field to be drained out as early as possible

*Vegetative stage*

- Drain out the excess water at the earliest, immediately after the water recedes apply a booster dose of 20 kg Urea + 15kg MOP application, preferably in the mud followed by light irrigation after 24 hrs
- If mortality of hills takes place and field is patchy, gap filling with split tillers is recommended along with application of booster dose of 20 kg urea and 15 kg MOP
- Take-up need based plant protection measures

*Reproductive stage*

- Drain out the excess water at the earliest
- Take-up need based plant protection measures

*At harvest*

- Drain out water
- Spread sheaves loosely in field or field bunds where there is no water stagnation
- Spray common salt at 5% on panicles to prevent germination and spoilage of straw from moulds
- Thresh after drying the sheaves properly
- Ensure proper grain moisture before storing
- Grow varieties having seed dormancy in flood prone areas

*Cotton*

*Seeding stage*

- Excess water from the field to be drained out as early as possible
- Take up the gap filling at the earliest
- When soil reaches the optimum field moisture condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre immediately, delay in interculture may harm the crop
- Take up plant protection measures against possible pest and disease incidence

*Vegetative stage*

- Drain out the excess water at the earliest
- Inter cultivate at optimum field moisture condition, Immediately after the soil comes to condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre
• In water logged areas, spray with 2% urea + 1% MgSO₄ followed by Annabhedi 5g + citric acid 0.5 g/l. Spray and also drench with copper oxychloride 0.3%

Reproductive stage
• Spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to support nutrition
• Take up plant protection measures against possible pests and disease incidence
• Kapas picking should be done carefully to prevent admixtures with waste plant mater

Cyclones
Horticultural crops

Mango
Vegetative stage
• Trees fallen on ground may be lifted and earthed up
• Manuring and plant protection measures have to be taken up
• Broken and damaged branches may be pruned and applied with Bordeaux paste

Reproductive stage
• Trees fallen on ground may be lifted and earthed up
• Manuring and plant protection measures have to be taken up
• Broken and damaged branches may be pruned and applied with Bordeaux paste

At harvest
• Drain the excess water as soon as possible
• Harvest the mature fruits as soon as possible
• Collect the fallen fruits and sell immediately or go for preparation of processed products
• If to store, store the produce in well ventilated place temporarily before it can be marketed.
• Broken and damaged branches may be pruned and applied with Bordeaux paste

Banana
Vegetative stage
• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• The fallen trees may be cut leaving two suckers
• Inter-cultivate the soil with gorru for aeration.
• Spray 0.5% KNO₃ or Urea 2% solution 2-3 times
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
• Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop.
• If the age of the plant is less than three months and submergence up to three feet better to replant the garden

Reproductive stage
• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• The fallen trees may be cut leaving two suckers
• Topdressing of booster dose of 80 g MOP + 100 g Urea per plant at two to three times intervals
• Mature bunches on the completely damaged plants be covered with Leaves and harvested within 15-20 days

At harvest
• Wind damaged plants should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste
• Drain the excess water as soon as possible
• 3-4 foliar application of KNO₃ on immature/developing bunches and leaves at weekly intervals
• Staking with bamboo for support
• Harvest the mature bunches as soon as possible.
• Use ripening chambers for quick and uniform ripening
• Store the harvested bunches in well ventilated place temporarily before it can be marketed
• Market the produce as soon as possible

Chillies

Seedling/nursery stage
• Grow nursery on raised beds.

Vegetative stage
• Uprooted plants may be lifted and earthed up
• Drain the excess water as soon as possible
• Gap filling must be done immediately
• If damage is more go for replanting Spray Urea 2% solution 2-3 times
• Top dressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible
Reproductive stage
- Uprooted plants may be lifted and earthed up
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Topdressing of booster dose of 15 kg MOP + 30 kg Urea per acre as soon as possible

At harvest
- Drain the excess water as soon as possible concrete floor/tarpaulins immediately
- Use poly house solar driers for quick drying
- Remove the pest and disease infected pods.

Cashew
Seedling/Nursery stage
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times
- Provide support to the young plants

Vegetative stage
- Drain the excess water as soon as possible
- Trees fallen on ground may be lifted and earthed up
- Broken and damaged branches may be pruned and applied with Bordeaux paste

Reproductive stage
- Drain the excess water as soon as possible
- Trees fallen on ground may be lifted and earthed up
- Broken and damaged branches may be pruned and applied with Bordeaux paste

At harvest
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the produce as soon as possible

Oil Palm
Seeding/Nursery
- Planting should be done on mounts or bunds
- Drainage system suited to local conditions may be provided to remove surplus water from root zone
- Relief drains [shallow] channels are opened at places where water accumulates and connected with main drain to remove water from the surface
**Vegetative stage**
- Drain the excess water as soon as possible
- Twisted leaves may be cut and removed
- Apply booster dose of NPK fertilizers
- The palms have fallen with root system

**Paddy**

**Seedling/Nursery stage**
- Excess water from the field to be drained out as early as possible

**Vegetative stage**
- Drain out the excess water at the earliest
- Immediately after the water recedes apply a booster dose of 10 kg Urea + 15 kg MOP application, preferably in the mud followed by light irrigation after 24 hrs
- If mortality of hills takes place and field is patchy, gap filling with split tillers is recommended along with application of booster dose of 20 kg urea and 15 kg MOP
- Take-up need based plant protection measures

**Reproductive stage**
- Drain out the excess water at the earliest
- Take-up need based plant protection measures
- Drain out the excess water at the earliest
- Inter cultivate at optimum field moisture condition
- Immediately after the soil comes to optimum field moisture condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre
- In water logged areas, spray with 2% urea + 1% MgSO₄ followed by Annabhedi 5g + citric acid 0.5 g/l. Spray and also drench with copper oxychloride 0.3% drain out the excess water at the earliest
- Inter cultivate at optimum field moisture condition
- Immediately after the soil comes to condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre
- In water logged areas, spray with 2% urea + 1% MgSO₄ followed by Annabhedi 5 g + citric acid 0.5 g/l. Spray and also drench with copper oxychloride 0.3%

**At harvest**
- Drain out water, Spread sheaves loosely in field or field bunds where there is no water stagnation
- Spray common salt at 5% on panicles to prevent germination and spoilage of straw from moulds
- Thresh after drying the sheaves properly
- Ensure proper grain moisture before storing
- Grow varieties having seed dormancy in flood prone areas

**Cotton**

**Seedling stage**
- Excess water from the field to be drained out as early as possible
- Take up the gap filling at the earliest
- Immediately after the soil comes to condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre
- Delay in interculture may harm the crop
- Take up plant protection measures against possible pests and disease incidence

**Vegetative stage**
- To drain out the excess water at the earliest
- Intercultivate at optimum field moisture condition
- Immediately after the soil comes to condition, intercultivate with gorru and apply a booster dose of 30 kg urea + 15 kg MOP per acre
- In water logged areas, spray with 2% urea + 1% MgSO₄ followed by Annabhedi 5g + citric acid 0.5 g/l
- Spray and also drench with copper oxychloride 0.3%

**Reproductive stage**
- To drain out the excess water at the earliest
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- In water logged areas, spray with 2% urea + 1% MgSO₄ followed by Annabhedi 5g + citric acid 0.5 g/l
- Spray and also drench with copper oxychloride 0.3%

**At harvest**
- Kapas picking should be done carefully to prevent admixtures with waste plant material
Nalgonda

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<thead>
<tr>
<th>Time period</th>
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<tbody>
<tr>
<td><strong>Shallow red soils</strong></td>
<td></td>
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<tr>
<td>June 4th week</td>
<td>Cotton, Pigeonpea, Greengram and Castor</td>
</tr>
<tr>
<td>July 3rd week</td>
<td>Pigeonpea + Greengram (1:5), Cotton and Castor</td>
</tr>
<tr>
<td>August 2nd week</td>
<td>Castor, Jowar, Bajra, Ragi, Sunflower and Horsegram and Cowpea Pigeonpea-no change, replace greengram with pigeonpea</td>
</tr>
<tr>
<td><strong>Black soils</strong></td>
<td></td>
</tr>
<tr>
<td>July 2nd week</td>
<td>Cotton, Red gram Greengram</td>
</tr>
<tr>
<td>July 3rd week</td>
<td>Pigeonpea + Greengram, Cotton</td>
</tr>
<tr>
<td>August 2nd week</td>
<td>Red gram and Sunflower</td>
</tr>
</tbody>
</table>

**Drought Management**

*Rainfed conditions*

**Shallow Red soils**

*Cotton*

- Gap filling to be done by pot watering 7-10 days after sowing if crop stand is poor at seedling stage

*Vegetative stage*

- Interculture
- Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19/ 20-20-20/ 21-21-2
- Sucking pest (Jassid) management with stem application of insecticides in 1:4 or 1:20 ratio (Imidachloprid)

*Reproductive stage*

- 35 kg urea + 15 kg MOP as top dressing Intercultivation to create soil mulch to conserve moisture
- Give Supplemental irrigation (5 cm) if available
- Sucking pest management with stem application

*Maturity stage*

- Spray urea-2% or KNO$_3$ 1% or other water soluble fertilizers 1% to supplement nutrition, give 5 cm supplemental irrigation

*Pigeonpea*

*Vegetative stage*

- Intercultivation
• Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19/20-20-20/21-21-21

Reproductive stage
• Supplemental irrigation at least 5cm, Leaf roller and Maruca-spray Chlorpyriphos @ 2.5 ml + Dichlorvos @ 1 ml per litre of water

Terminal drought
• Supplemental irrigation, 5cm supplemental irrigation

Castor
Vegetative phase
• Intercultivation. Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19/20-20-20/21-21-21
• Adopt nipping to allow main spike to develop

Reproductive phase
• Foliar spray of urea 2% or KNO₃ 1% or other water soluble fertilizers 1% to supplement nutrition or supplemental irrigation 5 cm from farm pond
• Nipping of auxiliary buds to allow the main spike to mature

Terminal drought
• Supplemental irrigation of 5cm for every spike orders such as primaries, secondaries, etc.,

Greengram
Vegetative stage
• Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19 / 20-20-20/21-21-21

Reproductive stage
• Spray urea-2% or KNO₃ 1% or other water soluble fertilizers 1% to supplement nutrition, supplemental irrigation of 5 cm of rainwater

Maturity stage
• Select the varieties with short duration if terminal drought is a common phenomenon in the region (LGG-460, MGG-348) supplemental irrigation of 5cm rain water

Black soils
Cotton
Seedling stage
• Gap filling to be done by pot watering 7-10 days after sowing if crop stand is poor
Vegetative stage
- Intercultivation
- Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19/20-20-21-21-21 or urea Sucking pest (Jassid) management with application of insecticides 1:4 or 1:20(Imidacloprid)

Reproductive stage
- Intercultivation
- Spray 2% urea solution or 1% water soluble fertilizers like 19-19-19/20-20-20/21-21-21
- Sucking pest management with stem application

Terminal drought
- Supplemental irrigation 5cm at every spike order
- Spray urea-2% or KNO$_3$ 1% or other water soluble fertilizers 1% to supplement nutrition
- The management practices for pigeonpea, greengram and castor are almost same as in red soils.

Irrigated conditions
Delayed release of water in canals due to low rainfed Red Soils/Black Soils/Canal irrigated (NSP Command)
- Crops: Greengram – Paddy instead of paddy alone.

Agronomic practices
  Greengram preceding Paddy: Cultivate medium and short duration varieties like Tella hamsa, JGL-384, MTU-1010 and IR-64. Transplant aged seedling with recommended management practices of aged seedlings

Limited release of water in canals due to low rainfall
Red Soils/Black Soils-Canal irrigated (NSP Command)
- Greengram /Sunflower instead of Paddy

Non release of water in canals under delayed onset of monsoon in catchment: Red Soils/Black Soils-Canal irrigated (NSP Command)
- Rainfed crops like, Jowar, Bajra, Ragi, Castor Sunflower and fodder instead of green manuring-Paddy

Lack of inflows into tanks due to insufficient /delayed onset of monsoon: Greengram-Paddy instead of Paddy alone

Insufficient groundwater recharge due to low rainfall: Red chalka soils, Rainfed crops like Greengram, Jowar, Cator crops instead of Paddy under bore wells.
Unusual rains

Paddy

**Vegetative stage**
- Drain excess water as early as possible
- Apply 10 kg N + 10 kg K/acre after draining excess water
- Take up gap filling either with available nursery or by splitting the tillers from the surviving hills
- Take up weed control Measures
- Take up suitable plant protection

**Flowering stage**
- Drain excess water as early as possible
- Apply 10 kg N + 10 kg K/acre after draining excess water
- Take up suitable plant protection measures in anticipation of pest & disease out breaks (Spray COC 3 g/l or Mancozeb 2.5 g/l to avoid incidence of false smut)

**Maturity stage**
- Drain excess water as early as possible
- Take up suitable plant protection measures in anticipation of pest & disease out breaks (Spary Hexaconazole 2ml/l or Carbendazim 1 g/l to avoid brown spot or grain discolouration)

**Post harvest**
- Drain out water and spread sheaves loosely in field or field bunds where there is no water stagnation
- Spray common salt at 3% on panicles to prevent germination and spoilage of straw from fungus
- Thresh after drying the sheaves properly
- Ensure proper grain moisture before storing

Cotton

**Vegetative stage**
- Drain the excess water as early as possible
- Apply 20 kg N + 10 kg K/acre after draining excess water
- Take up inter cultivation at optimum soil moisture condition to loosen and aerate the soil and to control weeds
- To spray KNO₃ 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 @ 1% to support nutrition
- Spray fungicides like Copper Oxy Chloride 0.3 % or Carbendazim 0.1 % or
Mancozeb 0.25% two to three times by rotating the chemicals

- Take up timely control measures against the outbreak of pests like Spodoptera, Helicoverpa etc.

**Flowering stage**

- Drain the excess water as early as possible
- Apply 20 kg N + 10 kg K/acre after draining excess water
- To spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Spray fungicides like copper oxy chloride 0.3% or carbendazim 0.1% or mancozeb 0.25% two to three times by rotating the chemicals
- Take up timely control measures against the outbreak of pests like Spodoptera, Helicoverpa etc.

**At maturity**

- Drain the excess water as early as possible
- Spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Spray fungicides like Copper oxy chloride 0.3% or Carbendazim 0.1% or Mancozeb 0.25% two to three times by rotating the chemicals
- Take up timely control measures against the outbreak of pests like *Spodoptera*, *Helicoverpa* etc.

**Pigeonpea**

**Vegetative stage**

- Drain excess water as early as possible
- Apply 20 kg N + 10 kg K/acre after draining excess water
- Take up inter cultivation at optimum moisture condition to loosen and aerate the soil and to control weeds
- Spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Lift the lodged plants if any and firm up the soil around the base of the stem
- Apply 4-5 kg N/acre after draining excess water

**Flowering stage**

- Drain excess water as early as possible
- To spray KNO₃ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Take up timely control measures against the outbreak of pests like Spodoptera, Helicoverpa etc.
• Lift the lodged plants if any and firm up the soil around the base of the stem
• Apply 4-5 kg N/acre after draining excess water

**Maturity stage**
• Drain excess water as early as possible
• Allow the crop to dry completely before harvesting
• Harvest the crop as soon as the field condition permits and transport to drying floor

**Post harvest**
• Spread the bundles drenched in rain on field bunds or drying floors to quicken the drying
• Thresh the bundles after they are dried properly
• Dry the grain to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage

**Castor**

**V egetative stage**
• Drain out excess water as early as possible
• Apply 20 kg of N and 10 Kg of K/acre after draining excess water
• To spray KNO3 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition.
• Spray fungicide Carbendazim 0.1% two to three times.
• Take up timely control measures against the outbreak of pests like Spodoptera etc.

**Flowering stage**
• Drain out excess water as early as possible
• Apply 20 kg of N and 10 Kg of K/acre after draining excess water
• To spray KNO3 1 % or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1 % to support nutrition
• Spray fungicide Carbendazim 0.1% two to three times
• Take up timely control measures against the outbreak of pests like Spodoptera etc.

**Maturity stage**
• Drain out excess water as early as possible allow the crop to dry completely before harvesting
• Spray fungicide Carbendazim 0.1%
Post harvest
- Spread the harvested capsule heaps drenched in rain on drying floors to quicken the drying
- Dry the capsules properly to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage

Greengram
Vegetative stage
- Drain the excess water as early as possible
- Apply 4-5 kg N/acre after draining excess water
- To spray KNO$_3$ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Spray fungicides like Copper Oxy Chloride 0.3% or Carbendazim 0.1% or Mancozeb 0.25% two to three times by rotating the chemicals
- Take up timely control measures against the outbreak of pests like Spodoptera etc.

Flowering stage
- Drain out excess water as early as possible
- Apply 20 kg of N and 10 Kg of K/acre after draining excess water
- To spray KNO$_3$ 1% or water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
- Spray fungicide Carbendazim 0.1% two to three times
- Take up timely control measures against the outbreak of pests like Spodoptera

Maturity stage
- Drain excess water as early as possible
- Allow the crop to dry completely before harvest

Post harvest
- Spread the bundles drenched in rain on field bunds or drying floors to quicken the drying
- Thresh the bundles after they are dried properly
- Dry the grain to proper moisture per cent before bagging and storing to prevent deterioration in quality during storage

Horticultural crops
Orange & Batavian
Vegetative stage
- Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste

**Flowering stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied.

**Mango**

**Vegetative stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times
• Wind damaged branches should be pruned using disinfected secateurs and cut ends must be smeared with Bordeaux paste.

**Flowering stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times

**Lemon**

**Vegetative stage**

• Drain the excess water as soon as possible
• Spray 1% KNO₃ or Urea 2% solution 2-3 times.
• Foliar spray of micronutrient mixture is also to be taken up
• Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
• If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied
• Wind damaged branches should be pruned using disinfected secateurs and cut
ends must be smeared with Bordeaux paste

**Flowering stage**
- Drain the excess water as soon as possible
- Spray 1% KNO₃ or Urea 2% solution 2-3 times
- Foliar spray of micronutrient mixture is also to be taken up
- Sand casting around the tree trunks should be removed up to the collar region of the tree to prevent fungal infections
- If the tree age is above eight years a booster dose of 500 g of Urea and 750 g MOP per tree should be applied.

**Bhendi (Okra)**

**Vegetative stage**
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Topdressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible
- Gap filling may be taken up if the plants are two weeks old and sowing window is still available for the crop
- In case of severe damage (considered as complete economical loss) and the contingency period is between June to August, sowing of best alternative crop must be taken up
- Intercultivate the soil with gorru for better aeration
- Spray Ferrous sulphate 20g + Citric acid 5g in 10 lit of water twice at weekly intervals

**Reproductive stage**
- Drain the excess water as soon as possible
- Spray Urea 2% solution 2-3 times
- Top dressing of booster dose of 12 kg MOP + 30 kg Urea per acre as soon as possible
- Spray ferrous sulphate 20 g + citric acid 5 g in 10 lit of water twice at weekly intervals

**At harvest**
- Drain the excess water as soon as possible
- Harvest the mature produce as soon as possible
- Store the produce in well ventilated place temporarily before it can be marketed
- Market the produce as soon as possible.
MAHARASHTRA
# Ahmednagar

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops /Cropping systems/Varieties</th>
</tr>
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<tbody>
<tr>
<td><strong>June 4th week</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Shallow grey soils</strong></td>
<td></td>
</tr>
<tr>
<td>Pearl millet</td>
<td>Pearl millet (Shanti), Pearl millet (Shanti) + Pigeon pea (Vipula) (2:1)</td>
</tr>
<tr>
<td></td>
<td>• Basal application of 25 kg K₂O per ha for pearl millet</td>
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<tr>
<td></td>
<td>• Two intercultivations 30 and 45 DAS</td>
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<td><strong>Medium deep black soils</strong></td>
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<tr>
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<tr>
<td>Maize</td>
<td>• African tall, Kaveer, Rajashree</td>
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<tr>
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<td>• Hoeing at 25 DAS</td>
</tr>
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<td>Onion</td>
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<td><strong>July 2nd week</strong></td>
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### Onion
Phule Samarth, Baswant -780
- Protective irrigation

**Deep black soils**

### Soybean
Soybean + Pigeonpea (6:2) intercropping
- Protective irrigation

### Onion
Phule Samarth, Baswant -780
- Protective irrigation

| **July 4th week** | **Shallow grey soils**
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<tr>
<td><strong>Pearl millet</strong></td>
<td>Pearl millet for fodder (Gaint Bajra)</td>
</tr>
<tr>
<td></td>
<td>One hoeing and weeding before 30 DAS Increase nitrogenous fertilizer (25% dose)</td>
</tr>
<tr>
<td><strong>Medium deep black soils</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Go for sunflower (SS-56/Bhanu) instead of soybean</td>
</tr>
<tr>
<td></td>
<td>Hoeing at 30 DAS</td>
</tr>
</tbody>
</table>
|                   | Opening of conservation furrows in between two rows of sole sunflower for water/moisture *instead of soybean*
|                   | (Fodder-African tall) |
|                   | Increase nitrogenous fertilizer (25% dose) *instead of maize*
|                   | Fodder Sorghum (Phule Amruta/MP Chari/CSV-21F) |
|                   | Application of 20:20 N:P₂O₅ kg/ha as basal and remaining 20 kg N per ha at 30 DAS with sufficient soil moisture |
|                   | Hoeing at 20 DAS and weeding at 30 DAS *instead of onion* |

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<thead>
<tr>
<th><strong>Deep black soils</strong></th>
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<td>Sunflower (SS-56/Bhanu)</td>
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<th><strong>August 2nd week</strong></th>
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<tbody>
<tr>
<td>Generally not applicable</td>
<td></td>
</tr>
</tbody>
</table>
Drought Management

**Rainfed conditions**

**Shallow grey soils**

**Pearl millet**

**Seedling stage**
- Transplant seedlings if the plant population is sparse
- Hoeing at 20 DAS and weeding at 30 DAS

**Early /Vegetative stage**
- Hoeing at 20 DAS and weeding at 30 DAS, urea spray 2% during or after dry spell 8% kaolin spray

**Flowering/Fruit setting stage**
- Protective irrigation
- Use of 8% kaolin spray

**Maturity stage**
- In case of poor grain filling harvest for fodder
- Supplemental irrigation of farm pond water

**Medium deep soils**

**Soybean**

**Early season/Seedling stage**
- In case of less than 30% germination, take up resowing with wider spacing of 45 cm with sufficient soil moisture
- Hoeing at 25 DAS black soils

**Vegetative stage**
- Protective irrigation 2% urea spray, Hoeing and weeding

**Flowering stage**
- Protective irrigation, hoeing, mulching, 8% kaolin spray,

**Maturity stage**
- Protective irrigation of farm pond water

**Onion**

**Seedling stage**
- Early season drought
- Protective irrigation through sprinkler

**Vegetative stage**
- Protective irrigation through sprinkler, 2% of urea spray
Flowering stage
- Protective irrigation through sprinkler 2% of urea spray, 8% kaolin spray

Maturity stage
- Protective irrigation, plan for rabi crops of Chickpea (Vijay/Digvijay)/Safflower (Bhima)/Sunflower (SS-Chickpea (Vijay/Digvijay)/Safflower (Bhima)/Sunflower (SS-56)

Maize

Early season/Seedling stage
- Gap filling should be taken up

Vegetative stage
- Protective irrigation 2% urea spray, Hoeing and weeding

Flowering stage
- Protective irrigation 2% urea spray, Hoeing and weeding

Maturity stage
- Protective irrigation plan for rabi crops like Wheat (Tapovan, Trimbak, Godavari)

Irrigated conditions

Shallow grey soil
Delayed release of water in canals due to low rainfall

Rabi-Sorghum
- Give Protective irrigation (Varieties; Phule Anuradha, Phule Vasudha, Maldandi)

Medium deep black soils
- Wheat (Tapovan, Trimbak, Godavari) and Chickpea (Vijay, Digvijay, Virat)
- In wheat, irrigate at critical stages
- Maize African tall, Rajashree, Karveer sowing on ridges and furrows
- Onion Phule Samarth, N-2-4-1 Sprinkler irrigation
- Chickpea Vijay, Digvijay, Virat, Sprinkler irrigation

Deep black soils
- Sugarcane Alternate furrow irrigation/ Trash mulching

Limited release of water in canals due to low rainfall

Shallow grey soils

Rabi-Sorghum
- Phule Anuradha, Phule Vasudha, Maldandi Protective irrigation

Medium deep black soils
- Wheat (Tapovan, Trimbak, Godavari) and Chickpea (Vijay, Digvijay, Virat) In wheat irrigate at critical stages
Maize
- African tall, Rajrshee, Karveer: Sowing on ridges and furrows
- Onion Phule samarth, N-2-4-1: Sprinkler irrigation
- Chick pea: Vijay, Digvijay, Virat: Sprinkler irrigation

Deep black soils
- Sugarcane alternate furrow irrigation/Trash mulching

Insufficient groundwater recharge due to low rainfall
Shallow grey soils- Open well irrigated
- Rabi Sorghum - Protective irrigation

Medium deep black soils-Open well irrigated
- Wheat Majorly wheat (Godavari, Tapovan, Trimbak) and/Chick pea (Vijay, Digvijay, Virat)
- In wheat-Irrigate at critical growth stages, chick pea-Sprinkler irrigation
- Onion: Micro Sprinkler irrigation
- Maize-Rajrshee, Karveer or Chick pea (Vijay, Digvijay, Virat) Sowing on ridges and furrows
- Sprinkler irrigation Chick pea Vijay, Digvijay, Virat Sprinkler irrigation

Deep black soils-Open well irrigated
- Sugarcane Drip irrigation, Paired row planting, alternate furrow irrigation & trash mulching

Unusual Rains
Pearl millet
Vegetative stage
- Drain out excess water
- Give second dose of N at optimum soil moisture

Flowering stage
- Drain out excess water, urea spray 2%

Maturity stage
- Harvest at physiological maturity stage

Post harvest
- Shift produce to safer place for drying
- Practices are same for other crops like soybean, Maize, onion and sugarcane
Horticultural crops

Banana
- Draining out excess water
- Cleaning and maintenance
- Drenching of orchard with Copper fungicides
- Spraying with 2% urea and application of fertilizers after flood

Pomegranate
- Draining out excess of water from the orchards and basins
- Cleaning and maintenance of the basins
- Drenching of orchard with Copper fungicides
- Treating the stems with 10% Bordeaux paste and geru paste with systemic insecticide
- Spraying with 2% urea

Insect management
- Short hole borer: 400 g Geru + 2.5 ml lindane (20 EC) + 2.5 g COC mix together and paste should be applied to branches
- The pests and diseases affecting pomegranate are
  - Stem borer, thrips, aphids, nematodes
  - Diseases-Sigatoka, bunchy top, cigar end rot, Erwinia rot

Remedies
- Cleaning and maintenance of the orchards
- Drain out excess water from the orchards
- Drenching with 0.4 % copper fungicides
- Staking with available material
- Sanitation of the affected plants
- Spray the crops with 0.20 to 0.25% copper fungicide for control of fungal diseases
- Drench 200 ml of solution (15 g Streptocycline + 300 g COC + 300 ml Chlorpyriphos in 100 L of water) per plant
- Spraying with Imidachloprid 17.8 SL @ 3-4 ml/ 10 L of water for control of sucking pests

Nematode management
- Soil application of Phorate 10 G @ 40 g / basin and Neem cake @ 1- 1.5 kg/ basin
- Planting of marigold around the pomegranate plants and deep summer ploughing
## Amravati

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<tr>
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<tbody>
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<tr>
<td>4th week of June</td>
<td>Cotton + Pigeonpea (6:2), Cotton + Greengram/Blackgram (1:1), Pigeonpea + Soyabean (1:4), <em>Kharif</em> sorghum greengram, blackgram</td>
</tr>
</tbody>
</table>
| 2nd week of July  | • Soyabeans (Varieties: JS-335, JS-93-05)  
  **Cotton**  
  • Pigeonpea (Varieties AKT-8811, Vipula, PKV-Tara, BSMR-736), Cotton + Pigeonpea (Replace hybrids with improved varieties in cotton)  
  • American Cotton: AKH-8828, PKV Raj, AKH-081  
  • Desi Cotton: AKA-5, AKA-7, AKA-8  
  • Avoid intercropping of greengram and blackgram in cotton  
  • Cotton + sorghum + pigeonpea + sorghum (6:1:2:1) to reduce the risk due to delayed sowing  
  • Maintain weed free condition at critical stages of crop growth  
  • Soybean: no change  
  • Prefer pigeonpea varieties like PKV Tara, AKT 8811 and BSMR-76. |
| 4th week of July  | Sole Pigeonpea  
  (varieties AKT-8811, Vipula, PKV Tara, BSMR-736)  
  • Sunflower (hybrids)/Sesame (variety AKT64)  
  • Castor (varieties/ AKC-1, GCH-4, 5, 6 and DCH-117, DCH-32)  
  • Pearl millet (varieties PKV Raj, Shradha, Saburi)  
  • Pearl millet + pigeonpea (4:2 or 2:1), Sunflower (hybrids)/Sesame variety (AKT-64), Castor (varieties /hybrids:AKC-1, GCH-4, 5, 6 and DCH-117, DCH -32) |
| 2nd week of August | Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736)  
  • Sunflower (hybrids)/Sesame (variety AKT64)  
  • Castor (varieties/hybrids:AKC-1, GCH-4, 5, 6 andDCH-117, DCH 32)  
  • Pearl millet (varieties PKV Raj, Shradha, Saburi)  
  • Pearl millet + Pigeonpea inter-cropping (2:1 or 4:2 row ratio) |
| **Shallow black soils** |                                                                                                                                 |
| 4th week of June  | Soyabean, Green gram and Blackgram |
| 2nd week of July  | **Soybean**  
  • Normal recommended package of practices of Dr. PDKV, Akola  
  • Test seed for higher germination percentage |
- Adopt seed rate of 75-80 kg/ha
- Seed treatment with Thiram 3 g + Carbendazim 1 g/kg seed, dried and then treated with bio-inoculants such as Rhizobium 200g + PSB 200g and Trichoderma 40 g for every 10 kg seed
- Soil test based application of fertilizers is recommended

| 4th week of July | Sole pigeonpea (varieties AKT-8811, Vipula, PKV Tara, BSMR-736)  
|                 | Sunflower (hybrids)/Sesame (variety AKT64)  
|                 | Castor (varieties/hybrids: AKC-1, GCH-4, 5, 6 and DCH-117, DCH 32)  
|                 | Pearl millet (varieties PKV Raj, Shradha, Saburi)  
|                 | Pearl millet + Pigeonpea (2:1 or 4:2) |

| 2nd week of August | Sunflower (hybrids)  
|                   | Sesame (AKT64)  
|                   | Pearl millet (PKV Raj Shradha, Saburi) |

### Drought Management

**Rainfed conditions**

**Deep and medium black soils**

**Cotton/Cotton + Pigeonpea**

#### Early vegetative growth

- Give protective irrigation wherever possible
- Raise cotton seedlings in nursery & transplant when sufficient soil moisture is available
- Gap filling aided with pot watering 7-10 days after sowing when crop stand is less than 80%
- In case of less than 30% germination, take up re-sowing with a wider spacing of 45 cm when sufficient soil moisture is available
- Making of conservation furrows for moisture conservation
- Sowing on broad bed furrow (BBF)

#### Vegetative stage

- Opening of alternate furrows
- Mulching with crop residue
- Take up intercultivation to create soil mulch and to conserve soil moisture
- Give protective irrigation, if possible avoid applying fertilizer till sufficient soil moisture is available
**Flowering stage/Fruiting stage**
- Apply foliar spray of 2% urea or DAP
- Adopt soil moisture conservation measures like ridges and furrows supplemental irrigation of 10 mm depth through drip if possible

**Terminal drought**
- Giving life saving supplemental irrigation, if available
- Picking/harvesting at physiological maturity

**Soybean**

**Early vegetative growth**
- Give protective irrigation wherever possible
- If germination is less than 50% take up re-sowing immediately after receipt of rains
- Take up one hoeing for weed management
- Avoid applying fertilizer till sufficient soil moisture is available
- Mulching with crop residues
- Apply organic matter/FYM/Compost for better moisture retention
- Making conservation furrows for moisture conservation
- Sowing on broad bed furrow (BBF)

**Vegetative stage**
- Opening of alternate furrows
- Mulching with crop residue
- Take up intercultivation to create soil mulch to conserve soil moisture
- Give protective irrigation, if possible avoid applying fertilizer till sufficient soil moisture is available
- Interculture for weeding

**Flowering stage/Fruiting stage**
- Apply foliar spray of 2% urea or DAP
- Adopt soil moisture conservation measures like ridges and furrows supplemental irrigation of 10 mm depth through drip if possible

**Terminal drought**
- Giving life saving supplemental irrigation, if available
- Picking/harvesting at physiological maturity
Pigeonpea

Early vegetative growth
- Gap filling either with sesame or maize
- Provide protective irrigation, wherever possible
- Take up hoeing avoid applying fertilizer till sufficient soil moisture is available
- Mulching with crop residue
- Apply organic matter/FYM/Compost for better moisture retention
- Making of conservation furrows for moisture conservation
- Sowing on broad bed furrow (BBF)

Vegetative stage
- Opening of alternate furrows
- Mulching with crop residue
- Take up intercultivation to create soil mulch to conserve soil moisture
- Give protective irrigation, if possible avoid applying fertilizer till sufficient soil moisture is available
- Interculture for weeding

Flowering stage/Fruiting stage
- Apply foliar spray of 2% urea or DAP
- Adopt soil moisture conservation measures like ridges and furrows supplemental irrigation of 10 mm depth through drip if possible

Terminal drought
- Giving life saving supplemental irrigation, if available
- Picking/harvesting at physiological maturity

Irrigated conditions

Delayed release of water in canals due to low rainfall

Deep and medium deep black soils
- Wheat to be replaced by chickpea/Safflower/Mustard Follow alternate row/ micro-irrigation Irrigate at critical crop growth stages

Light black soils
- Safflower/Mustard instead of chickpea

Insufficient groundwater recharge due to low rainfall
- Open well irrigated rabi cropping situation
- Chickpea/Safflower
Unusual Rains

Cotton

Vegetative stage
- Open field channels to drain excess water and avoiding surface ponding
- Apply 2% urea foliar spray after cessation of rains
- Interculture at optimum soil moisture to improve soil aeration

Flowering stage
- Open field channels to drain excess water and avoiding surface ponding
- Apply multi-nutrient or hormonal spray to promote flowering

Maturity stage
- Open field channels to drain excess water and avoiding surface ponding
- Timely picking of cotton

Post harvest
- Protect picked cotton in storage from drenching and soiling
- Drying of wet cotton and marketing

Soybean/Breengram/Blackgram

Vegetative stage:
- Provide drainage

Flowering stage:
- Provide drainage

Maturity stage:
- Timely harvesting of produce

Pigeonpea

Vegetative stage
- Open field channels to drain excess water and avoiding surface ponding
- Interculture at optimum soil moisture to improve soil aeration

Flowering stage
- Open field channels to drain excess water and avoid surface ponding

Maturity stage
- Timely harvest of produce
**Acid Lime and Orange**

**Vegetative stage**
- Opening of field channels to drain out excess water and avoid surface ponding in the orchard
- Interculture at optimum soil moisture to improve soil aeration

**Flowering stage**
- Mrig bahar crop is unaffected
- For Ambe bahar crop, open field channels to drain out excess water and avoid surface ponding
- Nutrient spray of NAA 10 ppm + 1% urea to prevent flower drop

**Maturity stage**
- Timely harvest to avoid losses

**Post harvest stage**
- Grading of fruits, cleaning of mould affected ones followed by washing and waxing after harvest

**Heavy rainfall with high speed winds in a short span**

**Cotton**

**Vegetative stage**
- Open field channels to drain excess water and avoiding surface ponding

**Flowering stage**
- Opening of field channels to remove surface ponding

**Maturity stage**
- Timely picking in case of early forewarning of rains

**Post harvest**
- Shifting to safer place for drying

**Nagapur Mandrin/Acid lime and Sweet orange**

**Vegetative stage**
- Provide bamboo staking to less than 3 year aged plants to avoid lodging

**Flowering stage**
- Provide bamboo staking to less than 3 year aged plants to avoid lodging
- Opening of field channels to drain out excess water and avoid remove surface ponding
Maturity stage
- Open field channels to remove surface ponding

Post harvest
- Collection, grading and marketing produce

Extreme events
Heat wave

Oranges (Mandarin and Sweet orange)

Seedling/Nursery stage
- Increase the frequency of irrigation
- Use of temporary shade net
- Mulching

Vegetative stage
- Increase the frequency of irrigation
- Pruning of damaged branches/twigs Protect with polythene sheet

Reproductive stage
- Increase the frequency of irrigation
- Mulching to reduce soil temperature
- Pruning of damaged parts and apply Bordeaux paste 1% to cut ends

Harvesting stage
- Immediate harvesting of fruits, grading and marketing

Cold wave

Oranges (Mandarin and Sweet orange)

Seedling/Nursery stage
- Protect the seedlings with polythene sheet

Vegetative stage
- Smoking, flood irrigation during evening hours, basin mulching
- Apply supplementary dose of fertilizer

Reproductive stage
- Smogging, frequent light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizer
Hailstorm

**Wheat, chickpea, Safflower**

**Seedling/Nursery stage**  
- Re-sowing in case of severe damage

**Vegetative stage**  
- Light and frequent irrigation.

**Reproductive phase**  
- Apply 10% additional nitrogen
- Light and frequent irrigation

**Harvesting stage**  
- Timely harvesting and shifting of produce to safer place in case of early forewarning

**Oranges (Mandarin and Sweet Orange)**

**Vegetative stage**  
- Prune damaged branches and twigs and apply Bordeaux paste 1% to avoid fungal infections

**Reproductive stage**  
- Prune damaged branches and twigs and apply Bordeaux paste 1% to avoid fungal infections
- Apply hormonal spray NAA 20 ppm + 1% urea to prevent flower drop.

**At harvest**  
- Immediate harvesting, grading and marketing of produce
Aurangabad

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<td>Shallow black soil with low rainfall</td>
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<tr>
<td>4th week of June</td>
<td>Cotton, Pearl millet/Pearlmillet + Pigeonpea, Pigeonpea , Maize</td>
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</table>
| 2nd week of July     | **Cotton:** Prefer short duration varieties / hybrids or Cotton + Pigeonpea (BSMR 736,853, BDN 708,711) in 6:1 row proportion.  
                       | **Pearl millet/Pearl millet + Pigeonpea, Maize-Pigeonpea. Prefer varieties like BSMR-736, 853 BDN-708, 711**            |
| 4th week of July     | **Cotton:** Prefer short duration varieties/hybrids or Cotton + pigeonpea (BSMR-736,853,BDN-708,711) in 6:1 row proportion adopt 20-25% more seed rate than recommended and reduce fertilizer dose by 25 per cent in cotton, Pearl millet/Pearl millet + Pigeonpea , Maize Pigeonpea prefer varieties like BDN 708, 711 |
| 2nd week of August   | Pearl millet (Sradha, Saburi, AIMP-92901), Sunflower (Morden, SS-56, LSFH-35, BSH-1) or fallow (plan for rabi) or Pearl millet + pigeonpea in 2:1 row proportion in place of cotton.  
                       | • Follow in situ soil moisture conservation measures like alternate furrow opening with Balaram plough                  
                       | • intercropping with pigeonpea in 3:3 or 4:2 row proportion in place of sole pearl millet                               
                       | • Follow insitu soil conservation measures like alternate furrow opening with balram plough/fodder maize (African Tall) Castor (VI-9,Aruna, GCH-4, 5, 6 and DCH-117/32)in place of pigeonpea         |

Drought Management

**Rainfed conditions**

**Cotton**

**Early vegetative growth**

- Gap filling within the rows with same cultivar or pigeonpea to maintain at least 75% plant population
- Raise cotton seedlings in polythene bags and transplant when sufficient soil moisture is available
- Give protective irrigation wherever possible
- Avoid applying fertilizers till sufficient soil moisture is available
• Making of conservation furrows for moisture conservation
• Interculture with harrows

**Vegetative stage**
• Avoid top dressing of fertilizers till sufficient soil moisture is available
• Interculture with harrow for weeding and to create soil mulch
• Opening of alternate furrows with Balaram plough
• Mulching with crop residue @ 3-5 t/ha
• Spraying of 2% urea or DAP

**Flowering/Fruiting stage**
• Give protective irrigation with drip, mulching with crop residue @ 3-5 t/ha
• Foliar spray of 2% KNO₃, urea and DAP
• Mulching with crop residue @ 3-5 t/ha

**Terminal drought**
• Life saving irrigation with drip
• Picking If possible, adopt relay cropping of chickpea, safflower, *rabi* sorghum

**Pearl millet/Pearl millet + Pigeonpea**

**Early vegetative growth**
• Gap filling or transplanting of seedlings either from the same field or from nursery or gap filling with pigeonpea
• Intercultivation

**Vegetative stage**
• Avoid top dressing of fertilizers till sufficient soil moisture is available
• Interculture with harrow for weeding and to create soil mulch
• Opening of alternate furrows with Balaram plough
• Mulching with crop residue @ 3-5 t/ha
• Spraying of 2% urea or DAP

**Flowering/Fruiting stage**
• Give protection irrigation, mulching with crop residue @ 3-5 t/ha

**Terminal drought**
• Life saving irrigation or harvest at physiological maturity Plan for *rabi* crops chickpea/safflower

**Maize**

**Early vegetative growth**
• Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population
Vegetative stage
- Avoid top dressing of fertilizers till sufficient soil moisture is available
- Interculture with harrow for weeding and to create soil mulch
- Opening of alternate furrows with Balaram plough
- Mulching with crop residue @ 3-5 t/ha
- Spraying of 2% urea or DAP

Flowering/Fruiting stage
- Give protection irrigation
- In case of severe stress harvest as green fodder
- Mulching with crop residue @ 3-5 t/ha within the rows
- If feasible spray anti-transparent (6% kaolin)

Terminal drought
- Life saving irrigation or harvest at physiological maturity
- Plan for rabi crops chickpea/ safflower

Pigeonpea

Early vegetative stage
- Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population, intercultivation

Vegetative stage
- Avoid top dressing of fertilizers till sufficient soil moisture is available
- Interculture with harrow for weeding and to create soil mulch
- Opening of alternate furrows with Balaram plough
- Mulching with crop residue @ 3-5 t/ha
- Spraying of 2% urea or DAP

Flowering/Fruiting stage
- Give protection irrigation Foliar spray of 2% KNO3, urea and DAP

Terminal drought
- Life saving irrigation Foliar spray of 2% KNO3, urea and DAP

Irrigated conditions

Delayed release of water in canals due to low rainfall
Medium deep to deep black soils with low rainfall
Irrigated cotton/wheat
- Give irrigation at critical stages of crop growth instead of Sugarcane and Wheat
- Depending upon time of release of water go for timely sown (HD-2496, HD-2189,
Triambak)/late sown (HD-2189, Kailash) wheat varieties
- Give irrigation at critical stages of crop growth

**Chickpea**
- Use early maturing varieties i.e. ICCV-2
- Use drip irrigation give irrigation at critical crop growth stages (branching and pod formation)

**Safflower**
- Use improved varieties i.e. PBNS-12/40
- Use drip irrigation/give irrigation at critical crop growth stages (branching and pod formation)

**Ginger, turmeric and chillies**
- Use drip irrigation for Turmeric and Chilles

**Rabi onion**
- No change but use drip system for rabi crops

**Shallow black soils**
- Chickpea/Safflower/summer pearl maize millet/fodder instead of wheat

**Limited release of water in canals due to low rainfall**

**Shallow black soils**
- Irrigated cotton/wheat/rabi onion instead of sugar cane
- Give irrigation at critical crop growth stages

**Non release of water in canals under delayed onset of monsoon in catchment**

**Medium deep to deep black soils with low rainfall** (Vaijapur and Gangapur tehsils)
- Take up Cotton/Soybean/Pigeonpea/maize instead of sugar cane, Ginger and Turmeric can also be takenup
- Timely Intercultural operations and mulching to conserve soil moisture
- Basal application of all the recommended fertilizers.

**Low rainfall Shallow black soils (Vaijapur and Gangapur Tehsils)**
- Chickpea/Safflower/Maize fodder

**Insufficient groundwater recharge due to low rainfall**

**Medium deep to deep black soils with low rainfall**
- Prefer alternate crops like cotton, soybean, maize and pigeonpea instead of sugarcane, *Rabi* sorghum instead of wheat. Instead of Ginger, Turmeric and Chilli, Rabi onion can be grown.
Crop Varieties to be taken up during low rainfall /drought period

<table>
<thead>
<tr>
<th>Crop</th>
<th>Varieties to be taken up during low rainfall /drought period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickpea</td>
<td>BDN-9-3, Akash, Vijay, Vikas</td>
</tr>
<tr>
<td>Safflower</td>
<td>PBNS-12/40, Sharada, Naari-6</td>
</tr>
<tr>
<td>Sorghum</td>
<td>M-35-1, Parbhani Moti</td>
</tr>
</tbody>
</table>

**Unusual Rains**

**Cotton**

*Vegetative stage*
- Open field channels to drain excess water and avoid surface ponding
- Apply 2% urea foliar spray after cessation of rains
- Interculture at optimum soil moisture to improve soil aeration

*Flowering stage*
- Open field channels to drain excess water and avoid surface ponding
- Apply multi-nutrient or hormonal spray to promote flowering

*Maturity stage*
- Open field channels to drain excess water and avoid surface ponding
- Timely picking of cotton

*Harvesting stage*
- Protect picked cotton in storage from drenching and soiling
- Drying of wet cotton and marketing

**Pearl millet**

*Vegetative stage*
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 20 kg additional N/ha after draining of excess water

*Flowering stage*
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 20 kg additional N/ha after draining of excess water

*Maturity stage*
- Drain excess water as early as possible
- Harvest at physiological maturity
Post harvest
- Dry the grain to optimum moisture content before storage

Maize

Vegetative stage
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 25 kg additional N/ha after draining of excess water

Flowering stage
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 25 kg additional N/ha after draining of excess water

Maturity stage
- Drain excess water as early as possible
- Harvest green cobs from dislodged plants for immediate marketing

Post harvest
- Harvest the cobs after they are dried up properly
- Dry the grain to optimum moisture content before storage

Pigeonpea

Vegetative stage
- Open field channels to drain excess water and avoid surface ponding and interculture at optimum soil moisture to improve aeration

Flowering stage
- Open field channels to drain excess water and avoid surface ponding and interculture at optimum soil moisture to improve aeration

Maturity stage
- Drain excess water as early as possible
- Allow the crop to dry completely before harvesting

Harvesting stage
- Spread the bundles drenched in the rain on field bunds/drying floors to quicken drying
- Thresh bundles after they are dried properly
- Dry the grain to proper moisture content before bagging and storing
Sorghum

**Vegetative stage**
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 25 kg additional N/ha after draining of excess water

**Flowering stage**
- Drain excess water as early as possible
- Intercultivation with hoe
- Apply 25 kg additional N/ha after draining of excess water

**Maturity stage**
- Drain excess water as early as possible
- Harvest the ear heads after they are dried up properly or use ear head dried
- Dry the grain to optimum moisture content before storage

**Green gram/Black gram-Chickpea**

**Vegetative stage**
- Drain excess water as early as possible

**Flowering stage**
- Drain excess water as early as possible

**Maturity stage**
- Drain excess water as early as possible
- Allow the crop to dry completely before harvesting

**Post harvest**
- Quick drying followed by threshing

**Sweet orange Mosambi, Mango, Sapota, Custard apple pomegranate**

**Vegetative stage**
- Drain excess water from the field
- Keep the field clean and do earthing up

**Flowering stage**
- Drain excess water from the field
- Keep the field clean and do earthing up
- Spray micro nutrients

**Maturity/Harvesting stage**
- Spray fungicides like Bavistin @ 1 gm/lt water after rain stop as a preventive measure to control disease
• Harvest mature produce on clear sunny day
• Fallen fruits may be collected
• Store fruits in well ventilated temporary structures before marketing
• Market the fruits as soon as possible

**Floods**

**Cotton**

**Seedling stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling
• Intercultivation at optimum field moisture condition
• Spray water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
• In case of severe damage, prefer resowing with short duration hybrid

**Vegetative Stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Intercultivation at optimum field moisture condition
• Spray water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition
• Need based correction of micronutrients like Zn by spraying ZnSO₄, Mg through MgSO₄ and Boron two times at 7-10 days interval

**Reproductive stage**

• Drain stagnated water at the earliest
• Spray water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 at 1% to support nutrition

**At harvest**

• Keep the fallen and soiled bolls and lint separately for drying and marketing
• Proper storage of picked cotton to avoid wetting and maintaining quality of lint

**Pearl millet**

**Seedling stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling by transplanting
• Intercultivation at optimum field moisture condition
• In case of severe damage, prefer re sowing with short duration hybrids

**Vegetative stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Intercultivation at optimum field moisture condition

**Reproductive stage**

• Drain stagnated water at the earliest
• Tie the lodged plants as bundles with leaves
• Harvest ear heads on clear sunny day

**Post harvest**

• Maintain optimum moisture of the grain by drying in sun or drier

**Pigeonpea**

**Seedling stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling with short duration varieties
• Intercultivation at optimum field moisture condition
• In case of severe damage, prefer resowing with short duration hybrids

**Vegetative stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Intercultivation at optimum field moisture condition

**Reproductive stage**

• Foliar spray of 2% Urea, DAP and KNO₃

**Post harvest stage**

• Spread the bundles drenched in the rain on field bunds/drying floors to quicken drying
• Thresh bundles after they are dried properly
• Dry the grain to proper moisture content before bagging and storing

**Soybean**

**Seedling stage**

• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling with short duration varieties
• Intercultivation at optimum field moisture condition
• In case of severe damage, prefer resowing with short duration hybrids

**Vegetative stage**
• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Intercultivation at optimum field moisture condition

**Reproductive stage**
• Drain stagnated water at the earliest
• Foliar spray of 2% Urea DAP and KNO₃
• Harvest and thresh the crop on clear sunny day

**Post harvest**
• Dry the grain to proper moisture content before bagging and storing

**Sorghum**

**Seedling stage**
• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling with short duration varieties
• Intercultivation at optimum field moisture condition
• In case of severe damage, prefer resowing with short duration hybrids
• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling with short duration varieties
• In case of severe damage, prefer resowing with short duration hybrid

**Vegetative stage**
• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water

**Reproductive stage**
• Drain stagnated water at the earliest
• Foliar spray of 2% Urea, DAP and KNO₃

**Post harvest**
• Dry the grain to proper moisture content before bagging and storing

**Green gram/Black gram-Chickpea/Rabi Sorghum/Safflower**

**Seedling stage**
• Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
• Take up the gap filling with short duration varieties
• Intercultivation at optimum field moisture condition
• In case of severe damage, prefer resowing with short duration hybrid

**Vegetative stage**
- Drain stagnated water at the earliest and apply 20 kg N/ha after draining excess water
- Intercultivation at optimum field moisture condition

**Reproductive stage**
- Drain stagnated water at the earliest
- Apply 20 kg N/ha after draining excess water
- Take up the gap filling with short duration varieties
- Intercultivation at optimum field moisture condition
- In case of severe damage, prefer resowing with short duration hybrids

**Post harvest**
- Dry the grain to proper moisture content before bagging and storing

**Sweet orange (Mosambi), Mango, Sapota, custard apple and pomegranate**

**Seedling stage**
- Drain stagnated water at the earliest
- Earthing up operation to support the crop
- Intercultivation at optimum field moisture condition
- Removal of dirt from soiled seedlings with water spray
- Staking of plants to prevent lodging

**Vegetative stage**
- Drain stagnated water at the earliest
- Earthing up operation to support the crop
- Intercultivation at optimum field moisture condition to improve aeration and to control the weeds
- Staking of plants to prevent lodging
- Apply organic manure, fertilizers and micronutrients as per the recommendations of MAU, Parbhani depending on age of crop

**Reproductive stage**
- Drainage of stagnation water
- Earthing up operation to support the crop
• Micronutrient spray, spray
• Fungicides like bavistin, redomil

Post Harvest
• Collect dropped fruits,
• Grade and market if feasible
# Buldhana

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops /Cropping systems/ Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deep and medium deep black soils</strong></td>
<td><strong>25\textsuperscript{th} June to 1\textsuperscript{st} July</strong></td>
</tr>
</tbody>
</table>
| **9\textsuperscript{th} - 15\textsuperscript{th} July** | Soybean, Pigeonpea  
Normal recommended Package of Practices by Dr. PDKV, Akola  
- Test germination percentage, Use seed rate @ 75-80 kg/ha  
- Seed Treatment with Rhizobium+ PSB (250 gm each /10Kg seed + Thiram 3 gm+Carbendazim 1gm+Trichoderma 4 gm/Kg of seed.  
- Intercrop one row of pigeon pea after every 4 or 6 rows of soybean as per convenience  
- Open furrow after six /Three rows of soybean  
- Cotton + Tur Intercropping (Use American varieties of cotton)  
- Use 20-25% more than recommended seed rate and reduce fertilizer dose by 25% for Cotton.  
- Replace the hybrids with improved varieties in cotton  
- American Cotton: AKH-8828, PKV Rajat, AKH-081  
- Desi Cotton: AKA-5, AKA-7, AKA-8  
- Avoid sowing of green gram and black gram to reduce the risk of late sowing  
- For Soybean follow recommended package of practices and varieties.  
- Pigeon pea: Change in variety: Akt-8811, Vipula, -Tara, BSMR-736 |
| **23-29\textsuperscript{th} July** | Sole Pigeonpea (AKT-8811, Vipula, PKV Tara, BSMR-736)  
Sunflower (hybrids)/ sesame AKT64/ castor AKC-1, GCH-4,5,6 & DCH-117, 32/pearlmillet. PKV Raj Shradha, Saburi  
pearlmillet + pigeon pea inter- cropping (2:1, 4:2)  
Adopt closer spacing (60x30 cm) for pigeonpea  
Follow insitu moisture conservation measures |
| **6-12\textsuperscript{th} August** | Sole Pigeonpea AKT-8811, Vipula, PKV Tara, BSMR-736.  
Sunflower (hybrids) /Pearlmillet. PKV Raj Shradha, Saburi  
Sesame AKT64/ Castor- GCH-4,5,6 & DCH-117 |
• Pearlmillet + Pigeon pea inter-cropping (2:1, 4:2).
• Adopt closer spacing (60x30 cm) for pigeon pea.
• Follow insitu moisture conservation measures.

| Shallow Black soils | 25th June-1st July | Soyabean | Normal recommended Package of Practices by Dr. PDKV, Akola (Test GP% Use seed rate @ 75-80 kg/ha)  
| Seed Treatment with Rhizobium+ PSB (250gm each/10Kg seed + Thiram 3 gm+ Carbendazim 1 gm + Trichoderma 4 gm/Kg of seed)  
| Greengram/Blackgram | Seed Treatment with Rhizobium+ PSB (250gm each /10 Kg seed + Thiram 3 gm + Carbendazim 1 gm + Trichoderma 4 gm/Kg of seed)  
| 9-15th July | Soybean-JS-335, JS-93 -05 | Normal recommended Package of Practices by Dr. PDKV, Akola (Test GP% Use seed rate @ 75-80 kg/ha)  
| Seed Treatment with Rhizobium+ PSB (250gm each/10Kg seed + Thiram 3 gm+ Carbendazim 1 gm + Trichoderma 4 gm/Kg of seed)  
| 23rd-29th July | Sole Pigeonpea (AKT-8811, Vipula) | Sunflower hybrids/ Sesame AKT-64/ pearlmillet. PKV Raj Shradha, Saburi | Pearlmillet + pigeon pea inter- cropping (2:1, 4:2)  

**Irrigated Conditions**

Delayed release of water in canals due to low rainfall

Deep to Medium deep black soils

• Wheat to be replaced by Chickpea/Safflower/Mustard

• Follow alternate row irrigation/irrigate at critical stages/ Stream cut off

Shallow black soils

• Safflower/mustard instead of chickpea

• Follow alternate row irrigation/irrigate at critical stages/ Stream cut off

Limited release of water in canals due to low rainfall

Deep to Medium deep black soils

• Wheat to be replaced by Chickpea/Safflower/Mustard/ Linseed/Sesame

• Follow alternate row irrigation/irrigate at critical stages/ Stream cut off

Shallow black soils
• Safflower/Mustard instead of chickpea
• Follow alternate row irrigation/irrigate at critical stages/Stream cut off

Insufficient groundwater recharge due to low rainfall

Open well irrigated-Rabi cropping
Chickpea, Safflower, sprinkler system of irrigation

Unusual Rains

Continuous high rainfall in a short span leading to water logging
Cotton/soyabean/blackgram/greengram/pigeonpea
• Opening of field channels to remove surface ponding
• Foliar spray of 2% Urea
• Interculture at optimum soil moisture to improve soil aeration.
• Opening of field channels to remove surface ponding
• Nutrient spray to arrest flower drop
• Opening of field channels to remove surface ponding

Horticulture
Acid Lime and orange
• Opening of field channels to remove surface ponding
• Mrig bahar not affected
• For Ambe bahar opening of field channels to remove surface ponding
• Nutrient spray of NAA 10 ppm+1% urea to prevent flowers drop

Maturity stage
• Timely harvest to avoid losses

Post harvest stage
• Fungal removal followed by Washing & waxing

Heavy rainfall with high speed winds in a short span
Cotton
• Opening of field channels to remove surface ponding
• Improved drainage and drenching with copper oxy chloride to avoid wilting incidence
• Opening of field channels to remove surface ponding
• Improved drainage and drenching with copper oxychloride by opening of the nozzle of spray pump to avoid wilt incidence.
• Occurrence of grey mildew- control by sulphur spray @ 25 g/10 lit.
• Occurrence of grey mildew- control by sulphur spray @ 25 g/10 lit.
• Shifting to safer place
**Nagpur Mandarin / Acid lime and sweet orange**

- Support by bamboo if < 3 years plants
- Support by bamboo if < 3 years plants.
- Opening of field channels to remove surface ponding
- Support by bamboo if < 3 years plants.
- Opening of field channels to remove surface ponding.
- Fungal removal followed by Washing & waxing

**Outbreak of pests and diseases due to unseasonable rains**

**Cotton**

- Control Jassids and Thrips spray with Acetamiprid 20 SP @ 1.5 g/10 lit.
- Jassids and Thrips will increase spray with Acetamiprid 20 SP @ 1.5 g/10 lit.

**Soyabean**

- Control semi-looper spray NSKE 5% or quinalphos 25 EC 20 ml/10 lit.
- Control semi-looper spray NSKE 5% or quinalphos 25 EC 20 ml/10 lit.

**Greengram and Blackgram**

- Control Powdery mildew penconazole 5 ml or dinocap 10 ml or triadomorph 5 ml or sulphur spray @ 30 g/10 lit of water
- Control Powdery mildew penconazole 5 ml or dinocap 10 ml or triadomorph 5 ml or sulphur spray @ 30 g/10 lit of water

**Pigeonpea**

- Improved drainage and drenching with copper oxy chloride @ 25g/10 lit of water to avoid incidence of wilt and root rot
- Improved drainage and drenching with copper oxy chloride @ 25g/10 lit of water to avoid incidence of wilt and root rot

**Mandarin orange**

- Control Citrus psylla Malathion 50EC 10 ml or Quinolphos 25 EC 10ml Or Cypermethrin 25 EC 4 ml/10 lit
- Control Citrus psylla Malathion 50EC 10 ml or Quinolphos 25 EC 10ml Or Cypermethrin 25 EC 4 ml/10 lit
- Immediate harvesting

**Extreme events**

**Heat wave**

**Horticultural crops**

- Increase the frequency of irrigation
- Use of temporary shed net.
- Spraying of antitranspirants
• Mulching, Pruning of damaged parts
• Increase the frequency of irrigation
• Spraying of antitranspirants
• Mulching, Pruning of damaged parts
• Application of Bourdeux paste
• Increase the frequency of irrigation
• Spraying of antitranspirants
• Mulching, Pruning of damaged parts
• Immediate harvesting of fruits
• Increase the frequency of irrigation,
• Spraying of antitranspirants
• Mulching, Pruning of damaged parts
• Application of Bourdeux paste

Cold wave

Horticultural crops
• Covering with poly tunnel
• Flood irrigation at evening.
• Covering with poly tunnel
• Flood irrigation at evening.
• Smogging, Flood irrigation at evening,
• Basin Mulching, Foliar application of potash fertilizers
• Immediate harvesting
• Smogging, Flood irrigation
• Basin Mulching, Foliar application of potash fertilizers

Hail storm

Horticultural crops
• Remove damaged parts, fungicidal spray
• Remove damaged parts, fungicidal spray
• Remove damaged parts, fungicidal spray, spraying of NAA 20 ppm + 1 % urea.
• Harvesting and grading
### JALNA

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Medium deep to deep black soils</strong></td>
<td></td>
</tr>
<tr>
<td>June 4th week</td>
<td>Cotton, pearl millet, maize, pigeon pea, greengram-sorghum, safflower/chickpea, soybean</td>
</tr>
<tr>
<td>July 2nd week</td>
<td>Cotton + Pigeonpea 6:2 (BSMR 736, 853, BDN 708, 711) Follow normal package of practices recommended by MAU, Parbhani or adopt 15-20% more seed rate than recommended and reduce fertilizer dose by 25 per cent. Pearl millet, maize, soybean + Pigeonpea 4:2 (JS-335, MAUS-71,81) Soybean + Pigeonpea 4:2 (JS-335, MAUS-71,81) Soybean + pigeon pea 4:2 row proportion (MAUS 71,81)</td>
</tr>
<tr>
<td>July 4th week</td>
<td>Cotton + Pigeonpea 6:2 (BSMR 736, 853, BDN 708,711) Pearl millet, maize, pigeon pea Soybean + Pigeonpea 4:2 (JS-335, MAUS-71,81) + (BSMR-736 853, BDN 708, 711)</td>
</tr>
<tr>
<td>August 2nd week</td>
<td>Pigeonpea (BDN 708, 711) Pearl millet + Pigeonpea in 3:3 or 4:2 row proportion for castor (VI9, Aruna, GGH-4, 5, 6 and DCH-117/32) Or Keep fallow and plan for Rabi Crops like Sorghum, Chickpea, Sunflower and Safflower.</td>
</tr>
<tr>
<td><strong>Shallow black soils</strong></td>
<td></td>
</tr>
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<td>June 4th week</td>
<td>Cotton, pearl millet, maize, pigeon pea, greengram-sorghum, safflower/chickpea, soybean</td>
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August 2\textsuperscript{nd} week Pigeonpea (BDN 708, 711), pearl-millet, Fodder Maize
Keep fallow and plan for early. Rabi Crops like Sorghum, Chickpea, Sunflower and Safflower

\textbf{Drought management}

\textbf{Medium deep to deep/shallow black soils}

\textbf{Cotton}

\textit{Early season drought}

- Gap filling 7-10 days after sowing by pot watering within the rows with same cultivar or pigeonpea to maintain at least 75\% plant population.
- Raise cotton seedlings in polythene bags and transplant when sufficient soil moisture is available.
- Give protective irrigation wherever possible
- Making of conservation furrows for moisture conservation
- When the crop is 2 weeks old take up interculture with harrow.
- Spray 2\% urea solution or 1\% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition

\textit{Vegetative stage}

- Give protective irrigation wherever possible
- Maintain weed free conditions
- Avoid applying fertilizers till sufficient soil moisture is available
- Making of conservation furrows for moisture conservation Interculture with harrows
- Two sprays of 2\% MgSO\textsubscript{4}, Zn, Boron at weekly interval when the crop is encountered reddening symptoms
- Spray 2\% urea solution or 1\% water soluble fertilizers like 19-19-19, 20-20-20, 21-21-21 to supplement nutrition

\textit{Flowering stage or reproductive stage}

- Give protective irrigation wherever possible.
- Avoid applying fertilizers till sufficient soil moisture is available.
- Making of conservation furrows for moisture conservation
- Interculture with harrows
- Two sprays of 2\% MgSO\textsubscript{4}, Zn, Boron at weekly interval when the crop is encountered reddening symptoms
- Spray 2\% urea solution or 1\% water soluble fertilizers like 19-19-19, 20-20-20,
21-21-21 to supplement nutrition.
- Give protective irrigation with drip Picking
- If possible, adopt relay cropping of chickpea, safflower, rabi sorghum

**Pearl millet/Maize**

**Early season drought**
- Gap filling or transplanting of seedlings either from the same field or from nursery or gap filling with pigeonpea
- Gap filling with short duration of same crop if the plant population is around 75% in maize

**Vegetative stage**
- Avoid top dressing of fertilizers till sufficient soil moisture is available. Interculture with harrow for weeding and to create soil mulch.
- Give protective irrigation if possible
- Opening of alternate furrows with Balaram plough.
- Mulching with crop residue Spraying of 2% urea or DAP

**Flowering / fruiting or Reproductive stage**
- Give protective irrigation
- Mulching with crop residue@ 3-5 t /ha

**Terminal drought**
- Life saving irrigation or harvest at physiological maturity
- Plan for rabi crops chickpea /safflower

**Pigeonpea**

**Early season drought**
- Gap filling within the rows with same or short duration cultivar to maintain at least 75% plant population
- When the crop is 2 weeks old take up Interculture with hoe

**Vegetative stage**
- Inter culture for weeding
- Protective irrigation if possible
- Opening of alternate furrows with Balaram plough
- Spraying of 2% urea and DAP

**Flowering / fruiting/ Reproductive stage**
- Protective irrigation if possible
• Opening of alternate furrows with Balaram plough
• Spraying of 2% urea and DAP

**Terminal drought**

• Life saving irrigation
• Foliar spray of 2% KNO₃, urea and DAP
• Plan for rabi crops chickpea / safflower

**Green gram**

**Sorghum / safflower**

**Vegetative stage**

**Early season drought**

• If the plant population is less than 75% of optimum, go for resowing of the alternate crops like sunflower / pigeonpea
• If possible give protective irrigation with sprinkler
• When the crop is 2 weeks old take up interculture with hoe

**Vegetative stage**

• Inter culture for weeding
• Protective irrigation if possible
• Opening of alternate furrows with Balaram plough.
• Spraying of 2% urea and DAP

**Flowering / fruiting/Reproductive stage**

• Protective irrigation if possible

**Terminal drought**

• Harvest at physiological maturity or in case of severe drought use as fodder/ green manuring
• Plan for rabi crops chickpea/safflower/rabi sorghum/sunflower

**Soybean**

**Early season drought**

• Gap filling within the rows with same or short duration cultivar to maintain at least
• 75% plant population or if the plant population is less than 50% re sow the crop
• Avoid applying fertilizers till sufficient soil moisture is available
Vegetative stage
- Interculture for weeding and to create soil mulch.
- Give protective irrigation wherever possible
- Opening of alternate furrows with Balaram plough.
- Spraying of 2% urea and DAP

Flowering / fruiting stage or At reproductive stage
- Give protective irrigation wherever possible
- Opening of alternate furrows with Balaram plough
- Spraying of 2% urea and DAP

Terminal drought
- Give protective irrigation wherever possible
- Plan for rabi crops chickpea / safflower / rabi sorghum / sunflower

Irrigated conditions

Delayed limited release of water in canals due to low rainfall

Medium-deep black soils
- Cotton (irrigated) wheat instead of turmeric and sugarcane.

Limited irrigation- Shallow black soils
- Maize, Cotton instead of Ginger and vegetables
- Under Limited irrigation conditions, follow Alternate furrow irrigation and Drip irrigation

Non release of water in canals under delayed onset of monsoon in catchment

Medium-deep black soils
- **Cotton**: Recommended spacing (120 x 45 cm) and 80:40:40 NPK kg/ha

Shallow black soils
- Cotton and Maize, Alternate furrow irrigation Lack of inflows into tanks due to insufficient/ delayed onset of monsoon

Lack of inflows into tanks due to insufficient/delayed onset of monsoon

Medium-deep black soil

**Cotton**
- Recommended spacing(120 x 45 cm) and 80:40:40 NPK Kg/ha

Shallow black soils
- Cotton and maize, Alternate furrow irrigation Insufficient groundwater recharge
due to low rainfall
  • Insufficient groundwater recharge due to low rainfall

**Medium-deep black soil**

**Cotton**
  • Recommended spacing (120 x 45 cm) and 80:40:40 NPK Kg/ha

**Shallow Black Soils**
  • Cotton and maize, Alternate furrow irrigation

**Unusual Rains**

**Cotton**

*Vegetative Stage*
  • Drain excess water
  • Interculture at optimum soil moisture
  • Apply 25 Kg N/ha to cotton

*Flowering Stage*
  • Drain excess water

*Maturity Stage*
  • Drain out excess water, timely harvest

*Post Harvest*
  • Protect picked cotton from drenching and soiling
  • Dry wet cotton and market

**Maize**

*Vegetative Stage*
  • Drain out excess water as early as possible
  • Intercultivation and Earthing up

*Flowering Stage*
  • Drain out excess water as early as possible
  • Intercultivation and Earthing up

*Crop Maturity*
  • Drain out excess water
  • Harvest green cobs from dislodged plants for immediate marketing

*Post Harvest*
  • Drain out excess water
• Harvest green cobs from dislodged plants for immediate marketing

**Soybean, Pigeonpea and short duration pulses**

**Vegetative stage**
- Drain out excess water

**Flowering stage**
- Drain out excess water as early as possible Inter cultivation and earthing up

**Maturity stage**
- Drain out excess water as early as possible Inter cultivation and earthing up

**Post harvest**
- Shift to safer place
- Dry the produce

**Horticulture**

**Mango/Sweet orange**

**Vegetative stage**
- Opening of field channels to drain out excess water and avoid surface ponding, Interculture at optimum soil moisture

**Flowering stage**
- Opening of field channels to drain out excess water and avoid surface ponding, Interculture at optimum soil moisture

**Maturity stage**
- Collect fallen fruits, grade and market if feasible

**Post harvest**
- Grading, cleaning and marketing of fruits

**Heavy rainfall with high speed winds in a short span**

**Cotton**

**Vegetative stage**
- Drain excess water
- Interculture at optimum soil moisture
- Apply 25KgN/Ha to cotton

**Flowering stage**
- Drain excess water and Timely harvest

**Maturity stage**
- Protect picked cotton from drenching and soiling
• Dry wet cotton and marketing

**Maize**

**Vegetative stage**
• Drain out excess water as early as possible

**Flowering stage**
• Drain out excess water as early as possible

**Maturity stage**
• Drain out excess water
• Harvest green cobs from dislodged plants for immediate marketing

**Post harvest**
• Harvest cobs after proper drying
• Dry the grain to optimum moisture content before storage

**Soybean, Pigeonpea and short duration pulses**

**Vegetative stage**
• Drain out excess water as early as possible

**Flowering stage**
• Drain out excess water as early as possible

**Maturity stage**
• Drain out excess water.
• Harvest at physiological harvest

**Post harvest**
• Shift the produce at safer place

**Horticulture**

**Mango/sweet orange**

**Vegetative stage**
• Drain out excess water

**Flowering stage**
• Provide support to prevent lodging and uprooting in young orchards

**Maturity stage**
• Apply multinutrient and hormonal spray to promote flowering

**Post harvest**
• Shift the produce at safer place
Outbreak of diseases and pests

**Cotton**

**Vegetative stage**
- Apply soil drench of carbendazim 0.1% or COC @ 3g/litre at base of plants to prevent wilt in low lying patches

**Flowering stage**
- Apply foliar spray of streptocycline sulphate @ 6g/60 litre + COC @ 25g/10 litre to prevent bacterial leaf blight
- Apply Sulphur 25g/10 litre (300 mesh) to prevent grey mildew. Apply MgSO4 25 kg/ha soil application or 1% MgSO4 foliar spray to prevent leaf reddening

**Maturity stage**
- Foliar spray of carbendazim 0.1% or Dithane M-45 0.2% to prevent boll rot

**Maize**

**Flowering stage**
- Foliar application of Mancozeb at0.25-0.5% at 8-10 days interval to control Turcicum leaf blight

**Soybean**

**Vegetative stage**
- Manually remove infested plants or plant parts from below the girdles
- Protect against semi looper when density reaches >4 larvae per meter row with foliar spray of NSKE 5% or dimethoate 30 EC 1 ml/litre

**Horticulture**

**Mango**

**Vegetative stage**
- Spray imidacloprid 0.3 ml or dimethoate 1 ml/liter to control hopper
- Drench the seedlings with COC0.25% against root rot

**Flowering stage**
- Protect against hoppers

**Maturity stage**
- Spray Dithane M 45 3g/litre or carbendazim 1g/liter against anthracnose
- Spray sulphur 0.5% to control powdery mildew

**Post harvest**
- Maintain aeration in storage to prevent fungal infection and blackening or fruits
Sweet orange

Vegetative stage
- Protect against Citrus Psylla with foliar spray of malathion 50 EC 10 ml or quinalphos 25EC 10 ml or cypermethrin 25EC 4 ml per 10 liters

Flowering stage
- Protect against Citrus Psylla with foliar spray of malathion 50 EC 10 ml or Quinalphos 25 EC 10 ml or cypermethrin 25EC 4 ml per 10 liters

Extrem events

Heat wave
Sweet orange

Nursery/Seedling stage
- Frequent irrigation, Shade temporary shade net, Mulching, Irrigation and pruning of affected branches/twigs

Reproductive stage
- Irrigation and pruning of affected branches / twigs
- Apply 1% Bordeaux paste to cut ends

At harvest
- Immediate harvesting, grading and marketing

Cold wave
Sweet orange

Nursery/Seedling stage
- Protect with polythene sheet

Vegetative stage
- Smoking, frequent and light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizers

Reproductive stage
- Smoking, frequent and light irrigation during evening hours, basin mulching, apply supplementary dose of fertilizers
## Nandurbar

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops /cropping systems/ Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shallow black soils</strong></td>
<td></td>
</tr>
<tr>
<td><strong>June 4th week</strong></td>
<td><strong>Pearlmillet</strong> (Shraddha, Saburi, Shanti) - Application of 25 kg K₂O per ha as basal dose-One hoeing and weeding before 30 DAS</td>
</tr>
<tr>
<td></td>
<td><strong>Greengram/Blackgram Greengram</strong> (Phule Vaibhav, Blackgram-TPU-4) One hoeing and weeding before 30 DAS, Sorghum CSH-14, I</td>
</tr>
<tr>
<td><strong>2nd week of July</strong></td>
<td><strong>Pearlmillet</strong> (Shraddha, Saburi, Shanti)</td>
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<td><strong>Upland paddy</strong> (Phule Radha, Indrayani, Bhogavati) - Direct seeding with seed drill - Weed free condition up to 40 days, N split application (50 kg N at sowing &amp; 50 kg N at 25 DAS)</td>
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<td><strong>Pearlmillet</strong> (Shraddha, Saburi, Shanti) + <strong>Pigeonpea</strong> (Vipula/BSMR-736) (2:1), <strong>Soybean</strong> (JS-335) + <strong>Pigeonpea</strong> - Preparation of conservation furrows after harvest of pearl millet/soybean for moisture conservation- Weed free condition up to 30 DAS</td>
</tr>
<tr>
<td></td>
<td><strong>Soybean</strong> (JS-335) - Hoeing at 25 DAS- Weed free condition up to 30 DAS</td>
</tr>
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<td><strong>July 2nd week</strong></td>
<td><strong>Upland Paddy</strong> (Phule Radha, Pavana) - Direct seeding with seed drill - Weed free condition up to 40 days, N split application (50 kg N at sowing &amp; 50 kg N at 25 DAS)</td>
</tr>
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<td></td>
<td><strong>Pigeonpea/Pigeonpea</strong> (Vipula/BDN-708) + <strong>Clusterbean</strong> (1:2), Opening of one conservation furrow after harvest of cluster bean</td>
</tr>
<tr>
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<td><strong>Soybean Sunflower</strong> (SS-56/Bhanu/Phule Raviraj) - Seed treatment with Imadachlorid 70 WS @ 5-7 g per kg of seed - Hoeing at 20 DAS - Weeding up to 30 DAS</td>
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<tr>
<td><strong>July 4th week</strong></td>
<td><strong>Sunflower</strong> (SS-56/Bhanu/Phule Raviraj) - Seed treatment with Imadachlorid 70 WS @ 5-7 g per kg of seed - Hoeing at 20 DAS - Weeding up to 30 DAS</td>
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<td><strong>June 4th week</strong></td>
<td><strong>Cotton Bt cotton</strong> - Hoeing at 20, 60 DAS- Weeding at 30 DAS</td>
</tr>
<tr>
<td></td>
<td><strong>Maize</strong> (Karveer, Phule Rajarshee) - Sowing on ridges - Weeding at 25 DAS</td>
</tr>
</tbody>
</table>
Drought Management

**Rainfed conditions**

**Soya bean**

*Early vegetative growth*
- In case of less than 30% germination take up resowing with wider spacing of 45 cm with sufficient soil moisture
- Hoeing/weeding

*Vegetative stage*
- Protective irrigation
- Use of 8% kaolin spray
- 2% urea spray
- Hoeing and weeding

*Flowering stage*
- Protective irrigation
- Hoeing and weeding

*Terminal drought*
- Protective irrigation
- Chickpea (Vijay/Digvijay) or Wheat (Trimbak, Panchavati, Godavari) under assured irrigation

**Irrigated conditions**

Lack of inflows into tanks due to insufficient/delayed onset of monsoon

- Uplands, light/red soils- or Medium, medium or deep black soils - tank fed
  - Late *kharif* onion (Phule Samarth/Baswant 780) Chilli (Phule Jyoti/Local Broad Bed Furrows, Drip irrigation)

Insufficient groundwater recharge due to low rainfall

- Uplands, light/red soils- or Medium, medium or deep black soils - Open well
<table>
<thead>
<tr>
<th>Crops</th>
<th>Varieties and Agronomic practices</th>
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<tbody>
<tr>
<td>Cotton</td>
<td>Bt cotton Skip row irrigation/Drip irrigation - Wheat Trimbak, Godavari, Tapovan Irrigate at critical stages CRI and flowering stage</td>
</tr>
<tr>
<td>Chickpea</td>
<td>(Vijay, Digvijay), Sprinkler irrigation</td>
</tr>
<tr>
<td>Onion</td>
<td>Late <em>kharif</em> onion (Phule Samarth/Baswant 780) S irrigation</td>
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<tr>
<td>Chilli</td>
<td>(Phule Jyoti/Local Broad Bed) Furrows, Drip irrigation</td>
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<tr>
<td>Tomato</td>
<td>(Phule Raja) Drip irrigation</td>
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</table>
## Pune

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<td><strong>June 4th week</strong></td>
<td>Sorghum CSH-14, CSH-16, CSH-17 • Frequent intercultivations • Groundnut JL-24, JL-501, JL-286 Hoeing and weeding up to 30 DAS, Pigeon pea Vipula, BDN-708, ICPL-87 Hoeing and weeding • Opening of conservation furrows after every two rows</td>
</tr>
<tr>
<td><strong>July 2nd week</strong></td>
<td>• Sorghum CSH-14, CSH-16, CSH-17 • Hoeing and weeding 20 DAS and 40 DAS • Groundnut JL-24, JL-501, JL-286 • Hoeing and weeding up to 30 DAS • Pigeon pea Vipula, BDN-708, ICPL-87 • Hoeing and weeding at 20 DAS • Opening of conservation furrows after every two rows</td>
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<tr>
<td><strong>July 4th week</strong></td>
<td>• Sorghum CSH-14, CSH-16, CSH-17 • Protective irrigation • Hoeing and weeding 20 DAS and 40 DAS • Groundnut / Sunflower (Bhanu) Hoeing and weeding in sunflower at 20 DAS • Pigeon pea Vipula, BDN-708, ICPL-87 Hoeing and weeding at 20 DAS • Opening of conservation furrows after every two rows</td>
</tr>
<tr>
<td><strong>2nd week of August</strong></td>
<td>• Sorghum CSH-14, CSH-16, CSH-17 • Protective irrigation Hoeing and weeding 20 DAS and 40 DAS • Sunflower (Bhanu) Hoeing and weeding in sunflower at 20 DAS • Pigeon pea Vipula, BDN-708, ICPL-87 • Hoeing and weeding at 20 DAS Opening of conservation furrow</td>
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<tr>
<td><strong>Medium deep black Soils</strong></td>
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</tr>
<tr>
<td><strong>June 4th week</strong></td>
<td>• Sorghum CSH-14, CSH-16, CSH-17 • Frequent intercultivations Low land paddy Indrayani, Pavana, Phule Samrudhi • Staggered planting in nurseries for timely availability of seedlings • Groundnut JL-24, JL-501, JL-286 Hoeing and weeding up to 30 DAS • Soybean JS-335, JS-9305 Hoeing and weeding • Pearl millet Shraddha, Saburi, Shanti Hoeing and weeding</td>
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<tr>
<td><strong>July 2nd week</strong></td>
<td>• Sorghum CSH-14, CSH-16, CSH-17 • For shoot fly control, seed treatment with Carbosulphan @ 2 g/kg • Intercultivation at 20 DAS and 40 DAS • Low land paddy Indrayani, Pavana, Phule Samrudhi Staggered planting in nurseries for timely availability of seedlings • Groundnut JL-24, JL-501, JL-286 Hoeing and weeding up to 30 DAS • Soybean JS-335, JS-9305 Hoeing and weeding at 30 DAS • Pearl millet Shraddha, Saburi, Shanti • Hoeing and weeding 20 DAS and 40 DAS</td>
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Soybean Sunflower (Bhanu) Hoeing and weeding in sunflower at 20 DAS • Pearl millet Sunflower (Bhanu) or pigeonpea (Vipula/ BDN-708) Hoeing and weeding in sunflower at 20 DAS  
Hoeing and weeding at 20 DAS opening of conservation furrows after every two rows |
| **August 2nd week** | • Sunflower (Bhanu) Pigeonpea (Vipula) Hoeing, thinning and weeding before 30 DAS and protective irrigation in sunflower • Hoeing and weeding at 20 DAS Opening of conservation furrows after every two rows in pigeonpea • Dolichus sp, Sunflower (Bhanu) Hoeing and weeding in sunflower at 20 DAS |

**Shallow red soils**

| **June 4th week** | • Low land Paddy Indrayani, Pavana, Phule Samrudhi Staggered planting in nurseries for timely availability of seedlings • Groundnut JL-24, JL-501, JL-286 • Hoeing and weeding Pearl millet Shraddha, Saburi, Shanti |
| **July 2nd week** | • Low land Paddy Indrayani, Pavana, Phule Samrudhi • Staggered planting in nurseries for timely availability of seedlings • Groundnut JL-24, JL-501, JL-286  
Groundnut + Pigeon pea (Vipula, BDN 708) (6:2)  
• Hoeing and weeding Protective irrigation |
| **July 4th week** | • Low land Paddy Indrayani, Pavana, Phule Samrudhi • Staggered planting in nurseries for timely availability of seedlings • Groundnut Pearl millet (Shraddha, Saburi, Shanti)  
• Hoeing and weeding at 20 DAS • Protective irrigation  
• Pearl millet Shraddha, Saburi, Shanti |
| **August 2nd week** | • Dolichos, sunflower (Bhanu) • Hoeing, thinning and weeding before 30 DAS  
Protective irrigation and pearl millet |
Drought Management

*Rainfed conditions*

**Medium deep black Soils**

**Sorghum**

*Seedling stage*
- Intercultivation, weeding and hoeing, resowing if necessary

*Vegetative stage*
- Hoeing/Weeding
- Use of 8% kaolin spray, 2 % urea spray
- Removal of every third row and use for mulching

*Reproductive/Flowering stage*
- Supplemental irrigation, urea 2% spray

*Terminal stage*
- Rainwater harvesting and supplemental irrigation

**Low land paddy**

*Seedling stage*
- Dapog method of transplanting if necessary

*Vegetative stage*
- Protective irrigation, urea bricks

*Flowering stage*
- Protective irrigation, urea 2% spray

*Terminal stage*
- Rainwater harvesting through farm ponds and protective irrigation

**Shallow red soils**

**Groundnut**

*Early vegetative growth*
- Resowing if needed Intercultivation, weeding and hoeing

*Vegetative stage*
- Hoeing/Weeding
- Use of 8% kaolin spray 2% urea spray, protective irrigation

*Flowering*
- Apply 8% kaolin spray, 2% urea spray and protective irrigation
Terminal stage
  • Protective irrigation

Irrigated conditions

Delayed release of water in canals due to low rainfall
  Medium deep black Soils

Pearl millet
  • Life saving irrigation
  • Hoeing Weeding

Under irrigated conditions prefer the following varieties:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>Rajarshee</td>
</tr>
<tr>
<td>Wheat or gram</td>
<td>Vijay, Digvijay</td>
</tr>
<tr>
<td>Sunflower</td>
<td>Bahnu, Phule Raviraj</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>Vipula, BDN-708, ICPL-87</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>Shradda, Saburi, Shanti</td>
</tr>
<tr>
<td>Onion</td>
<td>N-2-4-1, Baswavant-780, Phule Samarth</td>
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<tr>
<td>Tomato</td>
<td>Dhanasree, Baghyasree, Phule Raja</td>
</tr>
<tr>
<td>Brinjal</td>
<td>Hybrid Krishna</td>
</tr>
<tr>
<td>Potato</td>
<td>Kufri Pokhraj, Kufri Laukar</td>
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<tr>
<td>Tuberose</td>
<td>Phule Rajani</td>
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Deep black soils

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety/Agronomic practice</th>
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<td>Sugarcane</td>
<td>Alternate furrow irrigation</td>
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<tr>
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<td>N-2-4-1, Baswavant-780, Phule Samarth</td>
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<td></td>
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<td>Tuberose</td>
<td>Phule Rajani</td>
</tr>
</tbody>
</table>

Limited release of water in canals due to low rainfall

Medium deep black Soils
  • Sugarcane, Pearl millet, Maize (Rajarshee), Wheat (Triambak and Tapovan), Chickpea (Vijay, Digvijay)
  • Sunflower (Bahnu, Phule Raviraj)+pigeonpea (Vipula) (2:1)
Pearl millet (Shradda, Saburi, Shanti) + Pigeonpea (Vipula, BDN-708, ICPL-87) (2:1),
Onion (N-2-4-1, Baswavant-780, Phule Samarth)
Tomato (Dhanasree, Baghyasree, Phule Raja)
Brinjal (Hybrid Krishna)
Potato (Kufri Pokhraj, Kufri Laukar)
Tuberose (Phule Rajani)

Deep black soils
Sugarcane
- Alternate furrow irrigation
- Onion (N-2-4-1, Baswavant-780, Phule Samarth), life saving irrigation, hoeing, weeding
- Tomato (Dhanasree, Baghyasree, Phule Raja)
- Brinjal (Hybrid Krishna)
- Tuberose (Phule Rajani)
- Life saving irrigation hoeing and weeding are to be done commonly to all above crops

Non release of water in canal under delayed onset of monsoon in catchment
Shallow red soils: No crop
Medium deep black Soils
- Sugarcane, pearl millet, maize
- Irrigation at critical stages

<table>
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<tr>
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<tr>
<td>Chickpea</td>
<td>Vijay, Digvijay</td>
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<tr>
<td>Sunflower + Pigeonpe (2:1)</td>
<td>(Bahnu, Phule Raviraj) + (Vipula)</td>
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<td>Pearl millet + Pigeonpe (2:1)</td>
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</tr>
<tr>
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<td>Phule Raja</td>
</tr>
<tr>
<td>Wheat</td>
<td>Triambak, Tapovan</td>
</tr>
</tbody>
</table>
- Life saving irrigation hoeing, weeding to be followed to all above crops
Deep black soils

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion</td>
<td>(N-2-4-1, Baswavant-780, Phule Samarth)</td>
</tr>
<tr>
<td>Tomato</td>
<td>(Dhanasree, Baghyasree, Phule Raja)</td>
</tr>
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<td>(Hybrid Krishna)</td>
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</tbody>
</table>

Sugarcane

- Alternate furrow irrigation
- Life saving irrigation Hoeing, Weeding are to be followed to all above crops

Lack of inflows into tanks due to insufficient/delayed onset of monsoon

Medium deep black Soils

- Sugarcane, pearl millet, maize
- Irrigation at critical stages

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Chickpea</td>
<td>Vijay, Digvijay</td>
</tr>
<tr>
<td>Sunflower + Pigeonpea (2:1)</td>
<td>(Bahnu, Phule Raviraj) + (Vipula)</td>
</tr>
<tr>
<td>Pearl millet + Pigeonpea (2:1)</td>
<td>(Shradda, Saburi, Shanti) + (Vipula, BDN-708, ICPL-87)</td>
</tr>
<tr>
<td>Onion</td>
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Deep black soils

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Sugarcane

- Alternate furrow irrigation
- Life saving irrigation Hoeing, Weeding are to be followed to all above crops
Unusual rains

Pearl millet

Vegetative stage
- Drain excess water from field 2% urea spray

Reproductive stage
- Drain excess water from field

Crop maturity stage
- Drain excess water from field

At harvest
- Sorting, drying, cleaning, marketing

Onion

Vegetative stage
- Planting of border row crops viz. Maize, Mustard, Pearl millet
- Application of nitrogen 25% more than recommended dose to avoid leaching losses

Reproductive stage
- Drain excess water from field

Crop maturity stage
- Drain excess water from field

At harvest
- Sorting, drying, cleaning and marketing

Floods

Transient water logging/partial inundation

Sorghum/cereals Paddy/Sugarcane/Groundnut/Pulses

Seedling/Nursery stage/Vegetables
- Take up resowing if mortality rate is high.
- Extend the period of transplanting
- Open trench or increase aeration of nursery area by increasing drainage or infiltration rate
- Plant control measures to be taken up in onside ration of outbreak of pest/disease
- Fore warning
- Use of polythene sheet on nursery to avoid damage
Vegetative stage

- Forewarning to farmers regarding abnormal situation to get prepared for normality
- Open trench to drain out the excess water from field
- Increase infiltration rate of field & increase the aeration of field to improve root system
- Adopt plant protection measures in regards outbreak of pest/disease
- Input availability against pest/disease out breaks

Reproductive stage

- Forewarning to farmers regarding ensuing situation
- Harvest the produce if it is ready for harvesting
- Proper drying and storage of produce
- Send the good quality produce to the market for sale
- Open trench to drain out excess water from field
- Increase infiltration rate of field & increase the aeration of field to improve root system

At harvest

- For warning should be given of situation
- Harvest the produce dry it properly and store good place
- If possible, send it to the market for sale
- Adopt plant protection measures
- Arrange for help to farmers through State/Central schemes for warning should be given of situation
- Harvest the produce dry it properly and store good place
- If possible, send it to the market for sale
- Adopt plant protection measures
- Arrange for help to farmers through State/Central schemes
# Ratnagiri

<table>
<thead>
<tr>
<th>Time period</th>
<th>Suggested contingency crops /cropping systems/ Varieties</th>
</tr>
</thead>
</table>
| 3rd week of June   | **Upland medium deep to shallow soils**  
|                    | *Paddy* Prefer early matured varieties  
|                    | (Ratnagiri-73, Ratnagiri-24, Ratnagiri-1)  
|                    | **In Mid-land medium deep soils**  
|                    | Paddy Prefer early matured varieties  
|                    | (Ratnagiri-1, Karjat-3, Ratnagiri-24, Ratnagiri-5, Karjat-7)  
|                    | **In Low land deep soils go for Paddy**  
|                    | In Hill slope shallow soils take up Finger millet, Prosomillet  |
| 1st week of July   | **Upland medium deep to shallow soils**  
|                    | *Paddy*: Prefer very early matured varieties  
|                    | (Ratnagiri-73, Karjat-184), Sowing of sprouted seed  
|                    | *Cowpea*: (Var. Konkan Sadabahar), Black gram (TPU-4)  
|                    | Oil Seed like Niger (Var. IGP 76)  
|                    | **Groundnut**: Prefer short duration variety 17.323 “SB XI, TG-26”  
|                    | Niger Black gram  
|                    | **Mid-land medium deep soils**  
|                    | *Paddy*: Early matured varieties  
|                    | (Ratnagiri-73, Karjat-184, Ratnagiri -2)  
|                    | **Low land deep soils**  
|                    | *Paddy*: Mid-late duration varieties  
|                    | (Ratnagiri-4, Palghar-1 Palghar-2, Karjat-5 )  
|                    | **Hill slope shallow soils**  
|                    | Pulses like cowpea (Var. Konkan Sadabahar), black gram (TPU- 4), Oil Seed like Niger (Var. IGP 76)  |
| 3rd week of July   | Generally such situation not occur  |
| 2nd week of August | Generally such situation not occur  |

## Drought Management

### Rainfed conditions

**Upland medium deep to shallow soils**

**Early vegetative growth**
Paddy
- Increase number of seedling per hill (5 to 6)
- Increase 25% nitrogen dose for shortage of seedling
- Prepare seedling by mat nursery using short duration variety
- Protective irrigation for nursery
- Adopt close spacing (15 x 15 cm)
- Use water from the outside sources like farm ponds, nalas, streams, rivers for puddling

Finger millet/Proso millet
- Increase 25% nitrogen dose
- Adopt closer spacing (15 x 15 cm)
- Protective irrigation after transplanting Use water from outside sources like farm ponds, nalas, streams, river

Groundnut, Niger, Blackgram
- Midland/low lands/Paddy
  - Increase number of seedling per hill (5 to 6), Increase 25% nitrogen dose, protective irrigation
  - Hill slopes shallow soils

Vegetative stage

Upland medium deep to shallow soils

Paddy/Finger millet/Proso millet
- Adopt weed management practices
- Protective irrigation
- Apply split dose of Nitrogen after restart of rain

Groundnut
- Mulching with tree lopping or glyricidia leaves
- Adopt weed management practices with dry land weeder
- give protective irrigation

Mid-land medium deep soils/low lands medium soils

Paddy
- Adopt weed management practices
- Protective irrigation
- Maintain the existing water level in the field
• Apply split dose of Nitrogen after restart of rains

**Hill slope shallow soils**

• Finger millet/proso millet
• Adopt weed management practices
• Give protective irrigation if possible
• Apply split dose Nitrogen after restart of rains

**Flowering/Fruiting stage**

**Upland medium deep to shallow soils**

**Paddy/finger millet/proso millet**

• Protective irrigation

**Groundnut**

• Mulching with tree lopping or glyricidia leaves Protective irrigation

**Midland/low lands**

**Paddy**

• Protective irrigation Maintain the existing water level in the field

**Hill slopes shallow soils**

• Finger millet, pros millet

**Upland medium deep to shallow soils**

• Paddy/Finger millet/Proso millet/Groundnut/Cow pea/Niger
  Plan for *rabi* crops like Cowpea, groundnut, water melon, leafy vegetables, raising of seedlings for chilli, brinjal, cabbage, knol knoll,

**Protective irrigation**

• Harvest crop at physiological maturity
• Plan for *rabi* crops like Horse gram, cowpea, water melons cucurbitaceous crops Leafy vegetables
• Raising of seedling for chilli, brinjal, cabbage, knol kohl
• Low land deep soils; Paddy
• Sow field bean, horse gram, cowpea, mustard green gram on residual moisture for low land situations

**Hill slope shallow soils**

**Finger millet/proso millet:** Harvest crop at physiological maturity

**Irrigated conditions**

Delayed release of water in canals due to low rainfall conditions
Mid and low land Medium deep to deep soils

**Paddy (Rabi season)**
- Prefer early duration variety (Ratnagiri 73, Ratnagiri-1) or Grow short duration pulses viz. cowpea (Var. Konkan Sadabahar), under control irrigation and tail end area Dapog/mat technique of nursery raising, Young seedling transplanting, SRI Technique

**Groundnut**
- Prefer short duration variety (Phule Pragati)

**Non release of water in canals under delayed onset of monsoon in catchment**

Mid and low land Medium deep to deep soils
- Field bean, horse gram black gram, cowpea, mustard on residual moisture under low land situation Minimum tillage and sowing of seed by dibbling.

**Pulses (Cowpea, Horsegram/Green gram)/Vegetables/Watermelon Groundnut:**
If farm pond water is available go for short duration pulses and leafy vegetables

**Lack of in flows into tanks due to insufficient/delayed onset of monsoon**

Mid and low land Medium deep to deep soils
- Wal (lablab bean) - Var. Konkan Wal No. 1, Horse gram - Var. Dapoli - 1 on residual moisture under low land situation
- Minimum tillage and sowing of seed by dibbling

**Relay cropping**

**Groundnut/Pulses (Cowpea, Horsegram/ Green gram/Vegetables/Water melons**
- If farm pond water is available go for short duration pulses and leafy vegetables Minimum tillage

**Unusual Rains**

**Mango**
- If heavy rainfall is occurs during 15th July to 15th Aug
- Postpone Paclobutrazol application till congenial condition arrives to induce early flowering (Dose of Paclobutrazol @ of 0.75 g/i.e., per meter average canopy diameter)

**Banana/cucurbits**
- Drain out excess water
**Mango/Cashew**

**Vegetative stage**
- Prune the broken branches and apply carbaryl (50 WP) mixed with Bordeaux paste on cut surface and trunk
- Transient water logging/ partial inundation

**Floods**

**Paddy**

**Seedling stage**
- If washed out resowing of nursery by using mat nursery/sowing of sprouted seed puddled field

**Vegetative stage**
- Drain out excess water
- Apply dose of nitrogen after submergence is over

**Reproductive stage**
- Drain out excess water

**Post harvest**
- Immediate harvesting, immediate threshing and drying in shed
- Sea water intrusion

**Sea water intrusion**

**Paddy**

**Seedling/Nursery stage**
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water
- Irrigate the affected area with fresh water and drain out
- If crop is washed out resowing of nursery with salt tolerant varieties like Pnvel-1 and Panvel-2 should be taken up

**Vegetative stage**
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, Irrigate the affected area with fresh water and drain out

**Flowering/Reproductive stage**
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, Irrigate the affected area with fresh water and drain out
At harvest
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, irrigate the affected area with fresh water and drain out

Coconut
Seedling/Nursery stage
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, irrigate the affected area with fresh water and drain out
- Mound the crop with soil

Vegetative stage
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, irrigate the affected area with fresh water and drain out

Flowering/Reproductive stage
- Strengthening of creek bund and sea wall to prevent sea water intrusion
- Drain out sea water, irrigate the affected area with fresh water and drain out at harvest

Heat wave

Mango
Seedling stage
- Cover with shade net/Protective irrigation, spray water at seedling stage
- Support the young seedlings grafts

Vegetative stage
- Water spray/1% potassium nitrate spray

Reproductive stage
- Collect dropped fruits and use it for suitable processing

At harvest
- Collect dropped fruits and use it for suitable processing

Cashew
Seedling stage
- Cover with shed net /Protective irrigation, Water spray

Vegetative stage
- Protective irrigation

Reproductive stage
- Protective irrigation
Coconut/Arecanut

**Seedling stage**
- Cover with shed net/Protective irrigation/Water spray

**Vegetative stage**
- Frequent irrigation

**Reproductive stage**
- Frequent irrigation

**At harvest**
- Frequent irrigation

---

**Hail storm**

**Mango**

**Reproductive stage**
- Collect and destroy the fallen fruit to avoid the further built-up of pest and disease

**At harvest**
- Collect the fallen fruit to avoid the further built-up of pest and diseases

**Cashew**

**Seedling stage**
- Support the young seedlings/grafts

**Vegetative stage**
- Proper pruning of damage or broken branches

**Reproductive stage**
- Proper pruning of damage or broken branches

**At harvest**
- Proper pruning of damage or broken branches

**Arecanut and coconut**

**Seedling stage**
- Support the young seedlings

**Reproductive stage**
- Collect fallen tender nuts market and market it

**At harvest**
- Collect fallen tender nuts market and market it
4. Contingency plans for fodder production

**Early season drought**

Short to medium duration cultivated fodder crops like sorghum (Pusa Chari Hybrid-106 (HC-106), CSH 14, CSH 23 (SPH-1290, CSV 17 etc) or Bajra (CO 8, TNSC 1, APFB 2, Avika, Bajra Chari (AVKB 19) etc., or Maize (African tall, APFM-8 etc.) which are ready for cutting by 50-60 days and can be sown immediately after the rains under rainfed conditions in arable lands during *kharif* season.

If normal rain occurs during later part of the year, *rabi* crops like Berseem (Wardan, UPB-110 etc) or Lucerne (Co-1, LLC-3, RL-88 etc) can be grown as second crop with the available moisture during winter. In waste lands, fodder varieties like Bundel Anjan-3, Co-1 (Neela Kalu Kattai), *Stylosanthes scabra* etc. can be sown for fodder production.

**Midseason drought**

Mid season drought affects the growth of the fodder crops. Once rains are received, in later part of the season the crop revives and immediate fertilization helps in speedy recovery. If sufficient moisture is available, *rabi* crops like berseem (Wardan, UPB-110 etc), lucerne (Co-1, LLC-3, RL-88 etc.) can be grown during winter. In waste lands fodder varieties like Bundel Anjan-3, Co-1 (Neela Kalu Kattai), *Stylosanthes scabra* etc., can be sown for fodder production.

**Late season drought**

As late season drought affects seed setting, normal short duration fodder crops may be sown. Avoid multicut fodder varieties under rainfed conditions. All the available fodder must be harvested before drying-out to preserve nutritive quality. Depending on availability of moisture, *rabi* fodder crops especially low water requiring varieties of Lucerne may be planted. Normal intensive fodder systems may be followed under irrigated conditions.

**Augmenting green fodder when rains fail during *kharif***

In case of complete or major failure of grain crops in *Kharif*, contingency strategies for ensuring fodder supplies include:

- Available stover from cereals may be preserved as hay and fields may be re-sown with short to medium duration fodder varieties of millets, pulses or forage crops such as Sorghum - varieties/hybrids CSV-17 and CSH 14 in red soils; CSH 16, CSH 18 and CSH-21 in black soils
- Bajra-short duration varieties like Rajko, JB, PSB-2, GHB-526, HHB-67, ICMH-356, Shraddha, GK-1004 or medium duration varieties like GHB-558, Proagro-9443 and for late assured rainfall areas in light to medium soils of Marathwada region varieties like AHB-251
- Maize - African tall, APFM 8, PEHM-3 and FH-3077 which produce some grain and fodder
- Intercropping cowpea varieties like Bundel Lobia-1, Co-5, Co-8, IFC 8401, UPC-8705, DFC-1 and UPC-625 after 8 to 10 rows of finger millet
- *Rabi* fodder crops like berseem (Mescavi, Wardan, UPB 110), lucerne (Co-1, LLC-3, RL-88) should be sown in arable lands and tank beds.
- Current fallows should be used for fodder production by sowing short duration varieties of sorghum or bajra or ragi or maize or cowpea in *kharif* season and or berseem or lucerne in *rabi* season.
- In wastelands, grasses like *Cenchrus ciliaris*, *Cenchrus setigerus*, *Chloris gayana*, *Panicum maximum*, *Desmanthus virgatus*, *Stylosanthes scabra* can be taken up to increase forage production.
- In areas that receive north east monsoon rains, multi-cut fodder varieties of sorghum (Co-27, Pant Chari-5 (UPFS-32), COFS-29 or Pearl millet (Co-8) or maize (African tall) are recommended.
- In areas that receive summer rains, fodder crops like cowpea and maize are recommended.

**Fodder production strategies during drought**

In general, livestock farmers do not make special efforts for forage and pasture management during drought years. This leads to severe fodder crisis, which ultimately force distress sale of valuable animals for slaughter. Early season drought reduces the area under fodder crops, whereas mid season drought impacts fodder availability especially during lean period. Terminal drought has much less effect on fodder production but it affects the availability of seed material for the succeeding year. Most of the fodder crops can be revived with rain and subsequent fertilization.

A multi-pronged strategy to meet the fodder requirement of the region:

- Production of quality seeds (Breeder and foundation seeds) of selected promising varieties/hybrids with participation of farmers.
- Organizing fodder production programme by promoting appropriate and region-specific varieties.
- Post-harvest management techniques like fodder block making units, chaff cutter for fodder processing and silage making.

**Strategies for augmenting fodder production**

- Growing of High yielding perennial (Hybrid Napier varieties like CO-3, CO-4, APBN-1 etc.) and multicut fodder varieties (MP Chari, SSG etc)
- Growing of two or more annual fodder crops as sole crops in mixed stands of legume (Stylo or cowpea or hedge lucerne etc.) and cereal fodder crops like sorghum, ragi in rainy season
- Cultivation of short season fodder crops like sorghum and maize fodder.
✓ Fodder crops like *Stylosanthes hamata* and *Cenchrus ciliaris* can be sown in the inter spaces between the tree rows in orchards or plantations as hortipastoral and silvipastoral systems.

✓ Perennial deep rooted top feed fodder trees and bushes such as *Prosopis cineraria*, *Hardwickia binata*, *Albizia* species, *Zizyphus numularia*, *Colospermum mopane*, *Leucaena leucocephala*, *Azadirachta indica*, *Ailanthus excelsa*, *Acacia nilotica* trees in degraded lands

✓ Sowing of inter spaces of tree rows with drought tolerant grasses such as *Cenchrus ciliaris*, *Cenchrus setigerus* and *Lasirius sindicus* etc., further enhance forage production from these systems.

✓ *Azolla*, a blue green algae which has more than 25% crude protein and a doubling time of 5-7 days can be grown in pits in backyards depending on the number of milch animals owned by the farmer.
5. Management of Livestock (Climatic Vulnerabilities)

Livestock becomes an integral part of the traditional farming systems in rainfed agriculture. This component as a part of the traditional farming system will act as buffer to stabilize and enhance the income of rainfed farming community for different aberrant weather situations. Among livestock enterprises, the cattle, buffalo and small ruminants (Sheep and Goat) are important source for income and livelihood improvement in rainfed farming community of our country. There is a need to take care of hygiene, health and nutritional management to improve the productivity of the livestock

**Dairy Animals**

**Drought**

**Feed and fodder Resources**

- Harvest and use biomass of dried up crops (soybean, wheat, green gram, black gram, sorghum, bajra, maize, chick pea) material as fodder
- Use of unconventional and locally available cheap feed ingredients especially soya meal waste for feeding of livestock during drought
- Harvest all the top fodder available (Subabul, Glyricidia, Pipol, Prosopis etc) and feed the LS during drought
- Concentrate ingredients such as Grains, brans, chunnies & oilseed cakes, low grade grains etc. unfit for human consumption should be procured from Govt. Godowns for feeding as supplement for high productive animals during drought
- Promotion of Horse gram as contingent crop and harvesting it at vegetative stage as fodder
- All the hay should be enriched with 2% Urea molasses solution or 1% common salt solution and fed to LS.
- Continuous supplementation of minerals to prevent infertility. Encourage mixing available kitchen waste with dry fodder while feeding to the milch animals

**Drinking water**

- Adequate supply of drinking water.
- Restrict wallowing of animals in water bodies/resources
- Add alum in stagnated water bodies

**Health and disease Management**

- Carryout deworming to all animals entering into relief camps
- Identification and quarantine of ck animals
• Constitution of Rapid Action Veterinary Force
• Performing ring vaccination (8 km radius) in case of any outbreak
• Restricting movement of livestock in case of any epidemic
• Tick control measures be undertaken to prevent tick borne diseases in animals
• Rescue of sick and injured animals and their treatment
• Organize with community, daily lifting of dung from relief camps

**Heat and cold wave**

- Allow the animals early in the morning or late in the evening for grazing during heat waves
- Feed green fodder/silage/concentrates during day time and roughages/hay during night time in case of heat waves
- Put on the foggers/sprinklers during heat waves
- In severe cases, vitamin ‘C’ and electrolytes should be added in H2O during heat waves.
- Apply/sprinkle lime powder in the animal shed during cold waves to neutralize ammonia accumulation

**Poultry**

**Drought**

**Feed and fodder sources**

- Supplementation only for productive birds with house holds grain
- Supplementation of shell grit (calcium) for laying birds
- Culling of weak birds

**Drinking water**

- Mixing of Vit. A, D, E, K and B-complex including vit-C in drinking water 5 ml in 1 litre of water

**Heat Wave**

**Shelter Management**

- In severe cases, foggers/water sprinklers/wetting of hanged gunny bags should be arranged
- Don’t allow for scavenging during mid day

**Health and disease management**

- Supplementation of house hold grain
- Provide cool and clean drinking water with electrolytes and vit.C
- In hot summer, add anti-stress probiotics in drinking water or feed
Fisheries/Aquaculture

Drought

Inland

Shallow water depth due to insufficient rains/inflow

- Water resources of the areas will be exploited with planning of proper transport facilities in affected areas.
- Maintain the level of water to the required depth.
- Add stored water in shallow water depth.
- Harvesting of fishes as early as possible to avoid mortality.
- Use stored water.
- Use surface water flow
- Divert water from unutilized areas
- Utilize canal water

Changes in water quality

- Provision of water filtration system for the ponds to overcome the water contamination
- Use disinfectants and therapeutic drugs
- Adoption of bio-remedial measures

Aquaculture

Shallow water depth due to insufficient rains/inflow

- Water resources of the areas will be exploited with planning of proper transport facilities in affected areas
- Maintain the level of water to the required depth
- Add stored water in shallow water depth
- Harvesting of fishes as early as possible to avoid mortality.
- Use stored water
- Use surface water flow
- Divert water from unutilized areas
- Utilize canal water

Impact of salt load build up in ponds/ change in water quality

- Dilution of water or exchange water to avoid salt builds up
- Harvesting the marketable fish to reduce the density
- Use disinfectants and therapeutic drugs
- Adoption of bio remedial measures
Floods

Capture

Inland

Average compensation paid due to loss of human life

- Fishermen will be advised on use of Life saving jackets and life boats. The life saving appliances/machinery shall be kept ready for rescue operation.
- Sufficient stock of food, medicine etc. should be available.
- Govt. should take necessary action & provide trained people for rescue operation during flood
- Human evacuation from the area
- Coordination of assistance
- Damage and need assessment.
- Immediate management of relief supplies.
- Immediate help delivery

No. of boats /nets/damaged

- Fishermen will be advised to stop fishing during the floods and heavy rainfall.

No. of houses damaged

- Temporary shelter to the affected families will be provided.
- Arrangement of temporary shelters for homeless people.
- Damaged house numeration and need assessment Coordination of assistance.
- Immediate management of relief supplies

Loss of stock

- Provided subsidy on seeds by Govt.
- Implementation of Insurance policy.
- Locate backup stocks and verify its usability time
- Follow flood control management plan.
- Notify utilities of the critical demand about loss of stock and inputs.
- Loss assessment & insurance claim

Changes in water quality

- Provision of water filtration system for the ponds to overcome the water contamination
- Do not use contaminated water
- Proper preparation and management through emergency aeration.
• Use appropriate amount of disinfectants, chemicals and therapeutic drugs
• Immediate support of Govt./industrial organizations for maintaining the purity and quality of water bodies.
• Need based bioremediation
• Provision of water filtration system for the ponds to overcome the water contamination-
• Need based bioremediation

Health and diseases
• Water filtration system & control measures for diseases should be available.
• Advance planning and preparedness
• Store chemicals, disinfectants and therapeutic drugs
• Stock sufficient stores of medicines

B. Aquaculture

Inudation of flood water
• On the basis of forecasting information to farmers for sale of marketable fish with sufficient transport facility through various media. Proper drainage should be adopted so that inundation with flood water should be minimized
• On the basis of forecasting information to farmers for sale of marketable fish with sufficient transport facility through various media
• Proper drainage should be adopted so that inundation with flood water should be minimized
• Excess water should be drained from pond by providing screen outlets or using pumps
• Arrangement for evacuation
• Arrangement for rescue and casualty care
• Arrangement for burial control room
• Restoration of essential services, security and protection of property.
• Coordination of assistance.
• Damage and need assessment.
• Immediate management of relief supplies.
• Release excess water from height of T.
• Lower the water level in culture facilities
Water contamination and changes in water quality

- Supply of water purifier for the ponds to overcome the contamination and changes in BOD.
- Supply of water filtration system for ponds to overcome the contamination.
- Use of KMNO4 for bath of fish as prophylactics.
- Do not use contaminated water.
- Proper preparation and management through emergency aeration (paddle wheel aerator/circulating aerator), that may improve water quality in affected areas.
- Use appropriate amount of disinfectants, chemicals and therapeutic drugs.
- Maintaining the purity and quality of water bodies.
- Need based bioremediation.

Health and diseases

- Periodical checking particularly with respective fish mortality should be done during flood.
- Services of trained personnel need to be made available in affected areas with sufficient supply of life saving medicines.
- Disinfectants formalin treatments as prophylactics.
- Use appropriate amount of disinfectants, chemicals and therapeutic drugs.
- Determination of nature and speed of transmission of diseases.
- Emergency aeration or splashing in water bodies.

Loss of stock and inputs (Feed, chemicals etc)

- The pond embankments will be fenced with netting to avoid fish losses. The store rooms for inputs like feed, chemicals etc. shall be created.
- Available fish stock should be recovered.
- Stock of inputs must be stored in well protected area.
- Search/locate the stock/input.
- Purchase/hire valuable stock/inputs from distant areas not affected by flood.

Infrastructure damage (Pumps, aerators, huts etc)

- Pumps, aerator and generators shall be removed from the pond before the event.
- Use manual techniques for aeration or make substitute arrangement for the same.
• Notify utilities of the critical demand.
• Coordination of assistance.
• Immediate management of relief supplies

**CYCLONES**

**Inland**

**Aquaculture**

**Over flows/flooding of water**

• On the basis of forecasting information to farmers for sale of marketable fish with sufficient transport facility through various media. Proper drainage should be adopted so that inundation with storm water should be managed

• Enhancement of dyke’s height by sand bags

**Changes in water quality (fresh water / brackish water ratio)**

• Supply of water for correcting the changes in fresh water & brackish water. Use euryhaline species

**Health and diseases**

• Periodically checking particularly in respect of fish mortality & water parameter during flood.

• Disinfectants treatments.

**Loss of stock and inputs (Feed, chemicals etc)**

• Available fish stock should be recovered

**Infrastructure damage (pumps, aerators, shelters/huts etc)**

• Use manual techniques for aeration or make substitute arrangement for the same

**HEAT WAVE AND COLD WAVE**

**Aquaculture**

**Changes in pond environment (water quality)**

• Adequate facility should be ready for heatwave & system for changing water temperature during cold wave.

• Monitor fishing sites frequently to ensure that they are not affected by heat or cold waves.

• Use dark materials to cover the water bodies during excessive heat waves.

• Stay hydrated by drinking plenty of fluids during fishing/field work.
• Adopt proper care and management during the fishing period of cold/heat wave like keeping stock of drinking water and extra cloths.
• Educating the farmers through electronic or print media
• Maintain Water level in pond

**Health and Disease management**
• Periodical checking particularly with respective fish mortality should be done.
• Identification of type of disease outbreak, immediate removal of disease causing agents/dead fish.
• Use appropriate amount of disinfectant chemicals and therapeutic drugs.
• Determination of nature and speed of transmission of diseases.
• Emergency aeration or splashing in water bodies
• Bleaching powder 1 to 2% formalin treatment to prevent disease
### Crops and varieties

#### Andhra Pradesh

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<tr>
<th>District</th>
<th>Crop</th>
<th>Improved varieties</th>
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</thead>
</table>
| Anantapur | Groundnut | *Kharif* Ananta (110), Vemana (105), Kadiri-5 (100), Kadi-
|           |        | diri-9, Harithandra (110), Dharini (105-110), Narayani
|           |        | (105-110)                                               |
|           |        | *Rabi* (irrigated) Vemana, Kalahastiahasti, Greeshma, Ananta
|           |        | Narayani, Dharani                                        |
|           |        | Under delayed monsoon: Kadiri-4, 5, 6, Narayani         |
|           | Pigeonpea | Lakshmi, (150-160), Abhaya (160-165), P.R.G-100, T.R.G-22,
|           |        | LRG-30 (170)                                             |
|           | Pearlmillet | ICTP-8203, ICMV-221, ICMH-451                           |
|           | Setaria  | Prasad (70-75), Krishnadevaraya (80-85), Sri lakshmi
|           |        | (80-85), S.I.A (76-80), Surya nandi (75)                 |
|           | Ragi     | Maruthi, Suraj, Champavathi (85-90)                      |
|           | Sunflower | APSH-11, KBSH-1                                         |
|           | Horsegram | PHG-62 (85), PZM-1, CRIDA-1 & 2, PHG-9 (90-100)         |
|           | Castor   | GCH-4,6 PCH-111, PCH-222, DCH-177, Jyothi, Jwala       |
|           | Greengram | LGG-407, (65-70), ML-267 (65), MGG-295                  |
| Kurnool   | Groundnut | *Kharif* Abhaya (TPT-25) Kadi-
|           |        | diri-5/7/9, Narayani (TCGS-29), Greeshma, Harithandra
|           |        | (110), Dharini (105-110), *Rabi*
|           |        | Vemana (115), Pasoona (115), Greeshma (100)             |
|           | Pigeonpea | *Kharif* Palem Khandi (PRG-158, Red soils), LRG-41      |
|           | Paddy   | BPT-5204, Samba masoori, Nandyala sannalu, Deepti       |
|           |         | Saline soils: Deepti                                     |
|           | Foxtail millet | (Red soils) Foxtail millet SIA-3085, (70-75) Seteria
<p>|           |         | (SIA-3085) + Pigeonpea (PRG-158, 5:1)                    |</p>
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<td>Castor + Pigeonpea (1:1) (PCH-111; Castor)</td>
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<td>Cotton</td>
<td>Nandyal cotton hybrid-240, Sailam, (Mungari cotton-Red soils) yaganti, Jayadhar, Raghavendra -black soils</td>
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<td>Sunflower</td>
<td>Red soils: Modern, DRSF-1/ hybrids (NDSH-1) APSH-66, KBSH-44 and SH-416</td>
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<td>Sorghum rab/maghi</td>
<td>SPV-1626, NTJ-3, N-13, CV-216, Srisaila, NTJ-4</td>
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<td>Chickpea</td>
<td>Nandyala senaga-I, Jaki-9218, NBeG-1, Digvijay</td>
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<td>Jagityala Sannalu, JGL-3844, NLR-3449, MTU-1010 and Tellahamsa, SS-1, Swarna (gold)</td>
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<td>Tank fed and canals</td>
<td>Flood Tolerant varieties: RGL-2537, PLA-1100, MTU-1061 (Indra) MTU-1140 saline tolerant: MCM-100 and 101</td>
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<td>Flood Tolerant varieties: RGL-2537, PLA-1100, MTU-1061 (Indra) MTU-1140 saline tolerant: MCM-100 and 101</td>
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<td>Greengram</td>
<td>LGG-460, TM-96-2 Rabi delayed: LGG 460, 410, ML 267, TM-96-2)</td>
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<td>Paddy</td>
<td>Flood tolerant: MTU-1061&amp; MTU-1064 MTU-1140 saline area: depth, Swarna</td>
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<td>Cotton</td>
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<td>Soybean</td>
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<td>Pigeonpea</td>
<td>LRG-41, LRG-30, PRG-100, 158, MRG-66</td>
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<td>Digvijay, LBeG-7, Vihar, Vijay.</td>
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<td><strong>Nalgonda</strong></td>
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<td>Boldgrain: Seethe (80-90), kranti (95-100), Krishna (95-100), Small grain: LBM-422 (70-80 days), NRCHB-422</td>
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<td>Sorghum: Pusa chari, Maize: African Tall</td>
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<td>PKVSH-7</td>
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<td>HD-2189, Lok-1, NAIW-1415 (Netravati)</td>
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<td>Buldhana</td>
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<td>Deshi Cotton: - AKA-5, AKA-7, AKA-8</td>
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<td>AKC-1, CH-4,5,6 &amp; DCH-117, 32</td>
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<td>PKV Raj Shradha, Saburi</td>
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<td>PKV-Green gold, PKV-AKM -4</td>
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<td>Nandurbar</td>
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### Manual on Contingency Agricultural Plan

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### Fodder crops and varieties

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<td>Australian, Molopo, S-3108, S-3 106, CAZRI-75 (Jan-May irrigation)</td>
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<td>Dinanathgrass (Irrigation)</td>
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## Rainwater Management Technologies for different NICRA centres

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| **Anantapur** (Red loamy soils) | • Contour bunding with a cross section of 0.63 sq.m with a horizontal spacing of 25cm to 125cm  
• Compartmental bunds of 15m length and 10cm width or conservation furrow at 3.6m interval.  
• Water harvesting with kadapa slabs to avoid seepage losses in dugout ponds  
• Use of life saving irrigation |
| **Chittoor** (Rainfed shallow red soils) | • Sowing across the slope and ridging later  
• In-situ moisture conservation technologies like conservation furrows opened on contour or across slope at 3-5 m apart, deep tillage  
• Graded bunds with 0.8 m cross section bunds  
• Farm ponds for water harvesting to raise crop productivity |
| **Kurnool** (Red and mixed soils) | • Contour bunding with a cross section of 0.63 sq.m with a horizontal spacing of 25cm to 125cm  
• Compartmental bunds of 15m length and 10cm width or conservation furrow at 3.6m interval  
• Water harvesting with kadapa slabs to avoid seepage losses in dugout ponds  
• Use of life saving irrigation |
| **Srikakulam** | • Sowing across the slope and ridging later  
• Contour farming  
• Graded border strips  
• Water harvesting structures  
• Desilting of checkdams  
• Improved drainage system for water logging  
• Life saving irrigation for rainfed crops |
| **Telangana** | |
| **Khammam** | • Improvement of drainage  
• Farm pond |
<table>
<thead>
<tr>
<th>Location</th>
<th>Activities</th>
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</table>
| **Nalgonda**     | • Life saving irrigation for rainfed crops  
                   • Desilting of tanks  
                   • Construction of checkdams  
                   • In-situ conservation like mulching deep tillage once in three years  
                   • Conservation furrows, Ridges and furrows  
                   • Increasing soil infiltration capacity and reducing soil crust  
                   • Field bunds-graded bunds, Supplemental irrigation wherever feasible |
| **Ahmednagar**   | • Contour bunds  
                   • Graded bunds in high rainfall areas  
                   • Suitable surface drainage measures in high rainfall and deep black soils  
                   • Supplemental irrigation in high rainfall areas with harvested water during dry spells  
                   • In-situ conservation measures like mulching, conservation furrows, deep tillage  
                   • Compartmental bunding and ridges and furrows prior to sowing |
| **Amravati**     | • Compartmental bunding  
                   • Conservation furrows  
                   • Broad bed furrows  
                   • Graded bunds on clay soils to drain off excess water  
                   • In-situ conservation measures like tillage, mulching, contour farming  
                   • Graded bunds (light soils depth 20 to 30-35cm) |
| **Aurangabad**   | • Sowing across the slope  
                   • Compartmental bunding  
                   • Ridges and furrows prior to sowing  
                   • Lucaena lopping mulch@3.5 t/ha  
                   • Contour live bunds of Marvel-8grass or lucena |
| **Buldhana**     | • Importance for permanent soil conservation works  
                   • Broad bed furrows  
                   • Compartmental bunding  
                   • Sowing across the slope |
<table>
<thead>
<tr>
<th>Region</th>
<th>Measures and Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jalna</td>
<td>• Compartmental bunding&lt;br&gt;• Ridges and furrows prior to sowing&lt;br&gt;• Marvel-8 grass on bunds for protection of bunds&lt;br&gt;• Contour live bunds of Marvel-8 grass or Leucaena&lt;br&gt;• Leucaena lopping mulch @ 3.5t/ha</td>
</tr>
<tr>
<td>Nandurbar</td>
<td>• Compartmental bunding&lt;br&gt;• Conservation furrows&lt;br&gt;• Broad bed furrows&lt;br&gt;• Graded bunds on clay soils to drain off excess water, insitu conservation measures like tillage, mulching, contour farming&lt;br&gt;• Graded bunds (light soils depth 20 to 30-35cm)</td>
</tr>
<tr>
<td>Pune</td>
<td>• Compartmental bunding&lt;br&gt;• Conservation furrows&lt;br&gt;• Broad bed furrows&lt;br&gt;• Gabion structures in water ways&lt;br&gt;• Farm ponds for life saving irrigation and ground water recharge</td>
</tr>
<tr>
<td>Ratnagiri</td>
<td>• Drainage to remove excess water&lt;br&gt;• Water harvesting and reuse with bandharas</td>
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</tbody>
</table>
MANUAL ON CONTINGENCY AGRICULTURAL PLAN

National Initiative on Climate Resilient Agriculture

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