

## Drought, Losses Occuring and Mitigation Strategies for Major Crops of Telangana

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### SUMMARY

Drought is a prolonged period of abnormally dry weather characterized by a deficiency or absence of precipitation that results in water scarcity. It is a natural phenomenon that occurs when there is a significant imbalance between the amount of water needed and the amount of water available.

### INTRODUCTION

Drought can affect various regions, from local areas to entire countries or even larger geographic areas, and can persist for months or even years. It is typically characterized by reduced soil moisture, decreased water levels in lakes, rivers, and groundwater reservoirs, and a decline in water availability for agriculture, ecosystems, and human needs. Drought can have significant impacts on agriculture, water resources, ecosystems, and socioeconomic systems, leading to crop failures, reduced water supplies, ecological disturbances, and economic hardships.

### Losses occurring due to Drought:

1. **Yield reduction:** Drought can cause a significant reduction in crop yields due to water stress. Lack of water affects plant growth, development, and nutrient uptake, resulting in lower crop productivity. Plants may wilt, exhibit stunted growth, or fail to reach their full potential.
2. **Poor germination:** Insufficient soil moisture during drought conditions can hinder seed germination. Seeds may fail to sprout or take longer to germinate, resulting in patchy or uneven stands.
3. **Crop failure:** Severe and prolonged drought can lead to crop failure, where the plants are unable to survive due to extreme water shortage. In such cases, the crops may wither, die, or not produce viable yields.
4. **Reduced size and quality:** Drought stress can result in smaller crop size and poor quality. Fruits, grains, or seeds may be undersized or shrivelled, affecting market value and crop viability.
5. **Reduced nutritional value:** Drought can impact the nutritional composition of crops. Water stress can alter the nutrient content and affect the balance of carbohydrates, proteins, vitamins, and minerals in the harvested produce.
6. **Increased pest and disease susceptibility:** Drought weakens plants, making them more susceptible to pests and diseases. Stressed crops are more vulnerable to insect infestations, fungal infections, and other pathogens, further compromising yield and quality.
7. **Increased weed competition:** Drought conditions often favour the growth of drought-tolerant weeds that can outcompete crops for limited soil moisture and nutrients. Weeds can reduce crop yields and hinder harvest operations.
8. **Economic losses:** Drought-related crop losses can have significant economic consequences for farmers, agricultural communities, and the overall food supply chain. Lower yields and crop failures can lead to reduced income, increased production costs, and food price volatility.
9. **Livelihood impacts:** Drought-induced crop losses can have social and livelihood impacts, particularly in rural areas where agriculture is a primary source of income. Farmers may face financial difficulties, reduced food security, and increased vulnerability to poverty.
10. **Environmental consequences:** Drought can have broader environmental impacts, including soil erosion, loss of biodiversity, and reduced water availability for ecosystems and wildlife.

### Mitigation strategies for drought involve implementing measures to reduce the impact of water scarcity and increase water efficiency.

Here are some key strategies that can be employed:

1. **Water Conservation:** Encouraging water conservation practices can significantly reduce water consumption. This includes promoting efficient irrigation techniques, such as drip irrigation or precision sprinklers, and discouraging wasteful practices like overwatering or water leaks.

2. **Rainwater Harvesting:** Capturing and storing rainwater can be an effective strategy to mitigate drought. Rainwater can be collected from rooftops, pavements, or other surfaces and stored for later use in agriculture, landscaping, or other non-potable purposes.
3. **Water Recycling and Reuse:** Implementing systems to treat and reuse wastewater can help reduce the strain on freshwater sources. Treated wastewater can be used for agricultural irrigation, industrial processes, or even for non-potable purposes like toilet flushing or street cleaning.
4. **Improved Agricultural Practices:** Promoting water-efficient agricultural techniques can minimize water consumption in farming. This includes adopting drought-resistant crop varieties, improving soil moisture retention through techniques like mulching or conservation tillage, and implementing efficient irrigation methods.
5. **Water Pricing and Regulations:** Implementing effective water pricing mechanisms can encourage responsible water use. Higher tariffs for excessive water consumption can incentivize conservation. Regulations can also be put in place to limit water usage during drought conditions or to restrict water-intensive activities.
6. **Drought Monitoring and Early Warning Systems:** Developing robust monitoring systems to track drought conditions and predict water availability can help in taking proactive measures. Early warning systems can alert authorities and communities in advance, enabling them to implement drought response plans promptly.
7. **Public Awareness and Education:** Raising awareness about the importance of water conservation and providing education on water-efficient practices can empower individuals and communities to make conscious choices. Campaigns, workshops, and educational programs can play a vital role in changing behaviour and promoting sustainable water use.
8. **Infrastructure Development:** Investing in water infrastructure projects can enhance water availability during drought periods. This includes constructing water storage facilities like reservoirs or groundwater recharge systems, improving water distribution networks, and upgrading water treatment plants.
9. **Ecosystem Restoration:** Protecting and restoring natural ecosystems, such as wetlands and forests, can help regulate water flow and maintain ecological balance. Healthy ecosystems act as natural buffers against drought and contribute to sustainable water management.
10. **Research and Development:** Continued research and development efforts can lead to innovative solutions for drought mitigation. This can involve developing more efficient water-saving technologies, exploring new water sources like desalination or cloud seeding, and studying climate patterns to anticipate and adapt to future drought risks.

It is important to note that drought mitigation strategies should be tailored to the specific regional conditions and challenges faced. Local stakeholders, governments, and communities should work together to implement a combination of these strategies to effectively address and mitigate the impacts of drought.

## Mitigation Strategies Specific To Various Crops

### 1. Rice:

- Early planting: Plant rice crops as early as possible to take advantage of available soil moisture and to avoid critical drought periods during sensitive growth stages.
- Transplanting method: Use transplanting instead of direct seeding. Transplanted rice seedlings have a better chance of establishing roots and accessing moisture deeper in the soil, which can be beneficial during drought conditions.
- Mulching: Apply mulch, such as straw or plastic covers, around rice plants to reduce evaporation, conserve soil moisture, and suppress weed growth.
- Alternate wetting and drying (AWD): Implement AWD irrigation technique, which involves maintaining a cycle of wetting and drying the soil. This method helps conserve water while still providing sufficient moisture for rice growth.
- Supplemental irrigation: If feasible, provide supplemental irrigation during critical growth stages such as flowering and grain filling to minimize water stress and ensure proper crop development.
- Seed hardening: Low cost techniques like seed hardening or seed priming are useful for combating occasional moisture stress. Salts such as 4% KCl or 1% CaCl<sub>2</sub> are used for the seed treatment. When the dry seeds are soaked in water or chemical solution, the quiescent cells are hydrated and the germination is initiated.

**2. Maize:**

- Drought-tolerant varieties: Choose maize varieties that have been specifically bred for drought tolerance. These varieties have traits that allow them to withstand water scarcity and maintain yield under drought conditions.
- Conservation tillage: Implement conservation tillage practices, such as no-till or reduced tillage, to retain moisture in the soil. Reduced soil disturbance helps preserve soil moisture and reduces evaporation.
- Crop residue management: Retain crop residues on the soil surface to act as mulch, which helps conserve moisture, regulate soil temperature, and reduce weed competition.
- Precision irrigation: Utilize precision irrigation techniques like drip irrigation or pivot irrigation to apply water directly to the root zone, minimizing water loss through evaporation.
- Plant population density: Optimize plant population density to avoid excessive competition for limited water resources. Adjusting plant spacing can help ensure each plant has adequate access to available moisture.
- Plant growth regulators- Pre-soaking seed treatment with Abscisic acid (ABA) positively improves the antioxidant enzymes activity under water stress conditions in maize seedlings. Exogenous application of Ascorbic acid (AA) maintains water status by regulating the stomatal conductance and rate of transpiration.

**3. Pulses:**

- Variety Selection: Choose pulse crop varieties known for their drought tolerance and water-use efficiency. These varieties often have traits such as deeper root system, smaller leaf size, reduced water requirements.
- Timely Planting: Plant pulses at the optimal time, considering the availability of soil moisture and rainfall patterns. Planting earlier in the season when moisture is higher and synchronizing planting with expected rainfall events can increase the chances of establishment of pulses well before the onset of drought
- Soil Moisture Conservation: Improve soil moisture retention through organic matter addition, mulching, and conservation tillage practices which regulates soil temperature and suppresses weed growth
- Efficient water management is crucial for pulses during drought conditions. Implementing irrigation techniques such as drip irrigation or precision sprinklers can ensure that water is delivered directly to the root zone, reducing the wastage and optimizing water use efficiency.
- Intercropping and crop rotation: Interplant pulses with compatible crops to enhance water utilization and improve soil moisture conservation. By rotating pulses with other crops, especially deep-rooted ones like certain grains or grasses, helps in improving the soil structure, enabling better water infiltration and retention during dry spells.

**4. Oilseeds:**

- Selection of drought-tolerant varieties: Choose oilseed crop varieties that are specifically bred or selected for drought tolerance. These varieties have characteristics that enable them to cope with water scarcity and maintain productivity under drought conditions.
- Timely planting: Plant oilseeds at the optimal time, considering the availability of soil moisture and expected rainfall patterns. Early planting can help crops establish roots and access moisture before drought stress intensifies.
- Efficient irrigation: Implement efficient irrigation methods such as drip irrigation or furrow irrigation to provide water directly to the root zone and minimize water loss through evaporation.
- Weed management: Implement effective weed control measures to reduce competition for limited soil moisture and nutrients. Weeds can further stress oilseed crops during drought conditions.
- Nutrient management: Optimize nutrient management practices to ensure oilseed crops have balanced nutrition, as imbalances can exacerbate the impact of drought stress. Conduct soil tests and adjust nutrient application accordingly.

It is important to note that the suitability and effectiveness of these strategies may vary depending on local conditions and crop-specific requirements. It is advisable to consult with local agricultural extension services or experts to tailor these strategies to your specific region and farming system.

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