

MODERN WAYS OF GROWING ONIONS: INNOVATIONS IN AGRICULTURE

I.A.Teshaboev

<https://doi.org/10.5281/zenodo.13896575>

Annotation. This thesis illustrates information about the new ways and modern methods of growing onions in the world.

Key words: smart technology, mulching, hybrid, pest management, vertical farming, precision agriculture, cultivation.

Onions, a staple in cuisines worldwide, are essential for both culinary and medicinal purposes. As demand for onions continues to rise globally, modern agricultural techniques are being adopted to boost productivity, improve quality, and reduce resource consumption. The growing process for onions has evolved significantly with advancements in technology and sustainable practices, leading to more efficient and environmentally friendly production methods. "After potato and tomato, onion is considered the third most valuable vegetable in the world grown in 140 countries over an area of 54.8 hectares with an output of 104.5 tons." This article explores some of the most cutting-edge techniques for onion cultivation today.

Precision Agriculture and Smart Technology

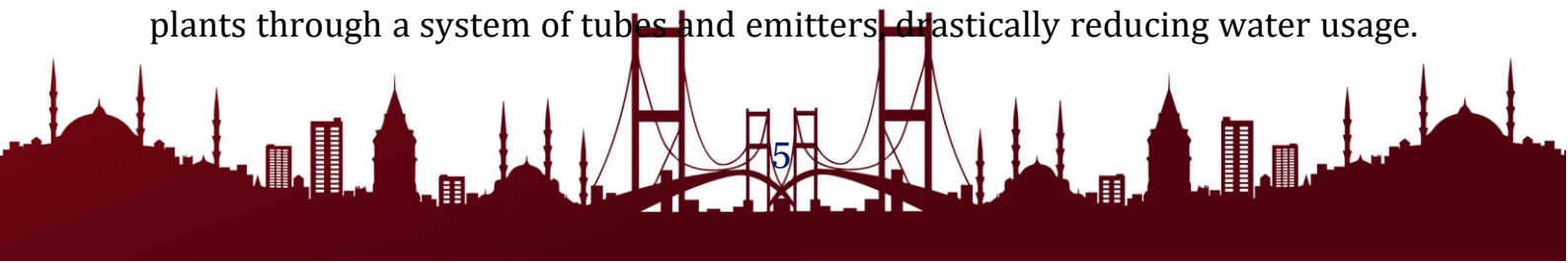
Precision agriculture is revolutionizing onion farming by using technology to optimize inputs like water, fertilizers, and pesticides. According to P.Sh.Tiwari it is "called site-specific management, is an emerging technology that allows for adjustments to address within-field variability in characteristics such as soil fertility" Sensors, drones, and satellite imagery allow farmers to monitor soil moisture, crop health, and growth conditions in real-time.

Smart irrigation systems, for instance, are designed to deliver precise amounts of water based on weather conditions and soil moisture levels. This prevents overwatering, which can lead to disease, while ensuring that crops receive the optimal amount of hydration. These technologies have proven to be cost-effective and environmentally sustainable.

Resource-Saving Cultivation Methods

One of the biggest challenges in onion farming is efficient use of resources like water and fertilizer. Modern resource-saving methods focus on improving onion yield while minimizing environmental impact.

- **Drip Irrigation:** This technique delivers water directly to the roots of plants through a system of tubes and emitters, drastically reducing water usage.



Drip irrigation systems are designed to maintain a consistent soil moisture level, which is ideal for onions, as they are sensitive to both drought and waterlogging.

- **Mulching:** Mulching involves covering the soil with organic or synthetic materials to retain moisture, suppress weeds, and regulate soil temperature. This method is particularly useful in onion cultivation, as it improves soil health and reduces the need for herbicides.
- **Seedling Transplantation:** Growing onion seedlings in nurseries and then transplanting them into fields has become a common practice. This method allows for better control of growing conditions during the vulnerable early stages of plant development. Additionally, it shortens the growing cycle, enabling farmers to produce more crops within the same growing season.

Hybrid Onion Varieties

Selective breeding and genetic improvements have led to the development of hybrid onion varieties that are more resistant to pests, diseases, and extreme weather conditions. These hybrids also tend to have a shorter growth cycle and offer higher yields than traditional varieties.

Vertical Farming and Controlled Environments

Vertical farming, though traditionally associated with leafy greens, is now being explored for onion cultivation. In this method, onions are grown in stacked layers inside controlled environments, such as greenhouses or indoor farms. By using LED lighting, hydroponics, and climate control systems, vertical farming allows onions to be grown year-round in environments that are insulated from external weather conditions. This method also reduces land use and maximizes space efficiency, making it ideal for urban agriculture and regions with limited arable land.

Sustainable Pest and Disease Management

Pest and disease control has always been a challenge in onion farming. However, modern approaches emphasize reducing chemical use in favor of integrated pest management (IPM).

- **Biopesticides and natural predators** are being increasingly used as alternatives to synthetic chemicals. For example, certain fungi and bacteria that naturally attack onion pests can be applied to crops to keep infestations in check without harming the environment.
- **Companion planting** is another effective technique, where onions are grown alongside other plants like carrots or marigolds that repel pests. This enhances biodiversity in the field and supports a more balanced ecosystem.

Climate-Resilient Practices



With climate change becoming a pressing concern, onion farmers are adopting resilient farming practices to cope with erratic weather patterns. Droughts, floods, and temperature fluctuations can significantly affect onion production, so adapting to these changes is crucial.

- Conservation agriculture focuses on minimum tillage, maintaining permanent soil cover, and crop diversification to improve soil health and water retention. These practices help onions thrive even in adverse weather conditions.
- Agroforestry, the practice of integrating trees into agricultural systems, provides shade and wind protection for onion crops, stabilizing temperatures and reducing the impact of extreme weather events.

Data-Driven Decision Making

Farmers today have access to an unprecedented amount of data, thanks to advancements in agricultural software. By analyzing weather forecasts, historical yield data, and soil health reports, farmers can make more informed decisions about planting schedules, fertilizer application, and harvesting times.

- Farm management software helps farmers track every stage of the onion-growing process, from seed planting to market delivery, enabling them to maximize efficiency and profitability. Predictive analytics tools are also used to forecast market demand, allowing farmers to adjust their production levels accordingly.

Conclusion

The modern onion-growing industry is benefiting immensely from new technologies and sustainable practices. By adopting precision agriculture, resource-saving techniques, hybrid varieties, and climate-resilient strategies, farmers can achieve higher yields while reducing their environmental impact. As innovations in farming continue to advance, onion cultivation is set to become even more efficient, productive, and sustainable, meeting the growing global demand for this essential crop.

References:

1. Dr. R. B. Kale, Dr. S. S. Gadge, Dr. B. Venkata Rao, Good agricultural practices in onion and garlic production, India 2022, 4p.
2. P. S. Tiwari, Precision agriculture, India 2013, 5p.

