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## Performance of high density planting system and closer spacing systems in cotton (*Gossypium hirsutum* L.) under Suryapet District

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### Abstract

A study was conducted in the Suryapet district of Telangana state in 2024-2025. A total of 50 farmers were specifically chosen from 9 Clusters within the Suryapet district and all the farmers followed HDPS/CS in cotton. In order to measure farmers' knowledge before and after the implementation of ICAR-CICR's Special project on Cotton, "Targeting technologies to agro-ecological zones - large scale demonstrations of best practices to enhance the cotton productivity" under NFSM. The study collected data through in-person interviews using a descriptive research technique and pre-structured interviews. The goal of the study, which was conducted in the Suryapet district of Telangana state in 2024-2025, was to measure farmers' knowledge both before and after the ICAR—CICR Special project on Cotton,

**Keywords:** High density planting system, closer spacing system

### Introduction

One of India's most significant commercial crops is cotton (*Gossypium* spp.), also known as the queen of fiber or white gold. After food grains, it is one of the most significant cash crops and is essential to the Indian economy (Patel *et al.*, 2016) <sup>[11]</sup>. Through production, commerce, transportation, ginning, and processing, cotton (*Gossypium hirsutum* L.), the most significant fiber crop, provides a living for millions of people (Kumari *et al.*, 2022) <sup>[4]</sup>. It is essential to the livelihoods of millions of farmers, traders, millers, and the global textile industry.

It must create innovative technology that can help farmers make a living wage without incurring losses due to climate change, labor shortages, and rising cotton pest and disease rates. To help farmers overcome these challenges, the high density planting system (HDPS) was developed. It uses semi-compact cotton types that mature early and has a small row spacing scheme. By maximizing bolls per unit area while limiting the number of bolls per plant, this technique helps farmers attain large yields.

By promoting early cotton crop maturity, facilitating quick canopy closure, and reducing soil water evaporation, this HDPS technology helps cotton crops avoid excessive vegetative growth. in light of the world's expanding population and rising food and clothing demands (Khan *et al.*, 2019) <sup>[7]</sup>.

In comparison to last year's 113.60 lakh bales, the USDA projects that the world's cotton production in 2024-25 will be 31.1 million hectares (76.84 million acres) and 116.40 million bales weighing 217.72 kg each, which is 2.8 lakh bales (2.46%) more than the 2023-24 estimates, which are led by the United States, Brazil, and China. In 2024-2025, China is expected to produce 27.80 lakh bales, followed by India (24 million), Brazil (16.70 million), the United States (14.50 million), and Pakistan (5.70 million).

China's cotton acreage is expected to reach 2.85 million hectares (7.04 million acres) in 2023-2024. The cotton crop is expected to produce 325.22 lakh bales in 2023-2024, compared to 336.60 lakh tons in 2022-2023. Gujarat produces 90.57 lakh bales of cotton, more than any other state. Maharashtra, Telangana, Rajasthan, and Karnataka follow with 80.45 lakh, 50.80 lakh, and 26.22 lakh bales, respectively.

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**Indian Cotton Scenario:** As on 27th September 2024, area under cotton during 2024-25 was 112.94 lakh ha as against 123.70 lakh ha in 2023-24 as compared to the previous year. Among the states, Maharashtra is leading in cotton acreage with 40.86 lakh ha followed by Gujarat (23.66 lakh ha), Telangana (17.70 lakh ha.), Karnataka (6.84 lakh ha.) and Madhya Pradesh (6.14 lakh ha).

**Cotton in Telangana:** As of September 25, the acreage planted to cotton in Telangana state was 43,76,043 acres, compared to 44,52,411 acres in 2023-2024. With 5,40,022 acres, Nalgonda was the largest district. Adilabad (4,34,993 acres), Sangareddy (3,56,619 acres), Asifabad (3,26,318 acres), and Vikarabad (2,41,592 acres) were next in line.

Compared to cotton planted conventionally, this planting strategy yields fewer bolls, but it keeps a larger proportion of all bolls in the first sympodial position and a smaller proportion in the second position (Vories and Glover 2006) [16].

(Paslawar *et al.*, 2015; Parlawar *et al.*, 2017) [9, 10] Higher seed cotton yields were seen with closer planting geometry. Although it causes inadequate boll load and delayed late-season leaf withering (Luo *et al.*, 2018) [5], plant competition for resources in higher populations led to smaller cotton plants with a higher resource use efficiency (Liu *et al.*, 2020) [6]. In a field with poorer fertility, cotton yield would increase with increased plant density (Dong *et al.*, 2010; Sankaranarayanan *et al.*, 2018) [2, 15].

### Research Methodology

In the Suryapet district of Telangana state, this study concentrated on improved cultivation methods for cotton employing a high density planting system and closer spacing. A descriptive research design was employed in the study, which clarifies the characteristics or phenomena being examined. A total of 50 farmers were chosen from 8 Clusters (Atmakur (s), Chivvemla, Mothey, Maddirala, Munagala, Nuthankal, Nagaram and Penpahad in the Suryapet district for adoption of higher density planting system and closer spacing in cotton growing area within the Suryapet district. The data were analyzed using frequency and percentage analysis to understand the adoption levels, benefits, and challenges of HDPS/CS for increasing cotton productivity in the Suryapet.

### Results and Discussion

The findings show that a greater seed rate (2.5-3 kg/acre) was needed for cotton grown in HDPS, a closer spacing method. The system's objective of boosting plant density and improving yield potential was reflected in the much narrower spacing employed for HDPS cotton (90 x 15 cm) and closer spacing (90 x 30 cm) compared to standard cotton (90 x 60 cm or 110 x 45 cm) (Prasad *et al.*, 2023) [12].

With the use of pneumatic planters, which guaranteed even plant dispersion, farmers embraced more automated sowing techniques for HDPS cotton. In contrast, traditional cotton was planted by hand, which resulted in less consistent plant spacing. Because of this, HDPS cotton had more plants per meter of row length (6-7), which enhanced the plant population and potential yield. HDPS cotton promotes higher vertical development by showing fewer sympodial branches per plant (7-8). Similarly, compared to regular cotton, HDPS cotton has more plants per square meter.

In addition to better light interception, efficient leaf area development, and early canopy closure that will shade out weeds and lessen their competitiveness (Wright *et al.*, 2011) [18],

Additionally, early cut-off, consistent boll bursting, and synchronized blooming are provided by the High Density Planting System (HDPS) (Gunasekaran *et al.*, 2020) [3].

As a result, HDPS is the way to boost output and profitability, optimize input use, and reduce the hazards related to India's current cotton production.

### Farmer's opinions about cotton cultivation in HDP System

According to farmers, the HDPS technology produces considerably superior cotton than the traditional method. The majority of farmers firmly believe that single picking is preferable to many pickings, and that high density planting agriculture is superior to conventional cotton farming in terms of both production and quality (Singh and Waris 2002) [14].

The high density planting system is an alternate production technique that could improve output and profitability, increase the efficiency of input use, decrease input prices, and lessen risks associated with India's current cotton production system (Venugopalan *et al.*, 2014) [17].

One strategy for raising cotton yields and net profitability is to increase plant density (Rossi *et al.*, 2004) [13].

Compact cotton types offer a tremendous deal of potential for increasing the profitability of labor-intensive cotton agriculture through mechanization. Because of their modest stature, lower vegetative development, fewer and shorter fruiting branches, short distances between branches and bolls, and synchronous maturity, compact genotypes are best suited for machine picking and high density planting (Coffey and Davis, 1981) [1].

They can be picked in two or three pickings because they are early (Patil & Patil *et al.*, 2007) [8]. Due to its short growing season, HDPS cotton exhibited a markedly reduced incidence of pink bollworm, a key pest in conventional cotton systems, particularly because of its late harvest period. On the other hand, because of the microclimate that the dense planting produced, pests such jassids, aphids, and whiteflies were more common in HDPS cotton (Prasad *et al.*, 2023) [12].

| Package of practices                     | HDPS Technology                     | CS Technology                       |
|------------------------------------------|-------------------------------------|-------------------------------------|
| Spacing                                  | 90x15 cm                            | 90x30 cm                            |
| Seed rate                                | 6 Packets/acre                      | 4 Packets/acre                      |
| Soils                                    | Light soils                         | Medium soils                        |
| Sowing method                            | Manual                              | Manual                              |
| Irrigation type                          | Rainfed                             | Rainfed                             |
| PGR Applied (Mepiquat Chloride)          | Yes                                 | Yes                                 |
| No. of Plants/Meter                      | 6-7                                 | 3-4                                 |
| Average no. of Sympodial Branches/Plant  | 7-8                                 | 7-8                                 |
| Average no. of Monopodial Branches/Plant | 1-2                                 | 1-2                                 |
| Major Insect Pests Noticed               | Aphids, Jassids, Thrips, Whiteflies | Aphids, Jassids, Thrips, Whiteflies |
| No. of Pickings                          | 1-2                                 | 1-2                                 |
| Crop Duration                            | 120-150 days                        | 120-150 days                        |
| Second Crop                              | Green gram, Jowar                   | Green gram, Jowar                   |

### Yield comparison between HDPS and CS Cotton Technology

| Particulars                   | HDPS  | CS    |
|-------------------------------|-------|-------|
| Average no. of Bolls/Plant    | 15-20 | 15-20 |
| Average Boll weight (g/boll)  | 4.5-5 | 4.5-5 |
| Average Yield/Acre (Quintals) | 12-14 | 10-12 |

## Conclusion

The findings suggest that through HDPS and CS technology there will be more production and productivity of cotton in India. By adopting this technology, the crop gets compact, short fruiting branches with higher retention of first position bolls. The boll size is > 4 g. The crop gets uniform maturity and it is easy for harvesting. It is new era to cotton growing farmers. The farmers will overcome the pink bollworm incidence and they go for second crop like Green gram, Jowar, Bengal gram.

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