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Binayak Pratap Shahi
Senior Scientist and Head – Krishi
Vigyan Kendra, Masodha,
ANDUA&T, Kumarganj,
Ayodhya, Uttar Pradesh, India

Praveen Kumar Maurya
SMS (Horticulture) – Krishi
Vigyan Kendra, Masodha,
ANDUA&T, Kumarganj,
Ayodhya, Uttar Pradesh, India

Aman Singh
Aman Singh, SMS (GPB) – Krishi
Vigyan Kendra, Masodha,
ANDUA&T, Kumarganj,
Ayodhya, Uttar Pradesh, India

SPS Somvanshi
SMS- Animal Science, Krishi
Vigyan Kendra, BUAT, Banda,
Banda, Uttar Pradesh, India

Corresponding Author:
SPS Somvanshi
SMS- Animal Science, Krishi
Vigyan Kendra, BUAT, Banda,
Uttar Pradesh, India

Impact assessment of NHRDF-883 kharif onion variety on yield and economic returns

**Binayak Pratap Shahi, Praveen Kumar Maurya, Aman Singh and SPS
Somvanshi**

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Abstract

The present study was conducted in Kharif season 2023-24 & 2024-25 to evaluate the performance of NHRDF K 883, under Front Line Demonstrations FLDs, randomly 10 farmers selected each year from adopted villages in district Ayodhya Uttar Pradesh. Improved agro-techniques for NHRDF K 883 gave 22.71 per cent higher yields compare to N-53. NHRDF K 883 recorded an average yield of 297.5 q/ha, compared to 242.5 q/ha in control plots. Economics increasing profit margins over time, with cost-benefit ratios improving from 1:7.11 to 1:3.21 respectively Demonstration plots showed higher actual profits and more favourable cost-benefit ratios. Results revealed significant improvements in yield, net returns, and benefit-cost ratios compared to traditional practices, underscoring the importance of varietal selection and integrated crop management.

Keywords: NHRDF 883, N-53, kharif onion, yield, technology gap, extension gap

Introduction

India is world leader in area and production of onion. 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 lakh hectares with an output of 1045.54 lakh tons. The average productivity of the world is 23.06 tons/ha. The area under onion production in the world majorly belongs to India (14.34 lakh ha) and China (10.9 ha) followed by Nigeria (6.6 lakh ha). The main onion growing states of India are Maharashtra (31.19%), Madhya Pradesh (13.61%), Karnataka, (12.88%).

Recently onion is being employed by processing industry to a greater extent for preparing dehydrated onion forms like powder and flakes. Minerals like calcium (180 mg/100 g) and phosphorus (50 mg/100 g) are abundant in onion bulbs. Quercetin a phytochemical is prevalent in onion bulbs, and it has therapeutic benefits as an anti-inflammatory, anti-cholesterol, anti-cancer, and anti-oxidant and has promise to be an antioxidant (Smith *et al* 2003) ^[1].

India is a global leader in onion production, ranking second worldwide. The crop is a significant contributor to both domestic and international markets. It holds a prestigious position as the second most important commercial crop in the country. The diversity in agro-climatic conditions facilitates year-round onion cultivation in India. Onion production in India primarily follows a seasonal pattern with approximately 60% of the cultivation during the *rabi* season, while the *kharif* and late-*kharif* seasons each contributed around 20%.

Ayodhya has a warm, humid, subtropical climate with a distinct seasonal pattern: hot summers (April-July), a rainy monsoon season (July-mid-September), and mild, foggy winters (December-January) with minimum temperatures that can be quite cold, sometimes dipping to near freezing. The NHRDF K 883 variety, developed by the National Horticultural Research and Development Foundation (NHRDF), offers promise due to its adaptability, yield potential, and market-preferred bulb characteristics. However, productivity during the kharif season is often constrained by climatic variability, disease incidence, and suboptimal agronomic practices. The, developed by NHRDF, has shown promise in terms of yield, bulb quality, and market acceptance. The major objective of this FLD is to disseminate the recently introduced high

yielding onion Line-883 variety along with better production technologies at the farmer level, leading to widespread acceptance and technology dissemination. This study evaluates its economic performance through FLDs conducted over five consecutive years.

Materials and Methods

Experiments in the farmers’ fields were planned in the year from 2023-2024&2024-2025 with objectives as -To demonstrate the performance of NHRDF K 883 under farmers’ field conditions, to compare yield and economic returns with local check variety N-53 to promote adoption of improved kharif onion technologies, to assess the economic viability of Line-883 under farmers’ field conditions. Ayodhya has a mixed soil composition, primarily featuring loam, silt, and clay soils, with sandy soils also present. Locally, these are often referred to by names like "Dumat" (loam), "Bhur" or "Silty Sand" (for sandy soils), and "Matiyar" (clay soil). The region also features some loamy and clayey soils, especially in the western and southern areas, along with pockets of silt and gravel. FLDs were conducted from 2023-24 to 2024-25 FY in adopted villages viz; karnipur, Barsandi, Sandwa, Magalshi and Palliaresali of district Ayodhya UP randomly selected 10 farmers each year. Participating farmers were trained in: Seedling production and transplanting techniques, Fertilizer scheduling and pest management, Irrigation and harvesting protocols. Each demonstration plot (0.4 ha) was compared with adjacent control plots using local varieties and traditional practices. Economic parameters were recorded for both demonstration plots (Line-883) and N-53 plots. Metrics included production (q/ha), total expenditure, gross profit, actual profit, and profit-to-expenditure ratio. The data on cost of production, gross and net monetary returns, Benefit: Cost ratio from both demonstrated plots and check plots

were compiled, calculated to work out the economic feasibility of the demonstrated technology against the framer’s practice. The yields of demonstrated plots or trials were compared with check plots yield and potential yield of the crop variety to estimate the yield gaps which are further categorized to assess the technology and extension gap. The Technology and Extension gap were calculated by using the following formulae as suggested by (Eswarprasad *et al.* 1993).
Technology Gap = Potential yield – Demonstrated yield

Extension Gap = Demonstrated yield – Farmer’s yield (Local check)

Technology Index = $\frac{\text{Potential yield} - \text{Demonstrated yield}}{\text{Potential yield}} \times 100$

Results and Discussion

Yield Performance

The results depicted in (Table 1) regarding bulb yield of kharif onion it was revealed that, Bulb weight is an important yield attributing character the increased onion bulb weight was found over the check were noticed in Line-883.NHRDF K 883 recorded an average yield of 297.5 q/ha, compared to 242.5 q/ha in control plots.Line-883 outperformed with yield increases 21.37% to 24.05%in 2023-24 & 2024-25 respectively, An increased in yield may be due to better genetic potential, early maturity, avoids late-season stress, Improved bulb weight and size and better adaptability for kharif conditions.The findings indicate that enhanced technology has had a positive impact on the farming community, since they were inspired by the new agricultural technologies used in the demonstration field. Our results are in accordance with the results obtained by Ohja and Singh 2013, Kumar Udit, 2014 ^[18], Gupta *et al.*, 2015 ^[14], Gaharwar *et al.* 2017 ^[12] for onion crops.

Table 1: Potential yield, Technology gap and Extension gap of Kharif Onions

Year	No. of farmer	Potential Yield of L-883	Production (q/ha)		Field increase percentage	Technology gap (q./ha.)	Extension gap (q. /ha.)	Technology Index
			K- 883	N-53*				
2023-24	10	325	301	248.0	21.37	24	53	7.35
2024-25	10	325	294	237.0	24.05	30	57	9.53
Mean			297.5	242.5	22.71	27	55	8.44

Table 2: Economic analysis of Kharif Onion NHRDF K-883 and N-53*

Year	No. of farmers	Total Expenditure (Rs.)		Total profit (Rs.)		Actual Profit (Rs.)		B:C Ratio	
		K- 883	N-53	K- 883	N-53	K - 883	N-53	K - 883	N-53
2023-24	10	73250	61152	502600	192400	429350	131248	1:6.9	1:3.1
2024-25	10	85200	60350	631400	203100	546200	142750	1:7.4	1:3.4
Mean		79225	60751	567000	197750	487775	136999	01:07.1	01:03.2

*Local Check

Technology gap

From the data presented in (Table 1) The technology gap shows gap in the demonstration yield over the potential yield and it was higher in NHRDF K 883 compared to N53 during 2023-24 and 2024-25. The variation in technology gap during the demonstration years may be due to varied soil fertility, climatic condition of the area and management practices implemented by the farmers. Hence, more location specific recommendations and precise use of technology in the fields are necessary to bridge the technology gap as supported by Gaharwar and Ughade (2018) ^[13] and Singh and Kanaujia (2019) ^[2].

Extension gap

Yield levels of varieties and their potential yield under front line

demonstrations trials was compared to estimate the yield gap. The technology gap shows gap in the demonstration yield over the potential yield and it was higher in NHRDF K 883 compared, to N53 variety during 2023-24 and 2024-25 (Table 1). This may be attributed to dissimilarity in the soil fertility status, weather condition and un-aware of educate the farmers more about the improved variety and its production technology (Gaharwar and Ughade 2018) ^[13] and (Singh and Kanaujia 2019) ^[2].

Technology index

The Technology index was higher in NHRDF K 883 compared, to N53 variety. This could be due the high yielding ability with good quality parameters result in better market preference

compared to local (Table 1).

Economic analysis

The economics of onion production were recorded year by year under frontline demonstrations and farmer practises, from the data presented in (Table 2) the higher gross return, net returns and benefit cost ratio was recorded higher in improved variety compared to local check (Table-2). The economic analysis reveal that by adoption of improved variety L-883 with minimal additional cost leads to higher additional net returns over local showing its profitability. A Similar result on profitability of onion was observed by Hiremath *et al.*, (2010) ^[16]; Gaharwar and Ughade (2018) ^[13]; and Singh and Kanaujia (2019) ^[2].

Conclusion

The NHRDF K 883 demonstrated its superiority over local variety in terms of yield, profitability, and marketability. Adoption of recommended practices further enhanced performance. Scaling up such demonstrations can play a pivotal role in improving Kharif onion production and farmer income. One of the most crucial instruments for transferring technology to farmers at the grassroots level is front-line demonstration, which has a big impact on both strengthening relationships with farmer communities and the horizontal spread of technology.

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