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Yield gap analysis and impact of onion demonstration in West Kameng district of Arunachal Pradesh, India

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Abstract

A field demonstration on onion was conducted in the years 2022-23 and 2023-24 in West Kameng district of Arunachal Pradesh by Krishi Vigyan Kendra (KVK) West Kameng. The demonstration focused on a dark red variety of onion with full scientific practices. It was carried out in 25 selected villages with the demonstration plots size having 1 hectare in size each. The yield from the demonstration plots was recorded as 288 and 305 quintals per hectare, respectively, compared to 188 and 295 quintals per hectare. The technology gap was found to be 17 and 10, the extension gap was 108 and 100, and the technology index was 5.5 and 3.2 respectively. This shows there is a big yield gap for onion crop in Arunachal Pradesh, India.

Keywords: Onion (*Allium cepa*), yield gap, technology gap, extension gap

Introduction

Onion (*Allium cepa* L.) is an important commercial vegetable grown in India for both domestic use and export. India holds 16% of the world's area for onion cultivation and ranks second after China. In India, the total area under vegetable cultivation in 2015-16 was 1320.04 thousand hectares, and the total production was 20931.21 thousand metric tons. However, the productivity of onion in India is much lower than the world average (Pandey, 2000; Lawande, 2005). The production and productivity of onion vary from state to state. In Assam, it is lower compared to states like Gujarat, Maharashtra, and Bihar (Gupta and Singh, 2010). This is due to factors such as lack of knowledge about suitable seasons, unavailability of high-yielding varieties, and lack of proper cultivation techniques. The farmers also lack awareness about the characteristics of varieties, seasonality, and package of practices, which limits the production and productivity of onion. According to the Directorate of Horticulture and Food Processing, Assam meets only about 7.20% (approximately 30.90 thousand metric tons) of its annual requirement of onion, while 92.80% (about 3.98 lakh metric tons) is imported from outside the state. The state's annual requirement of onion is estimated at 4.29 lakh metric tons, which is much lower than the national per capita availability rate of 13.76 kg. In 2015-16, the total area under onion production in Assam was only 8.47 thousand hectares, and the productivity was just 9.49 tonnes per hectare, the lowest among the four study states. Since the 1970s, yield gap analysis has been a useful research tool. It was developed by the International Rice Research Institute (IRRI) and has been widely used to measure and analyze the factors that influence yield gaps. Although production has increased over the years, there is still a noticeable difference between the actual yield achieved by farmers and the yield that can be realistically achieved with current technological improvements. The current study assessed yield loss in real farming conditions and identified that the inadequate supply of high-quality potato tubers from high-yielding varieties (HYVs) and uneven application of nitrogen, phosphorus, and potassium (N, P, and K) fertilizers were the main reasons. The study aimed to address the factors that lead to yield reduction and lower financial returns by promoting the adoption of recommended technologies.

Materials and Methods

The all over total forty Front Line Demonstrations (FLD) on the Onion crop were carried out in farmers' fields under West Kameng district of Arunachal Pradesh during the Kharif season of 2022-23 and 2023-24. These above said demonstrations were conducted in the Sangti, Yewang, Dirang Basti, Khasso, Phadam, and Chug villages under the Dirang circle of West Kameng district. The soil of these villages is mostly sandy loam and red soil. The size of each demonstration plot was 1.0 hectare each. The Dark Red variety of onion was demonstrated in farmers' fields using

the recommended package of practices. Before starting the FLD, experts from KVK conducted a field survey with onion growers to understand their current practices, such as variety used, seed rate, production methods, and yield (Table 1). Farmers reported that they were not using critical inputs and were growing old varieties of onion, that's why their yield was low. After initiation of demo the proper follow-up with regular field visits by the respective KVK scientists were made to ensure proper use of inputs and to address any field-related issues to technically support them and to enhance the onion production in the said villages. Other activities like mobile advisories and group discussions were also conducted by KVK experts at the demonstration sites to help other farmers in the area. Improved and suggested technologies were used as part of the FLD to address the identified problems. As per the recommended practices, a balanced fertilizer of N:P:K at 100:45:80 kg per hectare was used along with farmyard manure at 5 kg per square meter. Farmers' opinions were collected to support research and extension programs.

The difference between the potential and actual farm yield is called the "yield gap." The yield obtained in experiments is called potential yield, which is achieved when best practices and maximum inputs are used. The yield achieved in demonstration plots under expert supervision is called the demonstration yield. The conditions in demonstration plots are similar to those on farmers' fields in terms of infrastructure and environment. The yield farmers actually get on their fields using their farming methods is called actual yield. Data on production costs, input usage, monetary returns, yield gap, and adoption index were collected and analyzed to assess the economic viability of the recommended technology.

The Technology Gap and Extension Gap were calculated using the following formulas:

Technology Gap = Potential Yield (Pi) - Demonstration Yield (Di)

Extension Gap = Demonstration Yield (Di) - Farmer Yield (Fi)

Technology Index = (Potential Yield - Demonstration Yield) / Potential Yield × 100

Benefit Cost Ratio (B:C ratio) = Net Income (Rs per hectare) / Cost of Cultivation (Rs per hectare)

Percent Increase Over Farmers' Practices = (Improved Practices - Farmers' Practices) / Farmers' Practices × 100

Results and Discussion

The performance of high-yielding onion varieties was studied for the years 2022-23 and 2023-24 (Table 2). The data showed that the yield from demonstration plots was much higher than that from farmers' fields in both years. In different locations, the yield from demonstration plots ranged between 288 to 305 quintals per hectare, which was 62.5% higher than the yield from farmers' practices (local check). Many researchers have reported that high-yielding varieties, when managed with balanced nutrient inputs, give better yields [1, 2]. Mishra *et al.* [3] found that potato yields were higher in the Malwa region of Madhya Pradesh with proper nutrient management. Kumar *et al.* [4] reported that integrated nutrient management improved potato yields in Meghalaya under rainfed conditions. Mohapatra *et al.* [5], Mollah [6], Saini [7], Singh [8], and Venkatasalam [9] also confirmed these findings.

The gap between potential yield and demonstration yield is known as the "technology gap." This was measured in both study years and was found to be 17 and 10 quintals per hectare, with an average of 13.5 quintals per hectare (Table 2). Differences in soil fertility, farming practices, and local climate could be the reasons for this gap. Mishra *et al.* [10] noted that adopting good management practices, like blight control, can increase potato yields. They reported that blight is a major issue in potato cultivation. The extension gap was found to be 108 and 100 quintals per hectare, respectively (Table 2). The average extension gap was 104 quintals per hectare. This highlights the need for educating farmers through various extension methods like FLD to improve practices and yield. The technology index showed that using new technology on farmers' fields is possible. The lower the technology index value, the easier it is to use the technology. Studies by Mishra *et al.* [10], Saini *et al.* [7], and Singh *et al.* [8] found that changes in soil fertility, weather, pests, and diseases can cause the technology index to change. Over the study period, the index varied from 1.0% to 7.2%. On average, the technology index was 5.5%, showing that technical solutions work well. However, there is a gap between what farmers are doing and what is shown in the plots. Since farmers can clearly see the results from these plots, they are more likely to adopt the technology on their own.

During interviews with farmers, two main problems were mentioned

- There is not enough high-quality onion bulbs available in the market.
- Farmers are not aware of the right amount and timing for using fertilizers in their fields.

Table 1: Improved practices versus farmer's practices of Onion

Particular	Technological intervention	Existing practices	Gap
Variety	Agri found Dark red	Old variety	Full gap
Seed rate	8 kg per ha	10 kg per ha	Partial gap
Seed treatment	Seed was treated	Not treated	Full gap
Sowing method	Line sowing	Line sowing	Partial gap
Spacing	15x 10 cm	15 x 15cm	Partial gap
Application of recommended dose of manure	5 kg square meter	Nil or without recommendation	Full gap
Application of Bio fertilizer	Soil application of Azospirillum &PSB @ 2 kg per hectare mixed with FYM	No application	Full gap
Weed management	Done at 25 and 45 days after planting	Not common	Full gap
Harvesting	Manual	Manual	No Gap

Table 2: Production and different extension parameters of Onion

Year	Area	Variety	No of Demos.	Potential Yield	Average Yield (q/ha)		% increase over Check	Tech nology gap (q/q/ha)	Extension gap (q/ha)	Technology index (%) DC
					D	C				
2022-23	1	Onion	20	305	288	180	62.5	17	108	5.5
2023-24	1.5	Onion	25	305	295	195	67.11	10	100	3.2

Where D stands for Demonstration and C stands for Check

Conclusion

The Frontline demonstration program is a very good program where farmers get hands-on experience on their own fields. This also encourages other nearby farmers. In this way, the efficiency of scientific farming practices among farmer's increases. The yield gap analysis showed that the losses could be as high as 62.5%. The technology gap was 10-17 q/ha and is due to differences in soil fertility and local weather conditions. The extension gap was 100-108 q/ha, which means there is a need for better methods to share improved farming practices with the farming community. The technology index shows how well the technology used in the program works and how effective the steps taken were to close the potato yield gap. It is recommended that there should be more awareness and technical knowledge for farmers, supported by the concerned agencies and government, along with proper market connections.

Disclaimer (Artificial intelligence)

The authors hereby declare that no generative AI technologies like Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators were used during the writing or editing of this manuscript.

Competing Interests

The authors have declared that there are no competing interests.

References

1. Eswara prasad Y, Manohar Rao M, Vijaya Bhinandana B. Analysis of on farm and level of technology on oilseed and pulse crop in Northern Telgana Zone of Andhra Pradesh. Indian J Agric Econ. 1993;48:351-6.
2. Gupta RP, Singh RK. Area and production. In: Onion production in India-2010. 2010. p. 6-9.
3. Hiremath SM, Nagraju MV. Evaluation of front line demonstration of onion in Haveri district of Karnataka. Karnataka J Agric Sci. 2010;22:1092-3.
4. Hiremath SM, Hilli JS. Performance of front line demonstration of onion in Dharwad district of Karnataka. Agric Update. 2012;7(3&4):191-4.
5. Jeggar KL, Panwar PP, Pareek OP. Front line demonstration on maize in Bhilwara district of Rajasthan. Curr Agric. 2006;30:115-6.
6. Kumar A, Kumar R, Yadav VPS, Kumar R. Impact assessment of front line demonstrations of Bajara in Haryana state. Indian Res J Ext Edu. 2010;10(1):105-8.
7. Lawanda KE. Onion improvement present status and future trust National symposium on current treds in onion, garlic and seed spices- production, marketing and utilization, held at NRCOG, Rajagurunagar, Pune during 25-27 November, 2005. 2005. p. 1-11.
8. Mukharjee N. Participatory learning and action. Concept Publishing Company; 2003. p. 63-5.
9. Pandey UB, Bhonde SR. Agro-Techniques. In: Onion production in India-2002. 2002. p. 12-5.
10. Puneet Kumar, Singh Pushpendra, Singh Surendra. Yield gap analysis in Onion under front line demonstrations at Shivapur districts of Madhya Pradesh, India. Int J Agric Sci. 2018;10(9):5980-1.
11. Singh R, Soni RL, Singh V, Bugalia HI. Dissemination of improved production technologies of solanceous vegetables in Banswara district of Rajasthan through frontline demonstrations. Raj J Ext Edu. 2011;19:97-100.
12. Singh Satyendra, Singh HM. Impact of Technology Dissemination through Demonstration (TDTD) On yield and Economics of Rabi onion crop in Kurnool district of AP. Adv Biores. 2018;9(4):94-6.