Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1002.114>

Yield Gap Analysis of Onion under Front Line Demonstration in Mungeli District, Chhattisgarh, India

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ABSTRACT

Front line demonstration on yield gap analysis in onion was conducted in Mungeli district of Chhattisgarh with participation of farmers for two years 2017-18 and 2018-19. The demonstration was conducted at 10 farmer's field according to recommended package of practices of ICAR- Directorate of onion and garlic research, Rajgurunagar. The demonstration was carried out with the objective to provide improved variety of onion (Bhima Shakti) and production technology to the farmers with the aim to reduce the cost of production and increase the yield. Use local variety is the major constraint of farmer's practices in cultivation of onion. This gap of lower production can be fulfilled by using high yielding variety of onion and adopting improved package of practices in farmer's field. The data were collected and analyzed on cost of cultivation, production, productivity; gross return and net return. Results indicated that the average maximum yield of demonstration practice was recorded 346 q /ha yield whereas in farmers practice the yield was 236 q/ha. The percent increase in yield over farmer's practices was recorded 49.47 per cent. The average technology and extension gap were computed 220.50 q/ha and 118 q/ha respectively with technology index 28.70 per cent. The demonstration gave higher average net return Rs. 923250/- And B: C ratio is 2.84. The result of the demonstration indicated the gap exists in the potential yield and improved practice yield is due to difference in soil fertility and weather condition. The result showed that yield can be increased by adopting high yielding variety and recommended package of practices.

Keywords

Frontline,
Demonstration,
Technology,
Production, Onion

Article Info

Accepted:
10 January 2021
Available Online:
10 February 2021

Introduction

Onion is the most important bulb crop botanically known as *Allium cepa* it is a monocotyledonous plant belongs to the family Amaryllidaceae (Malik, 1994). It is consumed either raw as salad or cooked along with spices and vegetables. The flowering shoot of onion crop is known as scape which is also used as vegetable. It is rich in minerals like

phosphorus and calcium and carbohydrates. It also contains protein and vitamin C. The typical flavor of onion is due to presence of a volatile oil known as "Allyl propyl disulphide" and red colour is due to the presence of another pigment "Quercetin". A temperate crop but can be grown under a wide range of climatic conditions such as temperate, tropical and subtropical climate. Onion plant is hardy and in the young stage

can withstand freezing temperature also. Onion is an important foreign exchange earning vegetable crop. Area the export of onion during 2011-12 was 1309863.26 thousand tonnes with a value of Rs. 1722.85 crore. Anonymous, 2011 (Indian Hort database, 2011).

In India onion is cultivated in area 1285 '000 ha with production 23262'000 mt. with productivity of 181 q/ha (Horticulture Statistics at a Glance 2018). In Chhattisgarh state total area under onion is 25782ha with production 422867metric ton and productivity 164 q/ha (Horticulture Statistics 2018-2019).

The objective of conducting this front line demonstration is to demonstrate the high yielding variety of onion with improved production technologies at farmer's field by maximum utilization of available resources including wide scale adoption and diffusion of technology at farmers' level.

Materials and Methods

The front line demonstration (FLD) is a unique approach to provide a direct interface between researcher and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations. It is the method for transfer of technology from research to the farmer's field with the objective to maximum utilization of available resources for crop production and yield enhancement. To improve the yield of elephant foot yam with replacing local acrid variety with high yielding non acrid variety demonstration was conducted by Krishi Vigyan Kendra, Mungeli during Rabi 2017-2018 and 2018-2019 in ten farmer's field of Mungeli district. In this front line demonstration was carried out in an area of 0.4 ha adjacent to the farmers fields in which the crop was cultivated with farmers practice/ local variety.

The package of practices included in Improved practices were improved variety, seed treatment, seed rate, sowing method, recommended fertilizer dose, weed management, irrigation management, plant protection measures, etc. Improved variety of onion named Bhima Shakti was developed at DOGR, Rajgurunagar, Pune. The potential yield of this variety is 28-30 t/ha. A red onion variety identified by DOGR for late *kharif* as well as *rabi* season in the states of Maharashtra, Karnataka, Andhra Pradesh, Delhi, UP, Haryana, Bihar, Punjab, Rajasthan, Gujarat, MP, Chhattisgarh and Orissa. Bulbs mature in 130 days after transplanting during late *kharif* and *rabi* season. Marketable yield during late *kharif* is 45.9 t/ha and during *rabi* 42.7 t/ha. The variety has better storage for 5-6 months. Before the demonstration, farmers were trained about various technologies to be utilized during onion cultivation. Before the demonstration, farmers were trained with various technological interventions developed by Directorate of Onion and Garlic Research to be utilized in onion cultivation. All the participating farmers were guided time to time during crop production. The nursery of onion seeds were raised in first week of October month before sowing, seeds were treated with thiram @ 2 g/kg of seed to avoid damage from damping off disease. The seedlings were transplanted in the month of December with spacing 15×10 cm (between row to row and plant to plant). At the time of transplanting, one third of the seedling top were cut to get good establishment and the seedlings were transplanted after dipping roots in carbendazim solution (0.1%) for two hours to reduce the incidence of fungal diseases during the establishment. The onion seedlings were transplanted after dipping roots in carbendazim solution (0.1%) for two hours to reduce the incidence of fungal diseases during the establishment. The optimum spacing was 15 cm between the

rows and 10 cm between plants.

All the participating farmers were guided between sowing to harvesting stage of crop. The recommended dose of fertilizer was about 110 kg of N, 40 kg of P₂O₅, and 60 kg per hectare of K₂O. One third of recommended N and full dose of P₂O₅ and K₂O were applied at the time of planting while remaining two third N was applied in two equal splits at 30 and 45 days after planting. In addition to NPK, sulphur is also an essential plant nutrient important for onion crop for improving yield and the pungency of onion bulbs. Soil application of 50 kg S /ha is recommended for long day onion crops. The performance of crop was periodically observed by the scientists of Krishi Vigyan Kendra and advisory recommendations were followed. Data from FLDs and farmers practices were taken and computed to study the yield gap between front line demonstration and farmers practice results. Finally cost of cultivation, net income, cost benefit ratio was calculated. Average of cost of cultivation, yield and net return of different farmers was calculated by formula:

$$\text{Average} = \frac{(F_1 + F_2 + F_3 + \dots + F_n)}{N}$$

Where,

F = Summation of all values (n).

N = No. of values.

The extension gap, technology gap and technology index were calculated using formula suggested by Samui *et al.*, (2000).

Technology Gap = P_i (potential yield) – D_i (Demonstration yield)

Extension Gap = D_i (Demonstration yield) – F_i (Farmers yield)

Technology index = $\frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$

$$\text{B: C ratio} = \frac{\text{Net income (Rs ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs ha}^{-1}\text{)}}$$

$$\text{Percent increase over farmer's practices} = \frac{\text{Improved practices} - \text{Farmers practices}}{\text{Farmers practices}} \times 100$$

Results and Discussion

The data regarding bulb yield of onion crop in front line demonstration versus farmers practice are given in Table 1. It was revealed that, the increased onion bulb yield over the farmers practice was noticed during all the years of demonstration. The maximum average onion bulbs yield (229.5 q/ha) was obtained in demonstration technology with 54 % average increased yield over the farmers practice. The results are in accordance with the results obtained by Gaharwar *et al.*, 2018; Gupta *et al.*, 2015; Kumar Udit, 2014 for onion crop. The yield of Onion bulb was 223 q/ha and 236 q/ha during rabi 2017-18 and 2018-19, respectively using improved practices however, in farmers practice the average yield were recorded 146 q/ha and 152 q/ha during respective years. Increase in yield was due to high yielding variety, seed treatment with fungicide, timely sowing, recommended dose of fertilizer, proper and timely irrigation and plant protection measures. The difference in yield in different years may be due to variation in soil moisture availability, rainfall etc.

From the data presented in table 2, the average technology gap 70.50 q/ha was observed. This difference between potential yield and demonstration yield was, may be due to difference in soil fertility, management skill of individual farmers and climatic condition of the area. These findings are in accordance with Singh *et al.*, (2011). The extension gap of 77 and 84 q/ha was recorded in onion, Bhima Shakti variety and farmer's local variety yield during 2017-18 and 2018-19 respectively. On an average extension gap

in yield of two year front line demonstration was 80.5 q/ha, indicating the lack in adoption of high yielding variety and use of improved production technology. By using various extension ways including block/village demonstrations in large area along with

timely supply of quality inputs in technological guidance so as to minimize the technological gap in different components of onion production technology reported in this investigation. The results are in conformity with the findings of Teggeili *et al.*, (2015).

Table.1 Yield and yield difference of elephant foot yam under front line demonstration

Year	Yield (q/ha)			Additional yield over local check (q/ha)	Per cent increase over local check
	Potential	FLD	Farmers Practice		
2017-18	300q/ha	223 q /ha	146q/ha	77	52.74
2018-19	300q/ha	236 q/ha	152q/ha	84	55.26
Average	300 q/ha	229.5 q/ha	149 q/ha	80.5	54.00

Table.2 Yield gap and technology index in front line demonstrations

Year	No. of farmer	Technology Gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
2017-18	10	77	77	25.67
2018-19	10	64	84	21.33
Mean	-	70.5	80.5	23.50

Table.3 Economics of front line demonstrations

Year	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs./ha)		B:C ratio	
	FLD	Farmers practice	FLD	Farmers practice	FLD	Farmers practice	FLD	Farmers practice
2017-18	62000	55000	334500	219000	272500	164000	4.39	2.98
2018-19	65000	57000	354000	228000	289000	171000	4.45	3.00
Average	63500	56000	344250	223500	280750	167500	4.42	2.99

The technology index reported in table 2 showed the plausibility of the demonstration technology at farmer's field. The technology index was calculated 25.67 percent and 21.33 percent during the year of demonstration. An average technology index was computed 23.50 percent. This proves the strength of new technology with recommended package of practices. As the technology index denotes the gap between technology evolved at research farm and farmers field, lower the technology

index more feasible will be the technology (Jeengar *et al.*, 2006; Hiremath and Nagraju, 2010).The economic analysis for demonstrated technology was presented in table 3. The economics over two year between front line demonstration and farmer practice indicates that the cost of production of onion under demonstration was Rs. 62,000/- to 65,000/- ha with an average Rs.63,500/ha as well as in farmers practice cost of production was Rs. 55,000 to 57,000/ha with an average Rs.

56,000/ha. The additional cost increased in demonstration was due to more cost included in procurement of improved high yielding variety, balance dose of fertilizer and IPM practices. Bhima Shakti variety of onion is very profitable it gave higher net return of Rs. 2, 72,500/ha and 2, 89,000/ha on respective years with an average of Rs. 2, 80,750/ha. In farmers practices, this net return was calculated Rs.1, 64,000/ha and Rs. 1, 71,000/ha in respective years 2017-18 and 2018-19 with an average of Rs. 1, 67,500/ha. This is less as compare to demonstration. The benefit cost ratio of demonstration (FLDs) was calculated 4.39 and 4.45 with mean 4.42 whereas in farmers practice benefit cost ratio varied from 2.98 to 3.00 with mean 2.99. This is due to higher yield potential of onion variety Bhima Shakti used in demonstration and improved package of practices applied during the growth period of the crop. These findings are similar of Hiremath and Nagaraju 2010; Tandel 2011.

Before demonstration at the farmer's field this variety was not very well known to the farmers and they were not aware of the improved technology for cultivation of this crop. The results of front line demonstration come out with the fact that the potential of improved production technology is beneficial for farmers.

In conclusion the front line demonstration conducted at farmers field on yield gap analysis of onion variety Bhima Shakti during successive years from 2017-18 to 2018-19 it was clear that there is wide gap between research practices and conventional cultivation practice of onion. Increased bulb yield with higher monetary returns and B: C ratio is the success of this demonstration. The front line demonstration programme was effective in changing attitude, skill and knowledge of farmers regarding recent technology emerging in different research

stations. Considering the productivity and profitability the farmers expressed satisfaction with the performance of onion variety Bhima Shakti. The farmers of adjoining areas were also convinced and interested to adopt onion cultivation with this variety. The demonstration study summarized that FLDs conducted by KVK, Mungeli made significant impact on horizontal spread of this technology. The net return gained by farmers participated in this demonstration by cultivation of onion has created greater awareness and motivated other farmers to adopt demonstrated technology for production of this crop in Mungeli district. This helps to improve linkage between scientists and farmers and also enhance the tuber production, consumption, nutritional security and overall livelihood security of the farmers of Mungeli district of Chhattisgarh.

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How to cite this article:

Pramila Jogi. 2021. Yield Gap Analysis of Onion under Front Line Demonstration in Mungeli District, Chhattisgarh, India. *Int.J.Curr.Microbiol.App.Sci*. 10(02): 958-963.
doi: <https://doi.org/10.20546/ijcmas.2021.1002.114>