Yield and Economics of Kharif Onion (*Allium Cepa* L.) under Front Line Demonstration in Eastern Plain Zone of Uttar Pradesh, India

ABSTRACT

Aim: One of the most important tools for technology transfer to the farmers at the grassroots level that has a significant effect on the horizontal spread of technology is front line demonstration.

Study design: Not Applicable

Place and Duration of Study: ICAR-IIVR-Krishi Vigyan Kendra, Deoria, conducted front-line demonstrations at farmers' fields during the kharif season 2017, 2018, and 2019.

Methodology: Conducted 33 front-line demonstrations at farmers' fields during

Results: The onion is a very significant valuable vegetable crop, not just for domestic use but also because it is the fruit and vegetable that generates the most foreign exchange. To increase the output of onions through enhanced production technology, According to the demonstrations that were undertaken, the enhanced variety of onions (NHRDF Agrifound dark Red) produced an average yield of 274.4 q/ha, which was greater than the average local check (228.83 q/ha). The average yield improvement over farmer techniques was 19.91%. It was noted that the average extension gap was 45.57 q/ha. The economics of the data showed that, on average, in demonstrations, gross returns were (277453.3/ha), net returns were (191184/ha), and benefit cost ratio

was (3.2) as opposed to local check, where gross returns were 204160/ha, net returns were 122423.3/ha and benefit cost ratio was (2.5).

Conclusion: Front line demonstration is one of the most important tools for technology transfer to the farmers at the grassroots level that has a significant effect on the horizontal spread of technology as well as build up the strong interaction with the farmer communities.

The onion is a very significant valuable vegetable crop, not just for domestic use but also because it is the fruit and vegetable that generates the most foreign exchange. One of the most important tools for technology transfer to the farmers at the grassroots level that has a significant effect on the horizontal spread of technology is front line demonstration. To increase the output of onions through enhanced production technology, ICAR-IIVR-Krishi Vigyan Kendra, Deoria, conducted 33 demonstrations in 3.0 hectares of farmer fields during the karif season of the years 2017, 2018, and 2019. According to the demonstrations that were undertaken, the enhanced variety of onions (NHRDF Agrifound dark Red) produced an average yield of 274.4 q/ha, which was greater than the average local check (228.83 q/ha). The average yield improvement over farmer techniques was 19.91%. It was noted that the average extension gap was 45.57 q/ha. The economics of the data showed that, on average, in demonstrations, gross returns were (277453.3/ha), net returns were (191184/ha), and benefit cost ratio was (3.2) as opposed to local check, where gross returns were 204160/ha, net returns were 122423.3/ha and benefit cost ratio was (2.5)

Introduction

One of the significant commercial vegetable crops grown in India for both local and export purposes is the onion (*Allium cepa* L.). It is a member of the family Aliaceae, which is prized for its aromatic, flavorful, and pungent bulbs. Onion green leaves and bulbs can be eaten raw in salads or prepared in a variety of ways as a raw ingredient for soups, pickles, baked goods, curries, and other dishes (Strub and Emmet, 1992). Minerals like calcium (180 mg/100g) and phosphorus (50 mg/100g) are abundant in onion bulbs. Quercetin is prevalent in onion bulbs, and it has therapeutic benefits as an anti-inflammatory, anti-cholesterol, anti-cancer, and anti-oxidant.. The cultivation area under this crop throughout India is very large in Rabi season, but productivity of onion as compared to other countries is very low. Hence, there is a need to maximize the onion productivity with the introduction of high yielding verity, improved cultivation

technologies for onion crop. India produced 26.64 million tons in 2021 (Fig. 1) whereas, the average Onion production for last five years from 2017-21 of 24.25 million tons in India (Agriculture Statistics, Indian Horticulture Database, 2022). It accounts for 16% of the world's area and occupies the second position after China in production with a share of around 14 percent. In North India, onions are typically planted as a rabi crop. The bulk (60%) of onions is produced during the rabi season, with kharif and late kharif crops producing a lesser amount (40%) of onions in different parts of the nation. Onion production and imports into India cause a recurring pattern where prices tend to peak in September to November and decline from January to March to April. Onions are very scarce from October to December (Sharma and Chauhan, 2022). While both early and late kharif onions are frequently harvested in the months of October through November and January through February, respectively, Kharif onions are essential for satisfying consumer demand and controlling onion market prices. Production of onion in Kharif and Late Kharif season is a new strategy to have continuous supply of onion round the year (Dhar *et al*., 2016)

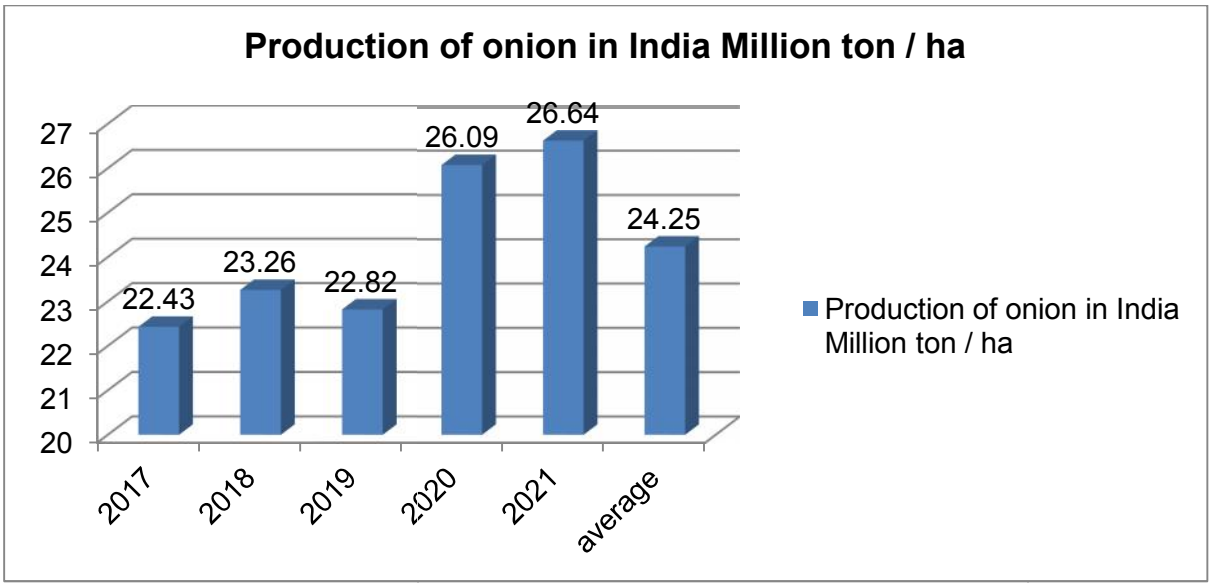

Fig. 1 Onion production (mt) in India by year over the last five years

The two key limitations on onion growing are the replacement rate of conventional varieties with better varieties and the lack of timely access to an adequate supply of high-quality seeds of improved varieties. Therefore, in the Kharif seasons of 2017, 2018, and 2019, frontline demonstrations of integrated crop management in onions utilising the variety NHRDF Agrifound dark red were conducted. The major objective of this FLD is to disseminate the recently

introduced high yielding onion variety along with better production technologies at the farmer level, leading to widespread acceptance and technology dissemination..

Materials and Methods

Front Line Demonstrations on High Yielding Variety and improved production practices of onion crop was conducted by the ICAR-IIVR- Krishi Vigyan Kendra, Deoria U.P., India during kharifi seasons of 2016-2018. In total 33 Front line demonstration, conducted in area of 3.0 ha at farmer's field in the district.. The certified seeds of onion var. NHRDF Agrifound Dark Red was procured from NHRDF centre Deoria and distributed to farmers for conduction of demonstrations. Each year prior to the implementation of programme, all selected farmers were trained on the aspects of land preparation, preparation of nursery beds, seed treatment, seed sowing and transplanting, nutrient management and weed management practices, plant protection, harvesting, curing of bulbs and integrated crop management in onion at farmers field. The soil of farmer's field was sandy loam with pH ranging from 7.8 to 8.5. These soils were low in organic matter, medium in available nitrogen and phosphorous while high in available potassium. The yield data in both the cases were recorded and a comparison was made with respect to some related parameters. The data on cost of production, gross and net returns, Benefit: Cost ratio from both demonstrated and check plots were compiled can calculated to work out the economic feasibility of the demonstrated technology against the framer's practice. The extension yield gap was calculated by using following formulae given in Samui et al., 2000.

Results and Discussion

Yield of the front line demonstration trails were recorded which were further categorized into extension gaps and economic analysis. A comparison of productivity levels between

Table: 1 Year wise yield of Khari Onion Varity NHRDF Agrifound dark red

Year	No of demonstration	Area (ha)	Demo Yield (q/ha)	Local Yield (q/ha)
2017	6	1.0	266.80	209.6
2018	18	1.3	275.80	232.60
2019	9	0.7	280.60	244.30
Total/Average	33	3.0	274.40	228.83

Improved production technology in demonstration trials and farmers' practices is presented in During the study period it was observed that the adoption of improved production technologies in demonstration trials has increased the yield over the farmers' practices.

Crop yield

The data regarding bulb yield of onion crop presented in table 1 and Fig. 1. The increased onion bulb yield over the check was recorded during the three year of study period. The improved variety for Kharif season (Agrifound dark red) of onion recorded higher yield of 280.60, 275.80 and 266.80 q/ha as compared to local check (244.30, 232.60 and 209.60 q/ha) in the year 2017-2019. The average per cent increase in yield over farmer practices was 27.29, 18.50 and14.85% for demonstration. Thus, the average of the study period of three years showed that the yield of demonstrated plot (274.40 q/ha) which was 20.21 per cent (Fig 3) more than check plot (228.83 /ha). An increased in yield may be due to high yielding demonstrated onion variety Agrifound dark red with integrated crop management contributed for increased bulb size as well as bulb weight over farmer practices. The results indicate that the improved technology has given a good impact over the farming community as they were motivated by the new agricultural technologies applied in the demonstrations field. Similar findings are reported by different researcher in onion and other crop Hiremath et al., (2011), Hiremath and Hill (2012), Kumar Udit (2014), Karabhantanal *et al*.,(2015), Meena *et al*.,(2016) and Gaharwar and Jayashri (2018).

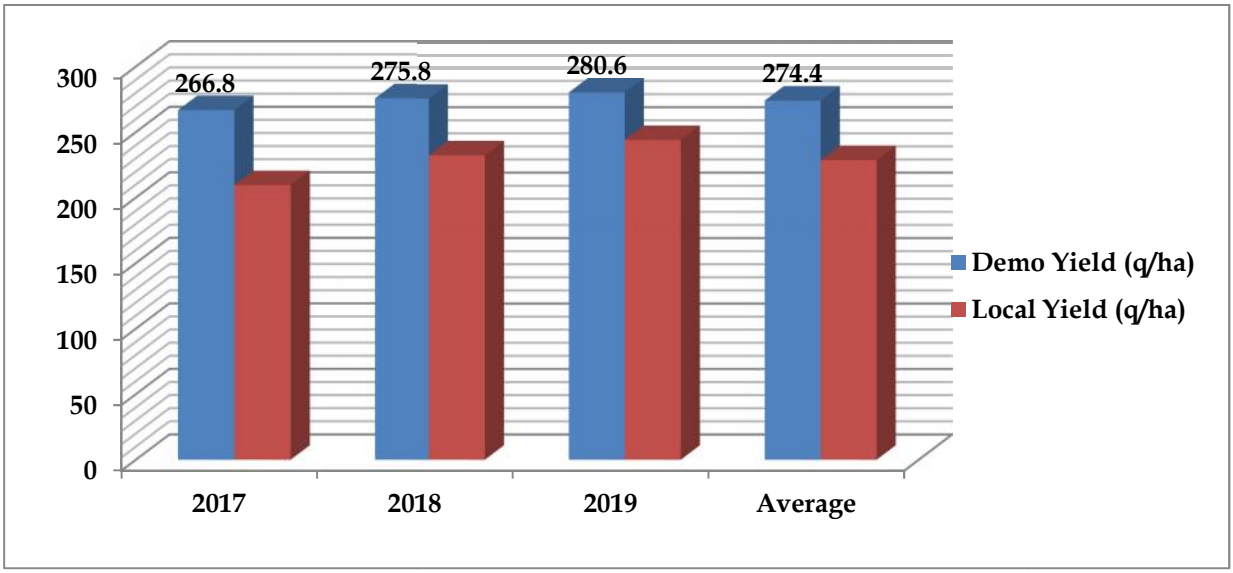

Figure.2: year-wise yield of demonstrated and local (farmer's practices) in q/ha

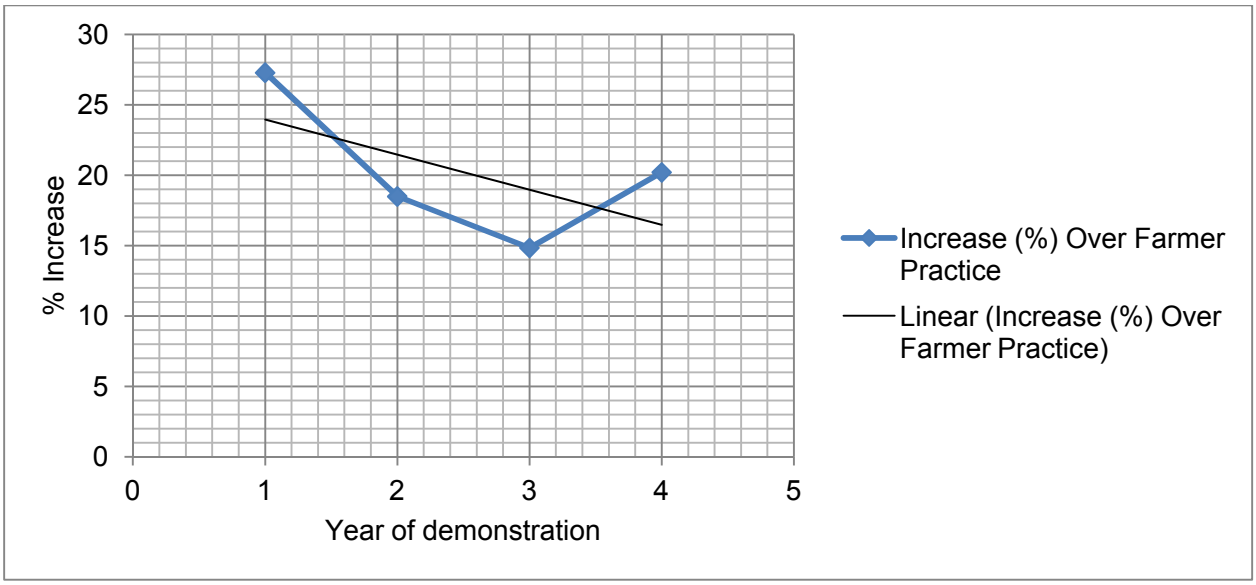

Figure.3: Year-wise percent increase in bulb production over farmers' practice

Extension gap

The extension gap showed the gap in the demonstration yield over farmers yield and the average extension gap (45.57 q/ha) was noted for three years (Fig. 4). This might be due to lack in adoption of high yielding variety and improved production technology. The higher extension gap (57.20 q/ha) indicates that there is a strong need to motivate the farmers for adoption of improved technologies over their local practices. The results are in agreement with the research worker Mukharjee (2003) who stated that, location based problem identification and thereby specific interventions may have great implications in the enhancement of crop productivity. The findings of the present study are similar with the findings of Hiremath and Nagaraj (2010), Hiremath and Hill (2012), Meena et al., 2016 and Gaharwar and Jayashri (2018)

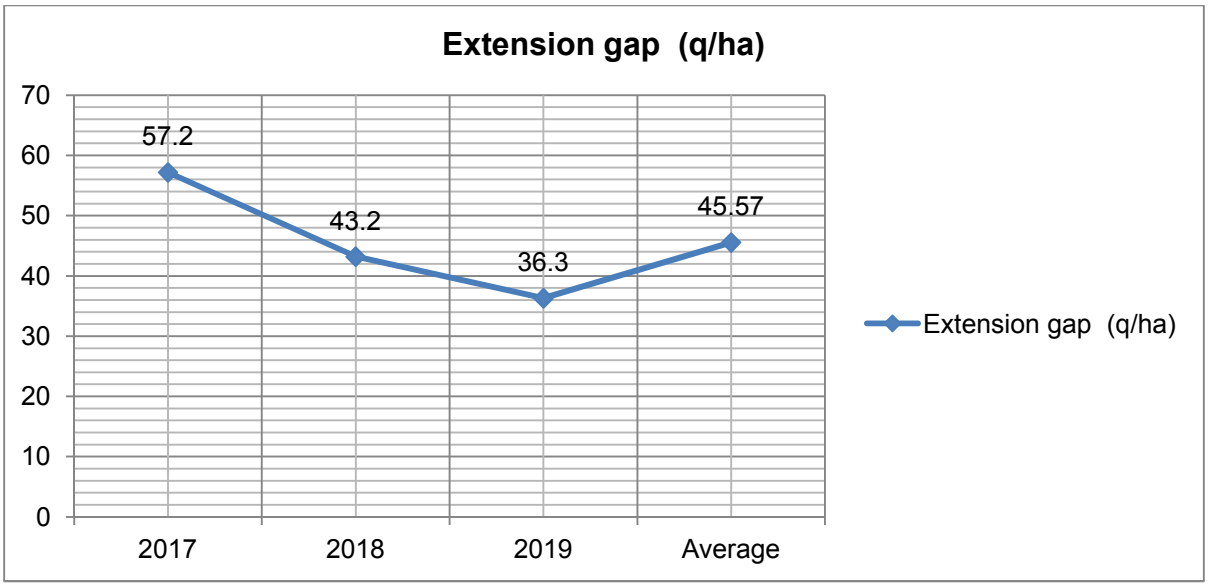

Figure.4: Year-wise Extension gap (q/ha) during demonstrated period

Economic Analysis

The year wise economics of onion production under frontline demonstrations and farmers practices were recorded and the results have been presented in Table 2 & Fig.5. Data reveal that the cost involved in the adoption of improved technology in onion varied and was more profitable. The higher gross return of (INR316440 /ha), net returns (INR 233090/ha) and benefit cost ratio (3.8:1) was recorded in year 2018 from demonstrated plot whereas, the maximum gross return (INR232600/ha), net returns (INR149620/ha) and benefit cost ratio (2.8:1) recorded from check in the year 2018. The average of the three years study period was calculted for gross return, net return and B:C ratio i.e. INR 277453.3, INR 191184 and 3.2:1 in the demonstration plot as compare to check i.e. INR 204160, INR 122423.3 and 2.5:1 respectively. The higher returns were due to higher bubs yields obtained in the demonstrated technology over check plots. The results are in confirmation with the findings of Hiremath and Nagraju (2010) and Hiremath, Hilli, (2012) and Kishor *et al*. (2020). From the study, there exists a wide gap between demonstration yields and check (Farmer practice) in onion mainly due to extension gaps and also due to the lack of awareness about growing of onion.

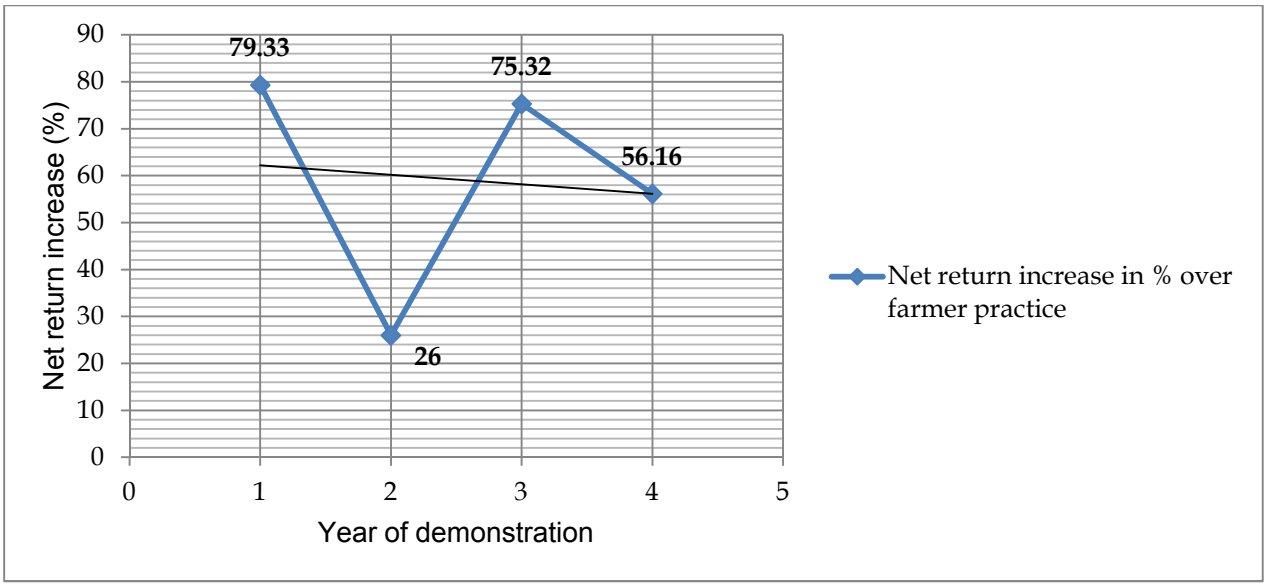

Figure.5: Year-wise increase net return (%) over farmer's practices.

The improved production technology has also shown potential to increase the yield of onion. It is further suggested that sincere extension efforts are required to educate the farmers for adoption of improved production technology besides strengthening improved technologies, so that resource poor farmers could improve their livelihood, providing employment to their local peoples, diversify their farming systems, and fertility of soil.

Table:2 Year wise Economics of Demonstration and Farmer Practice for Kharif onion Var. Agrifound dark red

Year	Economics of Demonstration (Rs/ha)				Economics of Farmer Practice (Rs/ha)			
	Gross Cost	Gross Return	Net return	B:C	Gross Cost	Gross Return	Net return	B:C
2017	88225	240120	151893	2.7:1	82980	167680	84700	2.0:1
2018	87231	275800	188569	3.2:1	82980	232600	149620	2.8:1
2019	83350	316440	233090	3.8:1	79250	212200	132950	2.7:1
Average	86268.67	277453.3	191184	3.2:1	81736.67	204160	122423.3	2.5:1

Conclusion

According to the demonstrations that were undertaken, the enhanced variety of onions (NHRDF it is concluded that Agrifound dark Red) produced an average yield improvement over farmer techniques was 19.91%. It was noted that the average extension gap was 45.57 q/ha. The economics of the data showed that, on average, in demonstrations, gross returns were

(277453.3/ha), net returns were (191184/ha), and benefit cost ratio was (3.2) as opposed to local check, where gross returns were 204160/ha, net returns were 122423.3/ha and benefit cost ratio was (2.5). Front line demonstration is one of the most important tools for technology transfer to the farmers at the grassroots level that has a significant effect on the horizontal spread of technology as well as build up the strong interaction with the farmer communities.

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