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Original Research Article

Impact Assessment of Front Line Demonstration on the Yield of Onion (*Allium Cepa* L.) under Hyper Arid Partially Irrigated Zone of Rajasthan

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A B S T R A C T

Front line demonstration is one of the key extension tool for transfer of technology at Grass root level that directly impact the horizontal spread of technology. Onion is extremely important vegetable crop not only for internal consumption but also as highest foreign exchange earner among the fruits and vegetables. Krishi Vigyan Kendra, Bikaner-II has conducted30 demonstrations in farmers' field at Chhatargarh villages of Bikaner district during Rabi 2018-19 and 2019-20 to enhance the yield of onion through improved production technology. From the conducted demonstrations, it was revealed that, the improved variety (NHRDF Red-4) of onion recorded average higher yield of 285.0 q/ha as compared to average local check (238.5 q/ha). The average per cent increase in yield over farmer practices was 19.49%. The average technological gap (65.0 q/ha), extension gap (46.5 q/ha) and technology index (18.57%) was recorded. The economics of data indicated that an average gross return of (2,28,000☐/ha), net returns (1,72,500 ☐/ha)and benefit cost ratio (4.11) was recorded in demonstrations as compared to local check where, gross return (1,90,800 ☐/ha), net returns (1,30,685 ☐/ha)and benefit cost ratio (3.17) recorded.

Keywords

Onion, Technology gap, Technology index, Extension gap, Economics

Introduction

Onion (*Allium cepa* L.) is one of the important commercial vegetable crops cultivated in India for both domestic consumption and export purpose. It belongs to the family Aliaceae, which is valued for its bulbs having characteristics odour, flavour and pungency. Green leaves of onion and bulbs are used for fresh consumption as greens in salad and also cooked as raw material in many ways in curries, fried, boiled, baked and used in making soups, pickles etc. (Strub and Emmet, 1992). Onion bulb is rich in minerals like phosphorous (50 mg/100g) and calcium (180 mg/100g).Onion bulbs are rich in quercitin and having medicinal values as anti inflammatory, anti cholesterol, anti cancer and anti oxidant. Onion is one of the major sources of income even to the marginal and small farmers. The cultivation area under this crop throughout India is very large, 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 varities, improved cultivation technologies for onion crop. Onion occupies an area of 1434 thousand ha, with production of 26738 thousand tonnes (Agriculture Statistics, Indian Horticulture Database, 2019).The productivity of onion is much low in India than the world average (Pandey, 2000; Lawande, 2005).

India accounts for 16% of the world's area and occupies the second position after China in production with a share of around 14 percent. The yield of onion cropis decreasing due to several abiotic and bioticfactors. Unawareness of the farmers about suitable seasons, climate, improved cultivation techniques, characteristic of the varieties and adoption of proper package of practices are also the reasons responsible for limiting the production and productivity of onion directly or indirectly (Pandey and Bhondey, 2002).

Further, the replacement ratio of traditional varieties with improved varieties and nonavailability of sufficient quantity of quality seeds of improved variety in time, are the other major constraints in onion cultivation.

The key factors in the successful growing of onions are, planting at the right time, fertilizer application and keeping the weeds down as onions need their full growing season and resent competition from weeds (Kumar *et al.,* 2001). Hence to improve the production of onion, front line demonstrations on integrated crop management in onion with var. NHRDF Red-4 were conducted in two *Rabi* seasons of 2018-19 and 2019-20. The primary objective of this FLD is to spread the newly released high yielding variety of onion with improved production technologies at the farmers' field by exploiting their available resources and acquaint them with front line varietal as well as management technologies leading to wide scale adoption and diffusion of technology at farmers' level.

Materials and Methods

Front Line Demonstrations on High Yielding Variety and improved production practices of onion crop was conducted by the Krishi Vigyan Kendra, Bikaner-II (Lunkaransar)at Chhatargarh village of Bikaner district during *Rabi* seasons of 2018-19 and 2019-20. An area of 0.4 ha. for demonstration plots and 0.4 ha. for local check plots were allotted for conduction of Front line demonstration, thus conducted total 30 demonstrations on 12 ha.

The certified seeds of onion var. NHRDF Red-4was procured and distributed to farmers for conduction of demonstrations. Each year prior to the implementation of programme, all selected farmers were trained on nursery raising of onion crop and integrated crop management in onion at farmers field and these selected beneficiaries were provided with all the essential inputs.

During the training session, farmers were guided 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 post harvest practices.

The soil of farmer's field was sandy loam with pH ranging from 7.9 to 8.5. These soils were low in organic matter, medium in available phosphorous while high in available potassium. The results 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 plots and check plots were compiled can calculated to work out the economic feasibility of the demonstrated technology against the framer's practice. The technology yield gap, extension yield gap and technology index were calculated by using following formulae suggested by (Samui *et al*, 2000) as given below:

Yield increase (%)

$$= \frac{\text{Demonstration yield (Kg ha}^{-1}\text{) - farmer's practice yield (Kg ha}^{-1}\text{)}}{\text{Farmer's practice yield (Kg ha}^{-1}\text{)}} \times 100$$

Technology yield gap (Kg ha^{-1}) = Potential yield (Kg ha^{-1}) – Demonstration yield (Kg ha^{-1})

Extension yield gap = Demonstration yield (Kg ha^{-1}) - Farmer's practice yield (Kg ha^{-1})

Technology Index

$$= \frac{\text{Potential yield (Kg ha}^{-1}\text{) - Demonstration yield (Kg ha}^{-1}\text{)}}{\text{Potential yield (Kg ha}^{-1}\text{)}} \times 100$$

Results and Discussion

Yield of the front line demonstration trails and potential yield of the crop was compared to estimate the yield gap, which were further categorized into technology and extension gaps (Table 1).

A comparison of productivity levels between improved production technology in demonstration trials and farmers' practices is presented in table 2. 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 2. The increased onion bulb yield over the check was recorded during both the years of study. The improved variety (NHRDF Red-4) of onion recorded average higher yield of 285.0 q/ha as compared to average local check (238.5 q/ha). The average per cent increase in yield over farmer practices was 19.49% for demonstration.

The increased in yield may be due to high yielding demonstrated onion variety NHRDF Red -4 with integrated weed and nutrient management technology contributed for increased bulb yield 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.

These findings are in line with the results of Warade *et al.*,(2006), Hiremath *et al.*, (2007), Warade *et al.*, (2008), Hiremath *et al.*, (2011), Hiremath and Hill (2012), Kumar Udit (2014), Gupta *et al.*,(2015), Gaharwar *et al.*,(2017), Karabhantanal *et al.*,(2015), Meena *et al.*,(2016), S. Rajput *et al.*, (2018) and Gaharwar and Jayashri (2018) for onion crop.

Technology Gap

The technology gap showed the gap in the demonstration yield over the potential yield. From the data presented in table 2, the average technological gap was recorded 65.0

q/ha during both the year of study and it needs to be minimized with the conduction of FLD/s. The technology gap may be attributed to dissimilarity in the soil fertility status, weather condition and lack of awareness about the improved variety and its seed availability. In addition to this, more location specific recommendations and precise use of technology in the fields are necessary to bridge the technology gap as supported by Singh *et al.*,(2011) and Meena *et al.*, 2016,.

Extension gap

The extension gap showed the gap in the demonstration yield over farmers yield and it was 46.5q/ha. This might be due to lack in adoption of high yielding variety and improved production technology.

The higher extension gap 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)

Technology index

The technology index shows the feasibility of the variety at the farmer's field. The lower the value of technology index more is the feasibility (Jeengar *et al.*, 2006 and Hiremath and Nagraju, 2010, Sagar and Chandra, 2004). The technology index reported in table 2, showed the average technology index value of 18.57%. The findings of the present study are similar with the findings of Hiremath and Nagaraju (2010), Hiremath and Hill (2012) and Gaharwar and Jayashri (2018)

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 3. Data reveal that the cost involved in the adoption of improved technology in onion varied and was more profitable.

The higher gross return of (2,28,000☐/ha), net returns (1,72,500 ☐/ha)and benefit cost ratio (4.11) was recorded in demonstrations as compared to local check where, gross return (1,90,800 ☐/ha), net returns (1,30,685 ☐/ha)and benefit cost ratio (3.17) recorded.

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 *et al.*, (2007) Hiremath and Nagraju (2010) and Hiremath and Hilli, (2012).

From the study that there exists a wide gap between the potential and demonstration yields in onion mainly due to technology and extension gaps and also due to the lack of awareness about growing of onion. 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.1 Technology details for the study on integrated crop management technology for onion crop under front line demonstration.

Sr. No.	Particulars	Technology for Onion cultivation under	
		Demonstration	Local check /Farmer's practice
1	Farming situation	Irrigated	Irrigated
2	Variety	NHRDF Red-3	Use of local/own seeds with varietals admixture
3	Seed treatment	Carbendazim 3g/kg seed	No seed treatment
4	Seed rate	10 kg/ha	12-15 kg/ha
5	Transplanting	First week of January	Mid of January
6	Fertilizer application	100:50:50 kg NPK/ha. Half N and full P_2O_5 and K_2O applied at the time of transplanting and half dose of N 1 month after TP.	Imbalanced application of fertilizer N:P:K @ 60:30:00 kg/ ha
7	Weed management	Spraying of pendimethalin@1.0kg/ha with one hand weeding at 45DAT	Three hand weeding at 20,40 and 60 DAT
8	Plant protection measures	Timely application of fungicide Dithane M-45 for control of disease.	Use of incorrect dose of pesticides abruptly

Table.2 Productivity, technology gap, extension gap and technology index of onion crop under FLDs

Year	**Variety**	**No.**	**Area (ha)**	**Average Yield (Kgha^{-1})**		**% Increase over FP**	**Extension Gap (q/ha)**	**Technology Gap (q/ha)**	**Technology Index (%)**
				Farmers Practice	**Demonstration**				
2018-19	NHRDF Red-4	15	6.0	231	278	20.34	47.0	72.0	20.57
2019-20	NHRDF Red-4	15	6.0	246	292	18.69	46.0	58.0	16.57
Average	NHRDF Red-4	30	12	238.5	285	19.49	46.5	65.0	18.57

Table.3 Economics of onion production under frontline demonstrations

Year	Demonstration				Farmer's Practice			
	Gross Cost (₹/ha)	**Gross Return (₹/ha)**	**Net Return (₹/ha)**	**B : C ratio**	**Gross Cost (₹/ha)**	**Gross Return (₹/ha)**	**Net Return (₹/ha)**	**B : C ratio**
2018-19	52400	222400	170000	4.24	57750	184800	127050	3.20
2019-20	58600	233600	175000	3.98	62500	196800	134300	3.14
Average	55500	228000	172500	4.11	60125	190800	130675	3.17

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