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IMPACT OF FRONT LINE DEMONSTRATION ON CABBAGE (*Brassica oleracea var. capitata* L.) YIELD IMPROVEMENT IN SOUTH TRIPURA

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ABSTRACT: One of the major constraints of traditional cabbage cultivation is low productivity due to non-adoption of recommended package of practices and improved varieties by the Tripura cabbage growers. To replace this anomaly, KVK South Tripura under ICAR Research Complex for NEH Region was conducted 15 frontline demonstrations (FLDs) on recommended production technology of cabbage var. BC-76 in five different villages of the district during Rabi season for two years (2007-08 and 2008-09). Cultivation practices comprised under FLD viz., use of improved variety, recommended planting spacing, balanced fertilizers application and control of pest and diseases. The present study was carried out to know that the yield gaps between improved package of practices and existing farmers practice of cabbage. An average yield of cabbage in FLD ranged from 323.75-338.50 q/ha whereas in existing practice 250.00 q/ha in 2007-08 and 2008-09. Percent increase yield with improved technology over existing practice was recorded in range of 29.50 to 35.40. The extension gap ranging between 73.75-88.50 q/ha during the study period. The trend of technology gap reflected the farmer's cooperation, in carrying out such demonstrations with encouraging results in subsequent years. Average per hectare net profit was found Rs. 72,000.00 under demonstration while Rs. 42,600.00 under control. The benefit cost ratio was noticed 2.79 and 3.02 with demonstrations whereas 2.37 and 2.48 with farmers practices during 2007-08 and 2008-09, respectively. By conducting frontline demonstration of proven technologies, yield potential from cabbage cultivation can be enhanced to a great extent with increase in the income of the farmers.

Keywords : *Frontline demonstration, technology gap, extension gap, technology index, cabbage.*

Cabbage (*Brassica oleracea* var. *capitata* L.) belongs to the Brassicaceae family and is, in fact, one of the oldest vegetables. The cabbage has been ranked by the FAO among the top twenty vegetable crops grown, establishing it as an important food source, globally (FAO, 4). It has high water content, is high in fibre, and has significant quantities of protein, calcium and iron. The cabbage is a rich source of vitamin A and vitamin C, in addition to containing some B vitamins (Adeniji *et al.* 1; Meena *et al.* 8; Hasan and Solaiman, 6). It also contains significant amounts of glutamine, an amino acid which has anti-inflammatory properties (Caunii *et al.,* 2). Cabbage has a number of anti-oxidative compounds that might be beneficial in the prevention of cancer (Kusznierewicz, *et al.* 7). This leafy vegetable is used mainly in salads, as a fresh food item, but is also cooked with other foods, and is suitable for processing. The cabbage head may be flat, round or pointed, with variations among these shapes. Green, round headed cabbages are the most common types. Maturity can range from early to late in the growing season. The cabbage is a cool season crop which grows best under cool, moist weather conditions. The cabbage is one of the most important vegetable crops of the North Eastern region. It is grown during the cool season of November to March in Tripura. However, the yield per hectare is low in the district as compared to other parts of country. Low yield per unit area can be attributed to the number of yield affecting factors such as low fertility of land, lack of knowledge of technology on the part of cabbage growers and ultimately low adoption of recommended cultivation technology. One of the objectives of this demonstration was to educate the cabbage growers about its scientific cultivation right from nursery raising stage to increase productivity.

MATERIALS AND METHODS

In present study performance of hybrid cabbage variety BC-76 against local check was evaluated through frontline demonstrations conducted at farmer's field during rabi season in the year 2007-08 and 2008-09. The study was carried out by the Krishi Vigyan Kendra South Tripura under ICAR Research Complex for NEH Region. Total 15 frontline demonstrations were conducted on the selected farmers' fields of five adopted villages i.e. Sataria, Chandrapur, Maharani, Jamjuri, and Dudhpushkarini, in different locations of South Tripura district, Tripura in

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the North Eastern region and covering 2.48 ha area. Materials for the present study with respect to frontline demonstrations (FLDs) and farmers' practices are given in Table 1. The seeds were sown in the nursery bed in IInd week of October and transplanted after 4 weeks in the main field whereas crops were harvested in first week of February. In case of local check plots, existing practices being used by farmers were followed. In general, soils of the area under study were sandy loam in texture with medium to low in fertility status. Climate of the district is characterized humid summer and dry cool winter with high rainfall during July – October. The FLD was conducted to study the gaps between the potential yield and demonstration yield, extension gap and technology index. In the present evaluation study, the data on output of cabbage cultivation were recorded from FLD plots, besides the data on local practices commonly adopted by the farmers of this region were also collected. In demonstration plots, a few critical inputs in the form of quality seed, recommended fertilizers, agro-chemicals etc. were provided and non- monetary inputs like healthy seedlings, timely transplanting, timely weeding and earthing-up were also performed. Whereas traditional practices were maintained in case of local checks. The demonstration farmers were facilitated by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting, grading etc. during the course of training and visits. The technologies demonstrated are mentioned in Table 1 and compared with local practices.

- Technology gap = Potential yield - Demonstration yield
- Extension gap = Demonstration yield - yield under existing practice
- Technology index = {(Potential yield - Demonstration yield) / Potential yield} x 100

RESULTS AND DISCUSSION

Results of 15 frontline demonstrations conducted during 2007-08 and 2008-09 in 2.48 ha area on farmers' fields of five villages of South Tripura district indicated that the cultivation practices comprised under FLD *viz.,* demonstrated high yielding variety (BC - 76), transplanted quality seedlings in recommended spacing (60cm x 45cm), application of balance dose of fertilizers (N:P:K @ 90:40:40 kg/ ha^{-1}), timely intercultural operations like weeding, earthing-up and control of pest and diseases through recommended chemicals at economic threshold level. The average FLDs yield was recorded 323.75 q/ha during 2007-08 and 338.50 q/ha during 2008-09 which was found 29.50 and 35.4 % consequently increased yield of

Table 1: Particulars of cabbage growing under FLD and existing practices.

Sl. No.	Operation	Cabbage	
		Existing practice	Demonstration package
1.	Variety	Local variety	Demonstrate high yielding variety BC–76 as recommended by ICAR Research Complex NEH Region Tripura Centre.
2.	Sowing and transplanting	Broad casting in nursery, transplanting as per farmers suitability	Raised quality seedlings in the raised nursery beds, line sowing and transplant after 27-30 days of seed sowing. Maintained recommended transplanting spacing i.e. row to row and plant to plant 60cm x 45cm.
3.	Fertilizers application	Less fertilizers dose	90:40:40 kg/ha, Half dose of N and full dose phosphorus and potash applied as basal and rest of N applied as top dressing in 2 split doses after 30 and 45 day of transplanting
4.	Intercultural operations and plant protection measures	No weeding, followed heavy irrigation and rarely use of plant protection chemicals	Two weeding, shallow hoeing to loosen the soil for better aeration and earthing-up after 30 – 40 after transplanting. Light and frequent irrigation followed as and when required. Application of recommended plant protection chemicals as occurrence of pest and diseases.

Table 2: Exploitable productivity, technology gaps, technology index, extension gaps of cabbage as grown under FLD and existing package of practices.

Years	Area (ha)	No. of FLDs	Yield (q/ha)			% increase yield over existing	Extension gap (q/ha)	Technology gaps (q/ha)	Technology index (%)
			Potential	Demonstrations	Existing practices				
2007-08	0.48	5	358.00	323.75	250.00	29.50	73.75	34.25	9.57
2008-09	2.0	10	358.00	338.50	250.00	35.40	88.50	19.50	5.45
Average			358.00	331.13	250.00	32.45	81.13	26.87	7.51

cabbage as compared to local check (250.00q/ha) . Data further showed that the yield of cabbage in the following years increased successively which clearly speaks of the positive impact of FLD over existing practices of cabbage cultivation (Table 2). The results indicate that the frontline demonstration has given a good impact over the farming communities of South Tripura district as they were motivated by the new recommended cabbage production technologies applied in the FLD plots. Moreover from first year onwards, farmers cooperated enthusiastically in carrying out of FLDs which lead to encouraging results in the second year. The similar results of yield enhancement in turmeric and rape seed-mustard crop in front line demonstration had also been documented by Deshmukh *et al.* (3) and Mitra and Samajdar (9).

The technology gap (ranging between 19.50 - 34.25 q/ha) reflected the farmer's cooperation, in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed may be attributed to the dissimilarity in the soil fertility status and weather conditions. The extension gaps which ranged from 73.75 - 88.50 q/ha during the period of study emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinuance of old varieties with the new technology.

The technology index shows the feasibility of the evolved technology at the farmers' fields. The lower the value of technology index more is the feasibility of the technology. As such, reduction of technology index from 9.57% (2007-08) to 5.45% (2008-09) exhibited the feasibility of technology demonstrated (Table 2).The income and benefit cost ratio of front line demonstrations (Table 3) clearly revealed that the benefit with B : C ratio from recommended practice were substantially higher than control plot i.e. farmers practice during both the years of demonstration. Average per hectare net profit from the demonstrations was recorded ₹ 71,500.00 and ₹ 72,500.00 while from existing practices ₹ 43,400.00 and ₹ 41,800.00 during 2007-08 and 2008-09 respectively. The benefit cost ratio of demonstrated and control plots were 2.79 and 2.37, 3.02 and 2.48 during 2007-08 and 2008-09, respectively. Hence, favourable benefit cost ratios proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. Deshmukh *et al.* (3) had also demonstrated attractive gross return and net return as well as higher B:C ratio by adopting scientific management practices in turmeric. Similar findings were reported by Sharma (10) in moth bean and Gurumukhi and Mishra (5) in sorghum.

Reasons of low yield of cabbage at farmer's fields

1. Optimum sowing time is not followed.
2. Sometimes non availability or not knowing of quality seed or variety/hybrid seed and farmers go for the local seed in hand.
3. Most of the farmers are broad cost the seeds in the nursery and not raise quality seedlings seedling
4. Farmers do not maintain proper plating spacing and plant population per hectare. They not follow transplanting at proper growth stage of seedlings.
5. Use of inadequate and imbalance dose of fertilizers by farmers does not make possible to fetch maximum yield.
6. Suitable plant protection measures may not be applied at on time.
7. Intercultural operations i.e. weeding, earthing-up are not followed properly because mechanical weed control is costly and chemical control is quite uncommon in this region.

Table 3 : Average return and cost benefit ratio of cabbage as grown under FLD and existing package of practices.

Year	Average Gross Return (₹/ha)		Average Net Profit (₹/ha)		Benefit : Cost Ratio	
	FLD	Existing Practice	FLD	Existing Practice	FLD	Existing Practice
2007-08	1,11,300	75,000	71,500	43,400	2.79	2.37
2008-09	1,08,320	70,000	72,500	41,800	3.02	2.48
Average	1,09,810	72,500	72,000	42,600	2.91	2.43

CONCLUSION

By conducting frontline demonstrations of proven technologies, yield potential of cabbage can be increased to a great extent. The results of front line demonstrations convincingly brought out that the yield of cabbage could be increased by 29.50% to 35.40% with the intervention on balanced nutrition coupled with the improved seed and crop production management in South Tripura, NE region. From the above findings it can also be concluded that use of scientific method of cabbage cultivation reduced the technology gap and extension gap to a considerable extent. This will substantially increase the income as well as the livelihood of the arming community. There is a need to adopt multi-pronged strategy that involves enhancing cabbage production through improved technologies in South Tripura district. This should be brought to the access of farmers through transfer of technology centres like KVKs.

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