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Impact Assessment of FLD for popularisation of Finger Millet in Ri-Bhoi district of Meghalaya

MEGHNA SARMA* AND MOKIDUL ISLAM

ABSTRACT

Millets have been recognized as super cereals by virtue of their climate resilience and superior nutritional profile. Finger millet (*Eleusine coracana*), the domesticated coarse cereal of African origin, forms staple food for the people in the drier parts of India. There is possibility to enhance finger millet productivity by adoption of improved production technology of finger millet cultivation, viz., improved seed, sowing method, use of balance nutrients, plant protection measures etc. The present study was carried out in nine villages under Ri-Bhoi district of Meghalaya, India. KVK, Ri-Bhoi initiated frontline demonstration of HYV of Finger Millet (Var.VL-379) with a total of 147 nos. of FLDs which were evaluated to find out the yield gaps between HYV of millet variety and variety grown by farmers. Yield data of both demonstration and farmers practice were recorded and their yield gap, technology gap, extension gap and technology index were analysed. Results revealed that the finger millet (Var. VL.379) recorded an average of 40.46 per cent higher yield over farmer's variety. On an average, technology gap was recorded 6.28 q/ha, while the average extension gap was recorded 5.32 q/ha. Average technology index was recorded 26.14 percent. Average net return was found Rs.27,787/ha and Rs. 14,487/ha with demonstration and farmers practice respectively. Higher benefit-cost ratio of 2.51 was recorded in the demonstration plot than the farmer's practice of 1.9, respectively.

Keywords: Finger Millet, Technology gap, Extension gap, Technology index, Economics

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INTRODUCTION

Millets are regarded as climate smart crop because of their ability to grow in adverse condition in nutrient poor soil, less irrigation and can be easily grown in hilly terrain which could help to feed the world's ever-growing population. Millets are small seeded cereal crops belonging to the family Poaceae and are considered the world's sixth most important cereal grain crop feeding more than one-third of the world's population (Verma and Patel 2012). They are pre-green revolution crops cultivated traditionally by many generations. Finger millet commonly known as ragi or mandua is extensively cultivated in various regions of India and in the entire world. It is better adapted in higher rainfall area (600-1200 m.m) particularly to acid soils and matures within 100-130 days (Gull *et al.* 2014).At the moment, the fragile and marginal ecosystem in the NEHR of India is one of the most significant factors that act as a barrier to optimum crop production (Das *et al.* 2019).In India finger millet is grown in 11.93 lakh ha with a production of 19.92 lakh tonnes and productivity of 1661 kg/ha (GoI, 2014).The improved varieties of finger millet under good management can produce 4tonne of grain per hectare. In North east India millets have been an integral part of farming system for a long time and local cultivars are grown in the jhum fields with other crops such as paddy. Millet was one of the most important crop in the past but neglected in the region even though they are playing a crucial role both in nutritional and cultural side for indigenous communities of Meghalaya (Zizira, 2015).

The total area under millet cultivation in Meghalaya is 2845 ha with production of 2,520 million tonnes (Azad *et al.* 2021). During the 2017-18, area and production of major millet increased significantly in the state. However, in Ri-Bhoi district, millet covers a meagre area of 28 ha, production of 38MT and productivity of 1214 kg/ha (GoI, 2014). There is a huge potentiality to incorporate millets on a large scale in this fragile ecosystem for its wider adoption. Through various awareness programmes and research activities, it can be popularised as an important crop in the ecosystem of North East. Hence, both the nutritionally rich local cultivars and high yielding varieties of millet must be selected, tested and conserved for its cultivation by the farmers (Layek *et al.* 2023).

Through various smart technologies and strategies, it will be possible to bridge the yield gap and increase the productivity of millets in Ri-Bhoi district of Meghalaya. Poor agronomic practices such as high seed rate, faulty nutrient management, negligence of plant protection measures is responsible for low productivity in the region. Therefore, to promote and increase the knowledge and skill, a demonstration programme was formulated by KVK, Ri-Bhoi with an objective to demonstrate this millet crop with HYV of finger millet (Var.VL-379) with all the proper management practice at farmers field in different

Krishi Vigyan Kendra, Ri Bhoi, ICAR Research Complex for NEH Region, Umiam, Meghalaya, India
*Corresponding Author E-mail: meghnasarma3@gmail.com

farming locations. Surveys were done in selected locations for popularization of HYV of finger millet variety in the district.

MATERIALS AND METHODS

Ri-Bhoi district of Meghalaya lies between 25° 40' N to 25° 21' N longitude and 90° 55' E to 91°16' E latitude with and elevation of 100 m to 1350 m above sea level. The district has loamy to fine loamy soil and receives an average annual rainfall of 1636.46 mm. The maximum rainfall is in the month of June and July. The total annual rainfall received during 2021-22 was 2968.4 mm that included the entire monsoon season beginning from June to September. The average annual maximum and minimum temperature is 21.0°C and 13.0°C, respectively. Since most of the farmers are small, marginal or landless agricultural labourers (18.8%) and cultivators (52.4%) among total workers in the district.

Before conducting the FLD's, meetings with farmers, surveys were undertaken for selection of farmers and thereafter an orientation cum awareness programme were imparted to the beneficiaries related to crop under demonstration. FLD on finger millet variety VL- 379 was then started in different villages under the district in an area of 10.0 ha and 15.0 during the year 2021-22 and 2022-23 respectively. Quality seeds of the variety were distributed to the selected farmers under FLDs and the crop was sown during the 1st week of June and transplanted before 15th July,2023. The recommended doses of organic manures were applied in furrows during the sowing operations. During the programme from sowing to harvesting, frequent monitoring and follow up visits were carried out to inspect the adopted package of practices, timely weeding, effective plant protection measures in both the practices (Table 1). The average yield of each FLD and farmers practice, cost of cultivation, gross return, net return and B:C ratio was recorded for interpretation of the results. The extension gap, technology gap and technology index were calculated using the following formula:

Extension Gap = Demonstration Yield - Yield under farmer's practice

Technology Gap = Potential Yield - Demonstration Yield

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

$$\text{\% increase over farmer's practice} = \frac{\text{improved practice – Farmers practice}}{\text{Farmers practice}} \times 100$$

RESULTS AND DISCUSSION

Production constraints of Finger millet

During the FLDs, the problems faced by the farmers in finger millet production were documented and the perusal of data is presented (Table 2). The major problems faced by the farmers are lack of high yielding varieties (82.25), timely availability of quality seeds (78.56), marketing (72.12), low technical knowledge (70.87), use of high seed rate (68.66), farm mechanization (55.34), fragmentation of land size (43.86), disease and insect pests (20.45), damage by wild animals (15.98) etc. Singh, (2017) also conducted a frontline demonstration on wheat in Rudraprayag District of Uttarakhand and reported almost similar production constraints. Dhruw *et al.*, (2012) has also reported similar constraints in maize.

Table 2: List of production constraints and their rank given by farmers

S.No.	Major constraints	Percentage	Rank
1.	Lack of high yielding varieties	82.25	I
2.	Timely availability of quality seeds	78.56	II
3.	Marketing	72.12	III
4.	Low technical knowledge	70.87	IV
5.	Higher seed rate	68.66	V
6.	Farm mechanization	55.34	VI
7.	Fragmentation of land size	43.86	VII
8.	Disease and insect pests	20.45	VIII
9.	Damage by wild animals	15.98	IX

Productivity and Technology Gap

Results indicated that the growth characters as well as the yield of finger millet variety was substantially higher than the variety grown by the farmers during the cropping period. The average pooled data on yield attributes recorded, viz., number of effective tillers m^{-2}, number of grains ear $head^{-1}$, number of fingers ear $head^{-1}$, test weight and length of finger were found to be higher in improved practice and presented in Table 3. Grain yield of finger millet variety in demonstration plots was recorded as 18.21 q/ha and 18.72 q/ha in the year

Table 1: Particulars of demonstration package and farmer's practice of Finger millet

Particulars	Demonstration Package	Farmers practice
Variety	VL-379	Sikkim-1
Seed rate	8-10 kg	10-20 kg
Sowing method	Line Sowing (25-30 cm in rows, 8-10 plant to plant)	Broadcasting
Sowing Time	June-July	June-July
Fertiliser Dose	5 t/ha FYM,150 kg rock phosphate with lime@500 kg applied in furrows	FYM
Weeding/Interculture operations	1st hand weeding at 25-30 DAS,2nd weeding -50 DAS.	No weeding
Insect pest and disease management	Spraying of neem oil 0.03% @ 3 ml/liter of water twice at 10 -day intervals for control of pink stem borer and Bihar hairy caterpillar. Disease-free seeds were selected, and proper sanitation practices were followed	No specific management practices followed

2021-22 and 2022-23 respectively which was 39.54 and 41.38 percent higher over farmer's practice (Table 4). On an average 40.46 percent increase in yield was obtained in the demonstration plots whereas average yield in farmers practice was recorded only 13.14 q/ha. Thakur *et al.* (2017) reported 140.12 percent higher grain yield of finger millet under improved practices. These results confirm with Ahmed *et al.,* (2017) & Sarmah *et al.,* (2014). The reduced productivity in farmers practice might be mainly due to factors like use of non-descript local variety and low level of agronomic management in addition to non-availability of resources in time. The results depict the positive effects of FLDs over the existing practices towards enhancing the yield of millet in the district.

Table 3: Impact of improved and farmers practice on growth attributes of Finger Millet (Pooled data of 2 years)

Method of Practice	Effective tillers m^{-2}	No of grains ear $head^{-1}$	No of finger ear $head^{-1}$	Test Weight (g)	Length of Finger (cm)
Improved Practice (Var.VL-379)	24.5	1348	7.3	2.63	11.72
Farmers Practice (Var.Sikkim-1)	19.4	1154	5.2	2.08	9.35
S.Em. (±)	1.27	0.61	0.60	0.31	0.66
C.D. (P=0.05)	3.92	1.87	1.83	NS	1.96

Table 4: Impact of improved and farmers practice on grain yield of Finger millet

Years	Area	No. of demonstration	Potential yield (q/ha)	Average Yield (q/ha)		Increase over farmers practice (%)
				Dem.	Local	
2021-22	10.0	62	25.0	18.21	13.05	39.54
2022-23	15.0	85	25.0	18.72	13.24	41.38
Total	25.0	147	-	36.93	26.00	80.92
Average	-	-	-	18.46	13.14	40.46

Extension Gap, Technology Gap and Technology Index

The extension yield gap was recorded of 5.16 q/ha and 5.48 q/ha during the year 2021-22 and 2022-23 respectively (Table 4). The extension yield gap might due to lack of awareness for the adoption of improved farm technologies by the farmers. It emphasizes the need to educate the farmers through various means to reverse the trend of extension gap. Replacement of local cultivars by HYVs is very much essential in this context. Frontline demonstrations are the much important tool for popularizing HYVs among the farming community. It was found that the refinement in the local farmers practices for higher adoption of location specific generated farm technology for sustaining crop productivity. However, adoption of improved technologies for small holders depends on more than careful planning of research and the use of appropriate methodologies in extension (Singh *et al.,*2020).

Table 5: Results of Extension gap, technology gap and technology index in Finger millet

Years	Area	No. of demonstration	Extension Gap (q/ha)	Technology Gap (q/ha)	Technology Index (%)
2021-22	10.0	62	5.16	6.79	27.16
2022-23	15.0	85	5.48	5.77	25.12
Total	25.0	147	10.64	12.56	52.28
Average	-	-	5.32	6.28	26.14

The technology gap recorded was 6.79 q/ha and 5.77 q/ha respectively during the year 2021-22 and average of 6.28 q/ha was obtained. The variation in technology gap might be due to uneven distribution rainfall, poor soil fertility and cultivation on marginal lands. The average technology gap of 9.91 q/ha for finger millet was reported by Thakur *et al.* (2017). Similar findings reported by Rewat *et al.* (2019) in finger millet crop under rainfed conditions of Uttarakhand. Technology Index calculated was 27.16 and 25.12 percent during the year 2021-22 &2022-23 respectively with average technology index of 26.14 percent. The lower value of technology index, more is the feasibility of technology (Kumar *et al.,* 2014). Fluctuation in technology index might be attributed to uneven rainfall distribution, long dry spell, increasing pressure of diseases and insect pests attack in the crop. Technology index indicates the feasibility of generated farm technologies in the farmers field under existing agro-climatic conditions as stated by Rawat *et al.* (2019).

Economic Analysis

Highest gross returns with Rs.46,800/ha, net return of Rs.28,800 /ha and B:C of 2.61 were calculated under improved practice while under farmers practice highest gross return of Rs.33,100/ha, net return of Rs.15,100/ha and B:C of 1.86 were

recorded during the year 2022-2023 (Table 6). Hence, higher B:C ratios proved the economic viability of the interventions made under FLD. Similar findings were reported by Ahmed *et al.* (2017). The variations in economic returns between the years may be attributed to the variable performance of respective crops in terms of grain yield under improved practices in fronline demonstrations. Higher returns and B:C ratio under improved practices in FLD was also reported by Thakur *et al.* (2017) in finger millet crop. Similarly higher net returns and B:C ratio in FLDs on improved technologies compared to farmers practice are reported by Joshi *et al.* (2014) in wheat.

Table 6: Economic analysis of FLD in Finger millet

Years	Gross Return (Rs. /ha)		Net Return (Rs. /ha)		B:C ratio	
	Dem	Farmers Practice	Dem	Farmers Practice	Dem	Farmers Practice
2021-22	45,525	32,625	26,775	13,875	2.42	1.74
2022-23	46,800	33,100	28,800	15,100	2.61	2.19
Average	46,162	32,862	27,787	14,487	2.51	1.9

CONCLUSION

Growing improved varieties in place of local varieties alone can result in incremental yield benefit of around 25–30%. Choosing appropriate variety depending on location is very important apart from good crop management. The productivity gain under FLD over farmer's practices created awareness and motivated the other farmers to adopt improved production technology of finger millet in the district. However, there is also a need of proper dissemination of location specific technologies imbedded with high yielding varieties to improve the rainfed farming system of agriculture in Meghalaya. For enhancing the production as well as consumption of millets along with creating awareness among the masses for food and nutritional security, the United Nations has declared the year 2023 as the International Year of Millets. Hence, in NEHR in order to popularize millets Govt. of India has been working with various organisations in order to promote millets in their diet and farming system. From this study, it can be concluded that there is immense potentiality of finger millet crop in the region therefore its popularization in the broader range is essential for the population to help in promoting the consumption of this millet

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