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Impact of Front Line Demonstrations on Yield Enhancement of Ginger (var. *Majauley*) in Tribal Reserve Biosphere of Sikkim Himalaya

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ABSTRACT Ginger is a very popular and important crop in Sikkim but due to improper adoption of practices of cultivation in Dzongu, North Sikkim, its productivity is far below the average productivity of the state. Considering the scope of improvement in productivity through the recommended technologies, 40 front line demonstrations were conducted by ICAR, Research Complex for NEH Region, Sikkim Centre, Tadong under National Agricultural Innovation Project, component III during 2007-2010 in five different villages' farmers' fields. Farmers' practices prevailing in the region were treated as control for comparison with recommended practice like no mother rhizome removal and application of leaf mulch for controlling soft rot in ginger. Yield of ginger increased by 44.22 per cent (for recommended practice) over control. An average net profit of Rs. 2,55,258 was recorded in recommended practice wherein it was Rs.1,31,677 in farmer's practice. Benefit: Cost ratio varied from 5.75 - 5.90 under demonstrations while it was 3.54 - 3.75 for control. Front line demonstration of recommended technology revealed that yield potential and net income from ginger cultivation can be enhanced to greater extent.

INTRODUCTION

Technology transfer refers to the spread of new ideas from originating sources to ultimate users (Prasad et al. 1987). Ginger has been the major horticultural cash crop of Sikkim for more than two decades with high returns which resulted in non-traditional areas being brought under this crop. Ginger is predominantly cultivated in all the district of Sikkim in mandarin-ginger, maize-ginger, beans-ginger cropping systems. New cultivation practices were introduced and adopted by a large section of ginger growers. But at later stage, many farmers gave up ginger cultivation while others are still struggling to survive because, over the last 15 to 20 years diseases severely affected the crop resulting in a decline in the yield ratio from 1 'seed' rhizome to 8–10 harvested rhizomes to only 1 to 2–3 (Gurung and Gurung 2006). There is ample scope for further improvement of production and productivity of ginger for raising the income level of the farming community of the state. Yield loss under real farming conditions can be attributed to several biotic and abiotic factors, important among them are improper crop rotation, poor field drainage, seed treatment, plant protection measures and cultural practices. Dzongu area of North Sikkim is dominated by Lepcha tribes since time immemorial. The Lepcha's were hunters and gatherers (Mukhopadhyay et al. 1996; Arora 2006) and used to live complete nomadic lives. Since mid-nineteenth century, they began practicing settled agriculture (Das 1978). Large cardamom was the cash crop of the region and was grown as pure crop under shady trees on hill slopes (Bhasin 2011). After decline in the large cardamom production, ginger becomes the main agriculture activity in Dzongu area of North Sikkim. Potentiality of recommended technology through front line demonstration was attempted in this study with an objective to combat the causes of low yield and lower economic returns.

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METHODOLOGY

ICAR Research Complex for NEH Region, Sikkim Centre Tadong, Gangtok conducted 40 Frontline Demonstrations on farmers field during 2007 - 2010 at five different villages viz. Bringbong, Gor, Lingdong, Passingdong and Upper Hee-Gyathang under Dzongu, North Sikkim in the operational areas of National Agricultural Innovation Project, component III. The area considered under each demonstration was 0.4 ha (1 acre). Survey, farmers meeting and field visit during cropping season, low yield and increased incidence of soft rot, bacterial wilt and shoot borer of ginger were identified as major issues. In order to manage these problems, innovative and recommended practices were followed as new interventions during front line demonstrations programme. In case of recommended practices, crop rotation, field drainage, seed treatment, plant protection measures and balanced cultural practices were followed whereas in the farmers (control plot) existing practices were also followed. Majauley var. of ginger was selected based on its better performance and adoptability in the selected area. Well before the conducting demonstrations, farmers of respective villages were trained with respect to identified technologies. Procedure for site and farmers selection, layout of demonstration and farmers participation etc. were followed as per the methodology followed by Choudhury (1999). Visits of the farmers and extension functionaries were organized at demonstration plots to show the significance of large scale cultivation of ginger. Yield data was collected from farmer's practices (control plots) and demonstration plots and cost of cultivation, net income and Benefit: Cost ratio were calculated and analyzed.

RESULTS AND DISCUSSION

The yield performance and its related economic indicators presented in Table 1 reveals that the under demonstration plot, production of ginger yield was found to be substantially higher than that of farmers practices (control plot) during the entire demonstration period (2007-10). The yield of ginger was recorded 120, 122.50 and 127.50 q/ha in the year 2007-08, 2008-09 and 2009 -10, respectively. The yield enhancement by the recommended technological intervention was higher as 40.4, 38.5 and 53.8 per cent over the control. The cumulative effects of technological intervention over three years indicated average productivity enhancement of ginger from the recommended practice, during the three cycles was 44.22 per cent which is far higher than the farmers practice (control). Mukherjee (2003) had reported that the innovative intervention may have superior implications in enhancing productivity. Similar results were also reported by others, namely Mishra et al. (2009), Tiwari et al. (2003), Tomar et al. (2003), Tiwari and Saxena (2001) and Haque (2000) in different crops.

Various economic indicators like gross expenditure, gross returns, net returns and Benefit: Cost ratios of frontline demonstrations are also presented in Table 1. The economic indicators clearly showed that the net returns from the recommended practices were substantially higher than the control plot that is, farmers practices during the demonstration period. The average net returns from the recommended practice were much higher (Rs. 2,55,258) in comparison to farmers practice/control plot (Rs. 1,31,677). An average Rs. 1,23,581 as additional income was received through the innovative technological interventions that is, crop rotation, field drainage, seed treatment, plant protection measures and balanced cultural practices. Economic analysis of the yield concluded that the benefit: cost ratios of demonstration plots were significantly higher over control. The benefit: cost ratio of the recommended practice and farmers practice were 5.70 and 3.59, 5.79 and 3.75 and 5.90 and 3.54 during 2007-08, 2008-

Table 1: Yield performance and economic indicators of frontline demonstration of ginger (var. Majauley)

Year	*No. of demonstrations*	*Yield (q/ha)*		*% increase over FP*	*Gross expenditure*		*Gross return*		*Net return*		*BC ratio*	
		RP	*FP*		*RP*	*FP*	*RP*	*FP*	*RP*	*FP*	*RP*	*FP*
2007-08	10	120	85.5	40.4	52550	50500	300000	181687.5	247450	131187.5	5.70	3.59
2008-09	15	122.25	88.25	38.5	52800	50000	305625	187531.3	252825	137531.3	5.79	3.75
2009-10	15	127.50	82.90	53.8	53250	49850	318750	176162.5	265500	126312.5	5.90	3.54
Average	40	123.25	85.55	44.2	52867	50133	308125	181794	255258	131677	5.79	3.60

09 and 2009-10, respectively. The overall average benefit: cost ratio varied from 5.79 to 3.54 between the recommended and farmers practice, respectively. The benefit: cost ratios of the system proved the economic viability of the interventions made under demonstration and convinced the farmers on the utility of the interventions. The authors like Mishra et al. (2009) in potato, Sharma (2003) in moth bean and Gurumukhi and Mishra (2003) in sorghum also reported similar findings. The data also revealed that the maximum increase in yield was recorded in the 2009-10, while maximum benefit: cost ratio of 5.90 was also recorded during the same year. The variation of benefit: cost ratio during the different years may be related to the yield performance and other inputs and production in that particular year.

CONCLUSION

The results of frontline demonstrations showed that the yield of ginger could be increased by 38.5 to 53.8 per cent with the help of innovative technological intervention coupled with the proper management of disease in the Dzongu area of North Sikkim. High benefit: cost ratio also advocated the economic viability of the demonstration and motivated the farmers towards adoption of interventions demonstrated. The suitable technology for enhancing the productivity of ginger crop, and need to conduct such demonstrations may lead to the improvement and empowerment of farmers. It is also proven from the results of the demonstrations that the project of improvement and empowerment of livelihood (NAIP-III) for Dzongu area is proceeding in the right direction.

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