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Popularization of Turmeric Production Technologies through Demonstrations in Tirap District of Arunachal Pradesh, India

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A B S T R A C T

The total fifty numbers of demonstrations were conducted during 2015-16 to 2017-18 in different villages of Tirap district of Arunachal Pradesh to disseminate the production technology of turmeric, var. Megha Turmeric 1. The different extension approaches (Farmer meetings, training programmes, field visits) and proper package of practices (timely transplanting, rhizome treatment, proper spacing, plant protection measures etc.) resulted higher yield over local practice of cultivation (251 q/ha and 224 q/ha). The net profit and benefit cost ratio also were reported higher than check (Rs.3,75,433 and Rs. 3,18,258 as compared to Rs.2,27,108 and Rs.1,86,146 respectively, 2.96 and 3.45 as compared 2.85 and 2.55 respectively). The knowledge level and adoption level were too higher between beneficiary and non- beneficiary farmers.

Introduction

In Arunachal Pradesh more than 70% farmers are directly or indirectly dependent upon agriculture. The agro ecological conditions of the state provide immense opportunity for the commercial exploitation of the horticultural crops. Among the horticultural crops, spices found integral space in the socio-economic life of the tribal farmers and recorded an area of 0.40 thousand ha with the production and productivity of 1.50 thousand tones and 3.75 tones/ha, respectively, in Arunachal Pradesh of north east India during 2012-13 (Anonymous, 2013). Among the spices, turmeric (*Curcuma longa* L.) is an important crop cultivated by the farmers in the state.

Turmeric is extensively used as stimulant, blood purifier, tonic as carminative and remedy against the skin diseases, pain and anthelmintic. A variety named as Megha

Turmeric-1 is a promising turmeric cultivar developed by the ICAR Research Complex of NEH Region, Meghalaya through clonally selection from Lakadong. This variety is suitable for mid hills condition, takes 300 to 315 days for crop maturity. The average yield of rhizome per clump is 350-425 g with yield potential of 270 q/ha. Further, it contained 16.37 % dry matter, 6.8 % curcumin and 5.5 % essential oil and highly tolerant to leaf spot and leaf blotch (Yadav *et al.,* 2009). MegaTurmeric-1 has showed high stability for dry yield across environments (10 locations) and could serve as a good genetic source for stability in breeding programs for high dry yield and curcumin content (Anandaraj *et al*., 2014).

Economy of the tribal farmers of Arunachal Pradesh who grow this crop traditionally without adequate knowledge on the variety, optimum plant spacing and size of rhizomes used as planting material. The average productivity of turmeric in this region is low owing to so many biotic and abiotic factors and important among them are cultivation of inferior varieties, no use of fertilizers and inadequate use of plant protection measures against leaf spot, leaf blotch, rhizome rot etc. Therefore there is ample scope for improvement of production and productivity of turmeric and raising the income level of the farming community. In this regard; technology transfer is measure tool to spread new ideas from originating sources to the users (Prasad *et al.,* 1987). Seeking these situation in mind (low yield and low economic returns), front line demonstrations of turmeric was attempted in the Tirap district of Arunachal Pradesh, India.

Materials and Methods

Study was confined to demonstrations conducted by Krishi Vigyan Kendra (Farm Science Centre) Tirap, Arunachal Pradesh-India. The yield and economic performance of demonstrations, the data on output were collected from demonstration as well as local plots and finally the yield, cost of cultivation, net returns with the benefit cost ratio was worked out. For the purpose of investigation, ten villages of Tirap district, where demonstrations were conducted during preceding two years were selected. A sample of 100 respondents was taken comprising 50 beneficiary (from 10 villages) and 50 non-beneficiary farmers. For selection of beneficiary farmers, a list of farmers where demonstrations on turmeric were conducted during Kharif 2015-16 to 2017- 18 was prepared (with full package and practices) and taking equal representation, five beneficiary farmers from each of the selected villages making fifty respondents were selected randomly. For the other half of samples (50 non- beneficiary farmers) were selected randomly from the locally adjacent to college, where demonstrations were not conducted by any institute or organizations. The data were collected through personal contacts with the help of well structured interview schedule. The gathered data were processed, tabulated, classified and analyzed in terms of mean percent score and ranks in the light of objectives of the study. More than 10 percent difference between beneficiary and non-beneficiary farmers' was considered as significant difference.

Results and Discussion

During the year, 2015-16, demo yield was recorded 251 q/ha as compared to 167 q/ha (local); which was 33.46% significantly higher than demo due to various reasons. In 2017-18 too, the demo yield 31.69 % higher was recorded than local (224 q/ha as compared 153 q/ha).

Chandra *et al.,* (1996), Govind *et al.,* (1998) and Chandra *et al.,* (2005) have shown similar trend of Yield results in Megha Turmeric 1. The yield enhancement due to technological intervention over control. The year-to-year fluctuations in yield and cost of cultivation can be explained based on variations in microclimatic conditions and marketability price. Mukherjee (2003) also reported that depending on identification and use of farming situation specific interventions may have greater implications in enhancing systems (Table 1).

The economic data of table-2 clearly show that the net returns from the demonstration plots were substantially higher than control plots during all two the years (Rs 3,75,433/as compared Rs 2,27,108 and Rs 3,18,258/ as compared Rs 1,86,146/). Economic analysis revealed that benefit/cost ratio in demonstration plots was comparatively higher than control plots.

In 2015-16 demonstrations, demo plots performed 2.96 B:C ratio as compared 2.85 of check plots. Similarly in 2017-18, demo plots B: C ratio was higher than check (3.45 as compared 2.55) during the study period. Hence favorable B: C ratio proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. Similar findings were reported by Sharma (2003) in moth bean, Gurumukhi and Mishra (2003) in sorghum and Kumar *et al.,* (2012) in ginger.

It is assumed that the knowledge of a farmer is largely depends upon the extent of exposure given to him or her about the technology. The demonstrations conducted on coriander crop by KVK Tirap were supposed to imparted knowledge of turmeric production technology to the farmer, where demonstrations were conducted on his farm. Therefore, efforts were made to assess the knowledge level of beneficiary as well as non-beneficiary farmers regarding turmeric production technologies. The knowledge of the respondents about improved package of practices were measured in term of mean percent scores (MPS). Total ten practices were included to assess the knowledge as given in Table 3.

The data in the Table 3 depicts that the both type of respondents possessed maximum knowledge regarding time of sowing, irrigation scheduling and improved quality rhizome of turmeric. The mean percent scores of knowledge of beneficiary farmers varied from 77.71 to 93.33, while in case of non-beneficiary farmers, the mean percent scores varied from 66.57 to 89.33. This indicates a little gap of knowledge between both categories of respondents. The data further revealed that knowledge of beneficiary farmers regarding practices like fertilizer application, field preparation, weed control, harvesting & storage, seed treatment, plant protection measure, and seed rate & spacing were found to be 91.71, 90.80, 90.67, 89.00, 88.29, 87.58 and 77.71 mean percent score, respectively. In-case of non- beneficiary famers, the knowledge regarding field preparation, harvesting & storage, fertilizer application, weed control, plant protection measure, rhizome treatment, and rhizome rate & spacing, were found to be 85.20, 85.00, 78.89, 78.86,76.57 and 66.57 mean percent score, respectively.

The Table 3 also revealed that the knowledge of beneficiary farmers regarding different improved turmeric production technologies was higher than non- beneficiary ranging from 4.33 MPS of harvesting & storage to 12.85 MPS of fertilizer application.

The significant difference between both categories of respondents was found in knowledge of fertilizer application (MPS 12.85) followed by weed control (MPS 11.78), rhizome treatment (MPS 11.72), rhizome rate & spacing (MPS 11.14) and plant protection measures (MPS 10.95) respectively.

The overall difference in knowledge level of beneficiary and non beneficiary farmers was only 8.21 MPS which was non- significant as per criterion followed by researcher (Kumawat 2008, and Meena *et al.*, 2013). This might be due the fact that there were number of other extension education programme which are working on the principle "*learning by doing*" and "*seeing is believing"* organized by different organizations and communication media for farmers which provide knowledge about turmeric production technology, resulting in increase of knowledge not only to beneficiary but non beneficiary farmers also.

Table.1 Yield performance of demonstrations on turmeric crop

Year	Variety	No of demonstrations	Area (ha)	Average yield q/ha		Increasing yield over check (%)
				Demo	Check	
2015-16	Megha Turmeric-1	50	25	251	167	33.46
2017-18	Megha Turmeric-1	50	25	224	153	31.69

Table.2 Economic performance of demonstrations on turmeric crop

Year	Cost of cultivation (ha^{-1})		Gross return (ha^{-1})		Net return (ha^{-1})		B:C ratio	
	Demo	**Check**	**Demo**	**Check**	**Demo**	**Check**	**Demo**	**Check**
2015-16	1,26,567	1,16,892	5,02,000	3,34,000	3,75,433	2,27,108	2.96	2.85
2017-18	1,29,742	1,19,854	4,48,000	3,06,000	3,18,258	1,86,146	3.45	2.55

Table.3 Level of knowledge of the respondents about improved turmeric production technologies (*showing Significant difference)

S.No.	Coriander production technology	Max. Score	Beneficiary (n=50)		Non Beneficiary (n=50)		Non-Beneficiary
			MPS	**Rank**	**MPS**	**Rank**	
1	Improved & quality seed	15	92.00	III	86.93	III	5.07
2	Rhizome treatment	05	90.80	V	85.20	IV	5.60
3	Rhizome rate & spacing	07	88.29	VIII	76.57	IX	11.72*
4	Irrigation scheduling	06	93.33	I	90.00	I	3.33
5	Plant protection measures	07	77.71	X	66.57	X	11.14*
6	Field preparation	14	91.71	IV	78.86	VII	12.85*
7	Time & methods of planting	05	92.20	II	87.20	II	5.00
8	Fertilizer application	09	90.67	VI	78.89	VI	11.78*
9	Weed control	19	87.58	IX	76.63	VIII	10.95*
10	Harvesting & storage	06	89.00	VII	85.00	V	4.00
Overall		100	**89.33**		**81.12**		**8.21**

Table.4 Adoption level of the respondents about turmeric production technologies (*showing Significant difference)

S.No.	Coriander production technology	Max. Score	Beneficary (n=50)		Non Beneficary (n=50)		Difference
			MPS	Rank	MPS	Rank	
1	Improved &quality seed	15	87.07	IV	78.80	IV	8.27
2	Field preparation	05	87.60	III	79.60	III	8.00
3	Seed treatment	07	77.71	VIII	58.00	IX	19.71*
4	Time & methods of sowing	06	90.33	IX	87.67	IX	2.66
5	Seed rate and spacing	07	67.46	VI	55.14	VI	12.32*
6	Fertilizer application	14	84.00	I	69.71	II	14.29*
7	Irrigation scheduling	05	88.00	VII	81.20	VII	6.80
8	Weed control	09	81.78	IX	63.33	VIII	18.45*
9	Plant protection measures	19	76.14	VI	61.05	V	15.09*
10	Harvesting & storage	06	82.67	IV	77.67	IV	5.00
Overall		100	**82.28**		70.98		**11.30**

Extent of adoption level

Extent of adoption level of beneficiary and non- beneficiary farmers was measured for ten practices of turmeric production technologies. Table 4 revealed that the beneficiary respondents adopted time of sowing on their farm at the highest extent with MPS 90.33 followed by irrigation scheduling, field preparation, and improved and quality seed with MPS 88.00, 87.60, and 87.07, respectively. The study further showed that MPS pertaining to practices like; fertilizer application, harvesting & storage, weed control were 84.00, 82.67, and 81.78 respectively, which showed high adoption of these practices by beneficiary farmers. On the contrary, the practices such as rhizome treatment, plant protection measures, and rhizome rate & spacing were found least adoption by beneficiary farmers with 76.14, 77.71, and 67.46 MPS, respectively. The extent of adoption of non- beneficiary farmers was also measured. The data of table 3 also depicts that non-beneficiary farmers adopted time of sowing to the highest extent with MPS 87.67 followed by irrigation scheduling (MPS 81.20) and field preparation (MPS 79.60), respectively. The study also indicated that the practices like; improved and quality rhizome, harvesting & storage and fertilizer application were adapted to the extent of 78.80, 77.67 and 69.71 MPS, respectively. The weed control, plant protection measures, rhizome treatment, and rhizome rate & spacing were found to be least adopted by non- beneficiary farmers with 63.33, 61.05, 58.00 and 55.14 MPS, respectively. When difference in extent of adoption of various aspects of turmeric production technologies between beneficiary and non- beneficiary farmers was measured, it was found that difference in extent of adoption level between both categories of respondents ranging from MPS 5.00 to 19.71. The highest and significant difference between both categories of respondents was observed in adoption of rhizome treatment with MPS 19.71 followed by weed control, plant protection measures, fertilizer application and rhizome rate & spacing with MPS 18.45, 15.09, 14.29, and 12.32, respectively. Overall difference in extent of adoption level between both categories of respondents was MPS 11.30 which was considered as significant as per criterion followed by researchers. It was clear that adoption of turmeric production technologies was more among the beneficiary as compared to non- beneficiary farmers. It might be due to the fact that continuous contact of beneficiary farmers with scientists during conducting demonstrations at their farm, motivating them to acquire knowledge and skills for adopting turmeric production technologies for maximize their yield and income Baran (Kumawat 2008, and Meena *et al.*, 2013).

The results of demonstration proving that turmeric yield could be increased by 32.58 per cent (pooled of two years) with the better technological intervention. In this subsequent, a attractive Benefit: cost ratio is self-explaining the economic viability of the demonstration. The technology founded suitable for enhancing the productivity of turmeric crop as well as area expansion under turmeric production in Tirap district.

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