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Investigation into Effectiveness of the Farmer Field School in Tomato Production in District Swat

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Abstract
The present study was conducted to investigate the effectiveness of the farmer field school (FFS) in tomato production in district swat of Khyber Pakhtunkhwa province. The study was carried out in four purposively selected villages of swat namely; Kotlai, Parrai, Rangilla and Qabershah. For primary data collection 80 respondents were selected for the study, 20 farmers were selected purposively from each village FFSS for the study. Data were collected through a well-structured and pretesting interview schedule. It was found that majority 36.25% of the respondents of the study area belonged to age group of 41-50 years. In terms of educational level, majority 45% were illiterate. Major problems faced by the sample respondents were insect/pest attacks which were stated by 35% and the second was non-availability of seed reported by 28.75% of the total sampled respondents. The average seed rate of tomato was 290.50 gram per acre before FFS and cost was Rs. 5835.0 per acre while, after FFS it was decreased to Rs. 160.11gram per acre while average seed cost was decreased to Rs. 1518.2 per acre. Farmers of the study area were using plant to plant space before FFS 24.43cm but after FFS they are using an average plant to plant space of 30cm in their farms. The cost of fertilizer before FFS was reported to be Rs. 13948 per acre after FFS it was decreased to Rs. 5080.0. Before FFS the cost of crop protection was much higher i.e Rs. 6462.50 per acre which reduced to Rs. 829.25 per acre after FFS. The cost of farm yard manure was stated to be Rs. 7918.60 per acre which after FFS increased to Rs. 8398.80 per acre. The average yield of tomato before FFS was recorded as 9508.8 kg per acre which increased to 12735 kg per acre after FFS through the adoption of modern techniques of tomato production recommended at FFS to the farmers that resulted in higher income of Rs. 288880.00 after FFS as compared to income before FFS i.e. Rs. 201750.00. Majority 92.5% of the respondents of the study were satisfied of the FFS services and were willing to adopt that approach in future as well.
Keywords: Investigation, Effectiveness, Farmer Field School, Tomato Production, District Swat.

1. Introduction

Most of the country's population depends on agriculture directly or indirectly. Almost about 24 % share in the Gross Domestic Products (GDP) and employs about half of the country population are agriculture as well as it is the largest contributor to the foreign exchange. Whole rural and urban population is feeded by this sector. The planners and policy makers have realized the importance of this sector and they are keen in getting reliable statistics of area and production of agricultural crops on right time. They primarily require statistics of major agricultural crops such as cotton, wheat, rice, maize, and sugarcane etc, however, due to the consistent ups and downs in the prices of essential agricultural products such as potatoes, onions, tomatoes, pulses and chilies, these vegetables are also considered important now a days. (GoP, 2013).

Swat can be divided into two physical regions: Mountainous Ranges and Plains. The area of Swat district is about 5337 square kilometers with the population of 1.75 million (2008 Census). This total area is divided in to two tehsils, namely Matta and Swat. Urban literacy is 48.05 % and rural is 25.53 %. The main language of the area is Pashto. With high mountains, green meadows, and clear lakes, it is a place of great natural beauty and is popular with tourists as "the Switzerland of the region. (www.swat.com,2013).

Keeping in view the importance of vegetable, two crops of tomato are grown annually, one in summer, for which the seeds are sown in November and the seedlings are kept covered over the winter months to protect them from frost. In February-March when the frost danger is over, they are transplanted to field. Harvesting of this crop starts in May and continues till August. The other is winter crop, which is produced only in places where no frost occurs during winter. Seeds are sown in June and seedlings are transplanted in July-August. Harvesting of this crop starts in November. In Pakistan production of tomato crop from 2005 to 2010 was raised from 468.1 to 476.8 tonnes which is still below from consumption line. According to Ministry of Food, Agricultural and Livestock in 2005-2010 tomato production was raised from 64.6 to 77.9 tonnes in Punjab, in Khyber Pakhtunkhwa production was decreased from 161.6 to 119.3 tonnes, In Baluchistan production was also decreased from 193.6 to 179.2, while in Sindh production was raised from 48.3 to 100.4 tonnes. Heavy rain fall with hailing, decrease in area under tomato cultivation, diseases etc. are the main causes for decrease in production (GoP, 2013).

The term "Farmer Field School" (FFS) comes from the Indonesian expression Sekolah Lampangan, meaning "field school". This name reflects the three educational goals of a FFS: (1) learning takes place in the field; (2) field conditions define most of the curriculum; and (3) real field problems are observed and analyzed

from planting to harvesting. Farmer Field Schools bring together concepts and methods from agro-ecology, experiential education and community development. At a Farmer Field School, a group of people comes together with a common interest as they want to learn about together. Topics of interest can vary from pest management to animal husbandry to organic agriculture. Members meet on a regular basis to study the "how and why" of their topic. They make regular field observations and relate these observations to the ecosystem. They combine their local knowledge with new information to make logical and appropriate decisions about how to manage their farms and livelihoods. This process builds self-confidence and teaches decision-making, problem-solving and management skills. The previous Technology Transfer model of extension had failed to contain large-scale outbreaks of the Rice Brown Plant Hopper, which threatened rice self-sufficiency in Indonesia. Since 1989 the Food and Agriculture Organization of the United Nations (FAO) has been promoting the FFS approach as part of its international effort's to defeat hunger and build food security across the globe. Today, an overview of the global status of FFSs is difficult to obtain since many different organizations have implemented FFSs in over 87 different countries. A global survey carried out in 2005 estimated that by 2008 between 10 and 20 million farmers had graduated from this Technology (James, *et al.,* 2010).

Fliert *et al.,* (1995) carried a major innovative effort in Indonesia to device make a new type of farmer training on IPM under the national IPM programe. After training a cadre of competent field trainers of IPM, outside of the regular national extension activities, thousands of FFS were conducted. In this study the experiences of Indonesian national IPM programe regarding the IPM training of FFs are presented. The study first provides the description of the development of IPM and extension as well as institutional framework of national IPM programe. Then it discusses the intensive training of IPM field trainers that form the core of IPM facilitators at the field level and effort which were made for training the large number of field school facilitators that included farmers and village extension agents/worker.

Stock (1996) carried out a study in cabbage growing areas of Philippines to describe the two participatory group activities that were developed for monitoring and evaluation of IPM based FFS trainings. These two activities were used in conjunction with the semi structured interviews that provided more help in completely understanding the changes in people way of learning and making decisions. The Venn diagram was used for showing the changes in resource and quantity decisions. The pest and disease matrix was used to chart the changes in pest and disease severity that changes with season and the changes in management activities for coping with pests. The study provides description that how these group activities should be carried out and also provides ideas about possible changes for using in other conditions.

Saddiqui *et al.,* (2012) sought to assess the success of Farmer Field School (FFS) training on farmers' knowledge and skills about agro-ecological sound integrated pest management practices in four districts of Sindh province (Hyderabad, Tando Allahyar, Matiari and Mirpurkhas). In addition, the study analyzed the performance of the agricultural extension field worker/facilitator in the adoption of the FFS training. The results indicated that FFS training was a favorable process in increasing knowledge and skills of cotton growing farmers regarding ecologically sound farming practices. In addition, the results indicated that the FFS graduate shared/transferred little knowledge to non- FFS participants, which is not good sign for the sustainability of the IPM-FFS program. It was therefore suggested that the FFS graduates should be used as a source for transferring the obtained knowledge

Iqbal *et al.,* (2012) found the present study that the Farmer field schools (FFS) is always aimed to help farmers to discover and learn about field ecology and integrated crop management. A study for rice crop was conducted in four FFS villages namely Chinar Kot, Karkani, Dheri and Matkani of Malakand Agency during 2004-05. From each FFS, Results of this study show that Best Agricultural Practices (BAP) has brought a positive change in the attitude of farmers of the project area through FFS approach. In rice 77.5% of the respondents were between the ages of 20 to 40 years, 25% of the respondents had education of primary level, 17.5% middle, 35% matric level, 7.5% at intermediate level and 15% at graduate level. Average land holding size was & acres, while 50% of the respondents were happy with FFS approach.

Rahman and Hamid (2012) conducted a study to determine the impact of Farmer Field Schools on farmer's adoption of IPM options for onion in the Gezira State. Field surveys were used to collect data from three Farmer Field Schools in the Gezira State in the 2010/2011 growing season. The results showed significant association between number of seasons of participation in FFS and adoption of suggested IPM package components for onion by FFS participants. It can be completed that the FFS approach is very efficient in the transfer of farm technology for vegetable farmers through their participation in various activities of FFS schools. Thus, FFSs approach should become national policy, share of authority of extension organizations in control and carrying out of FFSs activities with farmer units for more valuable participations of clientele in all activities of the schools and more efforts should be exerted in distribution of all inputs to farmers with reasonable prices through various agricultural centers in order to increase the adoption process.

Swat is a valley of fruits and vegetables specially tomatoes. Farmers are trying to get the maximum yield but all in vain. There is a general perception that the dissemination of new technology is the concern of the

extension agent only but it is also of many other stakeholders. In this regard the government has launched a Farmer Field School approach. It is because of the resourcefully and successfully transfer of the modern agricultural technologies is essential to add the agricultural production including fruits, pulses, vegetables, cereals and cash crops. It is therefore the dire need of to check the dissemination of the performance of the farmers, speed up the capacity building of growers, empowering them in decision making and will facilitate them to adopt new technology to increase their production.

Objectives of the study

1. To analyze the effect of Farmer Field School on tomato production in Swat.
2. To study the impact of FFS on farmer's perception regarding tomato production.
3. To sort out problems/constraints of farming community regarding tomato production.

2. Research Methodology

The area was selected due to the establishment of FFS through Agricultural Extension Department and National Integrated Pest Management (IPM) and Malakand Rural Development Project (MRDP), through a project for best Agricultural Practices (BAP). Four village of tomato were studied purposively. A list of all tomato FFS participants were obtained from Rangila, Parrai, Qabershah and Kotlai. From each FFS on the basis of equal allocation, 100% of the respondents (20 farmers) were selected purposively, which constitutes a sample size of 80. A pre-test Interview schedule was carried out to add or omit the relevant and irrelevant questions respectively as well as to check the validity and reliability of the tool.

In research two types of data were used primary data and secondary data. The primary data were collected from the farmers and secondary data from agricultural extension department and other published and unpublished materials such as progress reports/papers/thesis etc.

The Statistical Package for Social Science (SPSS) were used to analyze the data and to know the perception of farmers regarding the role of Farmers Field School in increasing production of tomato crop. The results were summarized in-terms of count and percentages. The comparisons were made for tomato crop individually to test whether the difference was significant for cost, yield and income before & after FFS or not by using paired sample t-test.

3. Result and Discussion

3.1. Age of the respondents

Age is an important factor to be studied as it has influence over the acceptance and rejection of new ideas and techniques. In many social science studies it has been found that age plays an important role in adoption and diffusion of any innovation. In other words adoption and diffusion of innovation are positively correlated with age (Crusan *et al.* 1982). Table 3.1 show that there were only 20% respondents in 1st age group out of which 6.25, 5.00, 2.5 and 6.25 percent were from Kotlai, Parrai, Rangilla, and Qabershah villages respectively. In second age group, there were 16.25% respondents out of which 1.25, 3.75, 5.00 and 6.25 percent belonged to Kotlai, Parrai, Rangilla, and Qabershah villages respectively. The third age group contained majority that is 36.25% respondents out of which 10, 7.5, 10 and 8.75 percent belonged to Kotlai, Parrai, Rangilla, and Qabershah villages respectively. The last age group comprised of 27.5% respondents out of which 7.5, 8.75, 7.5 and 3.75 percent were from Kotlai, Parrai, Rangilla, and Qabershah villages respectively.

3.2 Educational status of the respondents

Education is one of the most important factors that influence farmer's decision about new techniques and practices of farming. Farmers of the study area were categorized in to five groups on the basis of their educational level. Table 3.2 show that out of total 80 sample respondents 45% were illiterate out of whom 13.75, 12.5, 10 and 8.75 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. Farmers who had the educational level upto primary were 17.5% out of which 5, 5, 3.75 and 3.75 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. The farmers having educational level upto Middle were 21.25% in number out of which 2.5, 3.75, 8.75 and 6.25 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. There were 10% respondents who had educational level upto matric, out of which 1.25, 2.5, 1.25 and 5 percent were from Kotlai, Parrai, Rangilla and Qabershah villages respectively. The last group of farmers who had educational level of above matric were 6.25% in number out of which 2.5, 1.25, 1.25 and 1.5 percent were from Kotlai, Parrai, Rangilla and Qabershah villages respectively. The lake of awareness about education might be a reason of lower literacy rate in the study area (Ishaq et *al.,* 2007).

3.3 Distribution of respondents according the major problems faced by tomato growers.

Table 3.3 shows the details of the problems faced by tomato growers. The response of the majority of the sampled respondents/farmers in answering this question was almost same but the difference observed was only in order to find out their problems. In Pakistan these problems are faced by majority of the farmers which are almost the same

as in this case observed. The table shows that most of the farmers were affected and their production was lower due to the attack of insect and pest which cause major loss to the production and quality of tomato. Table 3.3 shows the information about the major problems faced by tomato growers of the study area. It was found from the data that there were 13.75% respondents who faced lack of credit problem out of which 3.75, 3.75, 1.25 and 5 percent belonged to Kotlai, Parrai, Rangilla, and Qabershah villages respectively. Improper market was second problem of tomato growers there were 8.75% respondents out of which 2.5, 1.25, 3.75 and 1.25 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. The third problem non-availability of seeds faced by tomato grower reported by 28.75% respondents 10, 3.75, 6.25 and 8.75 belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. The fourth problem pest and insect attacks faced by tomato growers reported by 35% respondents of which 7.5, 10, 10 and 7.5 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. The last problem lack of fertilizers faced by tomato growers was 13.75% respondents out of which 1.25, 6.25, 3.75 and 2.5 percent belonged to Kotlai, Parrai, Rangilla and Qabershah villages respectively. The main reason and problems are always observed by various researchers as (Rola *et al.,* 1993) also stated in such studied in India and Indonesia where these problems were faced specially the seed and fertilizer at the time of sowing of the crops.

3.4 Statistical Comparison of Seed Rate, Seed Cost, Plant to Plant Spacing, Cost of Fertilizer, Cost of Crop Protection, Cost of Farm Yard Manure, Yield and Income per acre of tomato crop before and after FFS

3.4.1 Seed rate per acre

It was found that the mean seed rate of tomato used in the study area before FFS was 290.50 grams per acre while after FFS it was 160.11 grams per acre (Table 3.4). The t-value (24.12) shows a significant difference ($p<0.05$) between the mean seed rate used before and after FFS in the study area as t_{cal} (24.12) > t_{tab} (1.98) at 5% level of significance. These results of the study are in conformity with the findings of Gyawali and Salokhe (1997) and Ciszinszky (1981).

3.4.2 Seed cost per acre

The statistical comparison of seed cost incurred in the study area before and after FFS is presented in Table 3.4. The mean seed cost incurred before FFS in the study area was Rs. 5835.0 per acre while it was Rs. 1518.20 per acre after FFS. The t-value (31.79) shows a significant difference ($p<0.05$) between the mean seed cost incurred before and after FFS in the study area as t_{cal} (31.79) > t_{tab} (1.98) at 5% level of significance. These result are similar to the findings of Khan *et al.,* (2013).

3.4.3 Plant to plant spacing

The statistical comparison of plant to plant spacing before and after FFS in the study area is presented in Table 3.4. The mean plant to plant spacing before FFS in the study area was 24.43 cm but after FFS the mean Plant to plant space was 30 cm. The t-value (-12.26) shows a significant difference ($p<0.05$) between the mean plant to plant spacing before and after FFS in the study area as t_{cal} (-12.26) > t_{tab} (1.98) at 5% level of significance.

3.4.5 Cost of fertilizer

It was found that mean of cost of fertilizer incurred before FFS was Rs. 13948 per acre while it was Rs. 5080 per acre after FFS in the study area (Table 3.4). Lower cost of fertilizer after FFS is due to the rational use of fertilizers in the study area. The t-value (61.48) shows a significant difference ($p<0.05$) between the mean cost of fertilizer incurred before and after FFS in the study area as the t_{cal} (61.48) > t_{tab} (1.98) at 5 % level of significance. The results are in line with the results of (Gyawali and Salokhe 1997).

3.4.6 Cost of crop protection

The statistical comparison of cost of crop protection incurred before and after FFS is presented in Table 3.4. It was found that the mean cost of crop protection incurred before FFS was Rs. 6462.50 per acre while it was Rs. 829.25 per acre after FFS. The much higher cost of crop protection before FFS was mainly due to injudicious use of expensive chemicals by the farmers of the study area which was replaced by trichograma cards which is a biological measure of crop protection recommended at FFS that is much cheaper and eco-friendly. The t-value 54.75 shows a significant difference ($p<0.05$) between the mean cost of crop protection before and after FFS in the study area as the t_{cal} (54.75) > t_{tab} (1.98) at 5 % level of significance.

3.4.7 Cost of farm yard manure

The statistical comparison of cost of farm yard manure incurred before and after FFS is presented in Table 3.4 as well. The mean cost of farm yard manure before FFS was found to be Rs. 7918.60 per acre while after FFS it was Rs. 8398.80 per acre in the study area. The higher cost after FFS was mainly due to the inflation in cost of farm yard manure and transportation. The t-value (-15.52) shows a significant difference ($p<0.05$) between the mean cost of farm yard manure before and after FFS in the study area as the t_{cal} (-15.52) > t_{tab} (1.98) at 5 % level of significance.

3.4.8 Yield of tomato crop

The statistical comparison of yield and income before and after FFS in Table 3.4 shows that the mean yield of

tomato before FFS was 9508.80 kg per acre while it was 12735.00 kg per acre after FFS in the study area. The higher yield of tomato crop after FFS was mainly due to the adoption of modern farming activities by the farmers that were recommended at FFS in the study area. The t-value (-22.03) shows a significant difference ($p<0.05$) between the mean yield per acre before and after FFS in the study area as the t_{cal} (-22.03) > t_{tab} (1.98) at 5 % level of significance.

3.4.9 Income of tomato grower

The statistical comparison of income per acre of tomato growers before and after FFS (Table 3.4) shows that the mean income of tomato growers before FFS was Rs. 201750.00 per acre while it was Rs. 288880.00 per acre after FFS in the study area. The higher income of tomato growers after FFS was mainly due to the higher production per acre by adoption of modern farming activities recommended at FFS in the study area. The t-value (-4.395) shows a significant difference ($p<0.05$) between the mean income per acre of tomato growers before and after FFS in the study area as the t_{cal} (-4.395) > t_{tab} (1.98) at 5 % level of significance.

Conclusion

The role of FFS was obviously encourage and cannot be neglected, in this stud FFS participants are positively correlated with adoption and production of tomato. Majority of the tomato growers faced certain problems like lack of awareness, lack of credits, improper marketing, non-availability of seed, insect pest attacks, lack of fertilizers and agricultural inputs. The tomato productivity was increased considerably due to the FFS activities in the study area.

Recommendations

After detailed investigation of the findings of the research study following recommendations were made.

- FFS participants should carry on their activities in order to increase the production of tomato of various vegetables and crops.
- Agriculture inputs have a positive impact on the enhancement of crop yield and hence it is recommended that quality inputs be provided to farmers at their doorsteps.
- After completion of the FFS program, the agricultural extension agents should visit the farmers at their field in order to help them if they face any difficulty in applying what they have learned during the training.
- The FFS members should be equipped with latest knowledge and techniques along with off station trainings in order to increase their efficiency and cope with the problems of farmers.
- The same study should be extended to other parts of the province to identify the problems of farmers in order to get raise their productivity.

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Table: 1 Distribution of respondents regarding their age

Village Name	Age group (years)				Total
	21-30	31-40	41-50	Above 50	
Kotlai	5 (6.25)	1(1.25)	8(10)	6(7.5)	20(25)
Parrai	4(5.00)	3(3.75)	6(7.5)	7(8.75)	20(25)
Rangilla	2(2.5)	4(5.00)	8(10)	6(7.5)	20(25)
Qabershah	5(6.25)	5(6.25)	7(8.75)	3(3.75)	20(25)
Total	**16(20)**	**13(16.25)**	**29(36.25)**	**22(27.5)**	**80(100)**

Source: Survey Data, 2014 Value in parenthesis are percentages

Table: 2 Distribution of respondents regarding their educational status

Village Name	Level of education					Total
	Illiterate	Primary	Middle	Matric	Above matric	
Kotlai	11(13.75)	4(5)	2(2.5)	1(1.25)	2(2.5)	20(25)
Parrai	10(12.5)	4(5)	3(3.75)	2(2.5)	1(1.25)	20(25)
Rangilla	8(10)	3(3.75)	7(8.75)	1(1.25)	1(1.25)	20(25)
Qabershah	7(8.75)	3(3.75)	5(6.25)	4(5)	1(1.25)	20(25)
Total	**36(45)**	**14(17.5)**	**17(21.25)**	**8(10)**	**5(6.25)**	**80(100)**

Source: Survey Data, 2014 Value in parenthesis are percentages

Table 3 Problems faced by tomato growers

Village Name	Major problems faced by Tomato farmers					Total
	Lack of Credit	Improper Marketing	Non availability of seed	Insect/Pest attacks	Lack of fertilizers	
Kotlai	3(3.75)	2(2.5)	8(10)	6(7.5)	1(1.25)	20(25)
Parrai	3(3.75)	1(1.25)	3(3.75)	8(10)	5(6.25)	20(25)
Rangilla	1(1.25)	3(3.75)	5(6.25)	8(10)	3(3.75)	20(25)
Qabershah	4(5)	1(1.25)	7(8.75)	6(7.5)	2(2.5)	20(25)
Total	**11(13.75)**	**7(8.75)**	**23(28.75)**	**28(35)**	**11(13.75)**	**80(100)**

Source: Survey Data, 2014 Value in parenthesis are percentages

Table: 4 Statistical comparison of seed rate, seed cost, plant to plant and row to row spacing of tomato before and after FFS (per acre).

Particulars	Before FFS		After FFS		Difference		t - value	P-value
	Mean	SE	Mean	SE	Mean	SE		
Seed Rate(gm) per Acre	290.50	5.42	160.11	0.11	130.39	5.31	24.12	0.000
Seed Cost per Acre	5835.0	136.01	1518.20	7.32	4316.8	128.69	31.79	0.000
Plant to plant spacing(cm)	24.43	0.453	30	0.00	-5.57	0.453	-12.26	0.000
Cost of fertilizer	13948.00	128.94	5080.00	67.58	8868.00	61.36	61.48	0.000
Cost of Crop Protection	6462.50	100.87	829.25	21.33	5633.25	79.54	54.75	0.000
Cost of Farm Yard Manure	7918.60	65.05	8398.80	68.88	-480.20	-3.83	-15.52	0.000
Yield (Kg/ acre)	9508.8	115.20	12735	113.81	3226.2	1.39	-22.03	0.000
Income (Rs/ acre)	201750.00	4967.53	288880.00	19477.13	871130	1.7728	-4.395	0.000

Source: Survey Data, 2014

Table: 7 Distribution of respondents regarding adoption of FFS approach in future

Village Name	Adoption of FFS approach in future		Total
	Yes	No	
Kotlai	19(23.75)	1(1.25)	20(25)
Parraie	18(22.5)	2(22.5)	20(25)
Rangilla	20(25)	0(0)	20(25)
Qabershah	17(21.25)	3(3.75)	20(25)
Total	**74(92.5)**	**6(7.5)**	**80(100)**

Source: Survey Data, 2014 Value in parenthesis are percentages