EXTENSION FIELD WORKERS' PERCEPTION OF COTTON INTEGRATED PEST MANAGEMENT PROGRAMME IN SINDH PROVINCE

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ABSTRACT:-The study was conducted in the Sindh province of Pakistan to assess the performance of Extension Field Worker (EFWs) performed during FAO-EU-ADB funded National Integrated Pest Management Programme (Nat-IPM) for cotton. The basic principle of Nat-IPM programme was to enable farmers to be self sufficient, using practices that are agro-ecological friendly. This study was carried out in four districts of Sindh province (Hyderabad, Tando Allahyar, Matiari, and Mirpurkhas). The sample size comprised 48 EFWs who participated in Training of Facilitators (ToF) and erecuted FFSs during 2001 and 2004. The results revealed that the EFWs performed effectively to attain the objectives of IPM programme. It appears that EFWs improved farmers' knowledge, skills and behavioral change in attitude towards agro-ecological sound IPM practices through FFS training.

Key Words: Extension Field Worker; Facilitator; Integrated Pest Management; Farmer Field School; Pakistan.

INTRODUCTION

In Pakistan cotton (Gossypium hirsutum L.) production provides a livelihood to around 1.5 million farmers in rural areas. Cotton is a major source of export capital, accounting for 7.8 % of value added in agriculture and 1.6% of GDP. The Pakistan's cotton production is projected at 13,595 thousand bales, during 2011-12 as against 11,460 thousand bales recorded in 2010-11, estimating an increase of 18.6%. (GoP, 2011).

Despite being one of the largest cotton growing countries, cotton yield in Pakistan is low as compared to other countries. The low yields result from unfavourable weather conditions, pests attack and limited awareness of pesticide and pest management options for improved cropping. Farmer uses a variety of pesticides in cotton to eliminate insects and weeds from their fields, but these pesticides can have the potential to harm human and environmental health (FAO, 2004). Excessive or mistimed use of pesticides can also disrupt the growth of cotton beneficial insects and provide opportunity for harmful pests to attack, pesticides use increases production costs to growers. The Farmer Field School (FFS) is a training model developed primarily by Food and Agriculture Organization (FAO) in which farmers gain the decision making power regarding use of agro-chemicals at their field. The FFS approach is

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unique extension season long training conducted on their fields. This extension approach is action-learning oriented where farmers are allowed to observe, analyze and make alternative decision about their crop (Kingsley, 1999). IPM-FFS training emphasized that the crops should be healthier with reduced use of pesticides, which could be deleterious to natural pest control mechanism. In addition, the basic principle of IPM-FFS training was to enable farmers to become self sufficient, using IPM practices that are agro-ecosystem friendly. To tackle these issues farmers require to have improved disease and pest recognition, to understand methods of monitoring and control options and be able to correctly apply chemistry or IPM techniques. The farmers who participate in FFS become part of wide scale IPM programmes, ranging from local to national research; they analyze production issues and develop solutions for them at the country level (FAO, 2000). This collective research with farmers involves establishing local needs, information about local conditions, eco-system characteristics, and weather (Linh, 2001). Various studies regarding IPM-FFS programmers agree that FFS strengthens farmers' eco_logical knowledge (Thiele et al., 2001; Rola et al., 2002; Feder et al., 2004; Reddy and Suryamani, 2005; Tripp et al., 2005). Improved farmer knowledge and understanding of the crop eco-system leads ultimately to reduction in pesticides use and increases production and profit (Godtland et al., 2004; Khan et al., 2005).

The FAO-EU Regional Project was designed for the capacity building of the extension field workers of Agricultural Extension Department and farmers through IPM-FFS programme to encourage more eco-friendly cotton crop production through sound IPM practices. IPM programmes played a key role in mobilizing and strengthening the farming families as FFSs improved the management skills for environment friendly agriculture and rural development. Cotton IPM programme officials along with other coordinators have substantially benefited many existing production methods and future plans to decrease poverty and safeguard the natural resource of the Pakistan (FAO, 2004).

During 2001-2004, Sindh province embraced IPM-FFS as the dominant interface between agriculture extension and farmers based on the assumption that, through this new FFS training model, farmers would change their traditional role from passive learner to active learner. The purpose of this study was to assess the performance of EFWs in a cotton IPM programme. It was hypothesized that EFWs engagement with farmers would improve knowledge, skills and changed attitudes of farmers' towards agro-ecological sound farming and achieved objectives of IPM programme successfully. If significant EFWs to farmer diffusion of knowledge occurred then the value of the FFS would be evident as a reliable extension training method to strengthen the agriculture information flow and dissemination of agricultural technologies among farmers with particular reference to cotton.

MATERIALS AND METHOD

The present research study utilised a descriptive research approach. In descriptive survey research, the researcher selects a group of respondents, collects information and then analyzes the information to answer the research questions (McMillan, 2008). The sampling frame of Extension Field Workers (Training of Facilitators Participants), involved in the implementing of IPM-FFS for cotton in selected districts of Sindh was obtained from National IPM-FFS programme coordinator, Director General, Agricultural Extension Wing, Hyderabad. The total sample of 48 were taken out of 60 on a random basis by using a table to "Determining sample size from a given population" (Degree of Accuracy = ±0.05, Confidence Level = 95%), (McCall, 1980). The study revolved around EFWs intended to collect self reported information that participated in Training of Facilitators (ToF) and executed FFSs during 2001 - 2004.

The questionnaire was developed in consultation with the IPM-FFS experts and following review of available literature. The concepts or ideas were predominantly measured through different statements on a continuum ranging from negative to positive. A data coding sheet was developed and all data were analyzed using appropriate statistical analysis techniques, with IBM-SPSS version 19 used for data analysis. Frequency, mean, percentage, and standard deviation were calculated. The questionnaire survey for this study was conducted during the March – September, 2009.

RESULTS AND DISCUSSION

The demographic characteristics of the sampled Extension Field Workers (EFWs) revealed that most of the EFWs (87.2%) fell in the age group of 41 - 50 years (Table 1). Majority of EFWs had M.Sc. degree (91.5%) and were agriculture officers (70.2%). Large number of EFWs (95.7%) had professional experience of 11 - 20 years and most of them were involved in IPM-FFS training programme in the interest of their self development.

Site/Plot Selection Criteria

The EFWs were asked to disclose on plot/site selection criteria considered for the establishment of IPM-FFS and the responses (Table 2) indicated that vast majority (80.9%) of the respondents established the IPM-FFS in cotton areas followed by 83% considered the area with irrigation water availability. As many as 80.9% considered and established FFSs in areas with transport

Table 1. Demographic characteristic of EFWs

Characteristics	Category	Frequency	Percentage
Age Group (years)	20 - 30	00	0.0
	31 - 40	4	8.5
	41 - 50	41	87.2
	51 - 60	2	4.3
Educational Qualification (years)	Diploma	4	8.5
	B.Sc.	00	0.0
	M.Sc.	43	91.5
	M. Phil.	00	0.0
	Ph.D.	00	0.0
Designation	Field Assistant	4	8.5
	Agriculture Officer	33	70.2
	Deputy District Officer	6	12.8
	District Officer	3	6.4
	Executive District Officer	1	2.1
Professional Experience (years)	Less than 10	00	0.0
	11 - 20	45	95.7
	21 - 30	2	4.3
	31 - 40	00	0.0
Intention to Involve in IPM-FFS	Self Development	32	68.1
	Government interest	7	14.9
	Incentives attraction	4	8.5
	Colleagues motivation	4	8.5

Table 2. Site/Plot selection criteria

Selection Criteria of Site Selection	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Cotton area	38	80.9	9	19.1
Land fertility	20	42.6	27	57.4
Irrigation availability	39	83.0	8	17.0
Pest Management problem	29	61.7	18	38.3
Excessive use of inputs	26	55.3	21	44.7
Transportation availability	38	80.9	9	19.1

availability while some 61.7% EFWs considered areas having serious pest problem.

Selection Criteria of IPM-FFS Participants

A series of 13 options related to participants' selection criteria for IPM-FFS training were developed and offered to the EFWs who were facilitators of IPM-FFSs (Table 3). More than 90% disagreed on the options that criteria was same age group, wealth status, marital status, language basis, religion basis, political affiliation and relationship with the EFW. More than 80% EFWs were denied that participants considered on the basis of education, farm size ownership and status in community; while more than 60% denied criterion supposed to be on farming experience and extent of cotton knowledge. However, majority of EFWs (97.9%) advocated that the selection of participants for IPM-FFS training considered on the basis of farmers' own interest (Table 3). Similar results have been reviewed from the study of Praneetvatakul and Waibel (2006) who investigated the economic efficiency of investment in FFS trainings and reported that IPM programmes are successful because the farmers intentionally participate in the IPM programmes and their own interest is the real cause of their association with the IPM programmes.

Table 3. Selection criteria of IPM-FFS participants

Selection Criteria of Participants	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Same age group	3	6.4	44	93.6
Qualification/education	7	14.9	40	85.1
Farming experience	15	31.9	32	68.1
Knowledge of cotton	17	36.2	30	63.8
Farmers own interest	46	97.9	1	2.1
Farm size ownership	5	10.6	42	89.4
Wealth status	3	6.4	44	93.6
Status in community	6	12.8	41	87.2
Marital status	1	2.1	46	97.9
Language basis	2	4.3	45	95.7
Religion basis	1	2.1	46	97.9
Political affiliation	1	2.1	46	97.9
Relationship with EFW	1	2.1	46	97.9

Improvement in Farmers' Knowledge, Skill and Attitude as Perceived by EFWs

The extent of improvement in farmers' knowledge, skills and change in attitude towards IPM was assessed by using a five point Likert scale (e.g. 1=no change, 2=minimally improved, 3=much improved, 4=very much improved, 5=not assessed) and responses of the EFWs along with their mean and standard deviation and percentage response of each category were ascertained (Table 4). The EFWs were enquired for extent of improvement in farmers' knowledge through IPM-FFS programmes; majority of EFWs indicated as 'much improvement' in land preparation and agronomic practices (46.8%), application and use of agricultural inputs (44.7%), lifecycle of insects/organisms (34.0%), diseases in cotton crop (36.2%), alternative pest management methods (48.9%), adverse

Table 4. Improvement in farmers' knowledge, skills and change in attitude through IPM-FFS as perceived by EFWs

Parameter	No change		Minimally improved		Much improved		Very much improved		Not assessed		Mean ± SD
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
Knowledge about											
Land preparation and agronomic practices	2	4.3	13	27.7	22	46.8	9	19.1	1	2.1	2.87 ± 0.85
Application and use of agricultural inputs	1	2.1	11	23.4	21	44.7	11	23.4	3	6.4	3.09 ± 0.90
Life cycle of insects/organisms	1	2.1	15	31.9	16	34.0	14	29.8	1	2.1	2.98 ± 0.89
Diseases in cotton crop	6	12.8	12	25.5	17	36.2	10	21.3	2	4.3	2.79 ± 1.06
Alternative pest management methods	3	6.4	8	17.0	23	48.9	12	25.5	1	2.1	3.00 ± 0.88
Adverse effects of indiscriminate use of pesticides	5	10.6	8	17.0	22	46.8	10	21.3	2	4.3	2.91 ± 0.99
Benefits of adopting new technology	3	6.4	10	21.3	20	42.6	11	23.4	3	6.4	3.02 ± 0.98
Skills in											
Identification of insects/organisms	5	10.6	9	19.1	23	48.9	9	19.1	1	2.1	2.83 ± 0.94
Conservation of natural enemies	8	17.0	12	25.5	16	34.0	9	19.1	2	4.3	2.68 ± 1.10
Data collection and record keeping	4	8.5	10	21.3	19	40.4	12	25.5	2	4.3	2.96 ± 0.99
Crop monitoring and critical observation	1	2.1	8	17.0	22	46.8	14	29.8	2	4.3	3.17 ± 0.84
Conduct field trials/experiments	4	8.5	10	21.3	22	46.8	10	21.3	1	2.1	2.87 ± 0.92
Problem solving and critical thinking	2	4.3	15	31.9	20	42.6	7	14.9	3	6.4	2.87 ± 0.94
Communication and presentation	4	8.5	7	14.9	21	44.7	13	27.7	2	4.3	3.04 ± 0.97
Attitude towards											
Growing healthy crop	4	8.5	21	44.7	9	19.1	10	21.3	3	6.4	2.72 ± 1.09
Alternative strategies to control insect pest	5	10.6	18	38.3	15	31.9	7	14.9	2	4.3	2.64 ± 1.00
Least-toxic pest management practices	4	8.5	16	34.0	16	34.0	10	21.3	1	2.1	2.74 ± 0.96
Participatory and encouraging approach	4	8.5	11	23.4	15	31.9	15	31.9	2	4.3	3.00 ± 1.04
Behavioral change in working relationship	3	6.4	11	23.4	13	27.7	17	36.2	3	6.4	3.13 ± 1.05
Believe in learning by doing	4	8.5	5	10.6	26	55.3	9	19.1	3	6.4	3.04 ± 0.95
Adopting new technology	7	14.9	7	14.9	21	44.7	11	23.4	1	2.1	2.83 ± 1.02

effects of indiscriminate use of pesticides (46.8%) and benefits of adopting new technology (42.6%); while 'very much improvement' in farmers knowledge stated above has been reported by EFWs. These findings coincide with David (2007), who reviewed knowledge improvement in relation to IPM-FFS and literature relevant to IPM-FFS indicates that varied outcomes do not permit to be reached with regard to the effectiveness of the IPM-FFS approach. Positive results have been acquired to assure the discovery based learning; IPM improved participants' knowledge and also FFS graduates given practical exhibition of their superior knowledge on FFS as compared to non-FFS farmers.

While knowing the extent of development of farmers' skills in various farm operations; majority of EFWs indicated 'much improvement' of farmers in skills related to identification of insect/organisms (48.9%), conservation of natural enemies (34.0%), data collection and record keeping (40.4%), crop monitoring and critical observation (46.8%), conduct field trials/ experiments (46.8%), problem solving and critical thinking (42.6%) and communication and presentation (44.7%); while a negligible frequency of EFWs responded as 'no change' or 'not assessed' for farmers' skills in various field operations in relation to IPM-FFS training programme. The results of present study are also in line with those reported by Vasquez-Caicedo et al; (2000); Boucher and Ashley (2001) and Godtland et al; (2004), who reported that due to training of farmers under FFS cotton production and protection technologies. The farmers' skills were markedly improved and their average cotton yields were increased considerably.

The EFWs were also asked to perceive on farmers' behavioral change in attitude towards IPM practices; and majority of EFWs indicated 'minimally improved' attitude of farmers in growing of healthy crops (44.7%), alternative strategies to control insect pests (38.3%), least toxic pest management practices (34.0%); while perceived as 'much improved' attitude towards participatory and encouraging approach (31.9%), behavioral change in working relationship (27.7%), belief in learning by doing (55.3%) and in adopting new technology (44.7%); while EFWs perceived as 'no change" or 'not assessed' was negligible with regard to farmers' attitude towards agro-ecological farming practices related to crop production and protection. Bajwa et al; (2010) stated that transfer the skills, knowledge, technologies and facilities among farmers to make certain that hi-tech and scientific developments are reachable to applier who can then advance and make use of the crop production and protection technologies.

IPM Programme Learning Objectives Achieved as Perceived by EFWs

The extent of IPM programme learning objectives achieved by EFWs responses of the EFWs along with their mean±SD and percentage response of each category was assessed (Table 5). The EFWs were asked to perceive the extent of IPM programme learning objectives achieved while conducted IPM-FFS activities; majority of EFWs

Table 5. Extent of IPM-FFS learning objectives attained and principles understood by farmers as perceived by EFWs

Objectives principles	Not at all		To little extent		To some extent		To considerable extent		To very great extent		Mean ± SD
	Freque-ncy	Percent-age	Freque-ncy	Percent-age	Freque-ncy	Percent-age	Freque-ncy	Percent-age	Freque-ncy	Percent-age	
IPM-FFS Capacity building	1	2.1	2	4.3	12	25.5	20	42.6	12	25.5	3.85 ± 0.93
Empowerment	6	12.8	7	14.9	12	25.5	15	31.9	7	14.9	3.21 ± 1.25
Confidence building	3	6.4	5	10.6	8	17.0	16	34.0	15	31.9	3.74 ± 1.20
Decision making	1	2.1	8	17.0	13	27.7	14	29.8	11	23.4	3.55 ± 1.10
Grow a healthy crop	3	6.4	4	8.5	13	27.7	20	42.6	7	14.9	3.51 ± 1.06
Conserve natural enemies	10	21.3	10	21.3	14	29.8	9	19.1	4	8.5	2.72 ± 1.24
Conduct regular field observation	5	10.6	7	14.9	13	27.7	16	34.0	6	12.8	3.23 ± 1.18
Farmers become expert	3	6.4	7	14.9	17	36.2	15	31.9	5	10.6	3.26 ± 1.05

perceived as 'to a considerable extent' in 'capacity building' (42.6%), 'empowerment' (31.9%), 'confidence development' (34.0%) and 'decision making' (29.8%), indicating that EFWs achieved the IPM programme objectives 'To considerable extent'. Mallah and Korejo (2007) found that sustainability of IPM programmes ensures the sustainability in growth of agriculture, because IPM programme has positive impact on the farmers' awareness over crop production and crop protection techniques; environmental and profitable sound protection / production of cotton through the IPM practices by farmers are the ultimate objective of this programme.

IPM-FFS Principles Attained as Perceived by EFWs

The understanding of the farmers on IPM programme principles was measured through perceptions of EFWs as they were responsible to establish and train farmers through FFS training (Table 5). The analysis indicated that the average understanding of farmers about IPM programme principles attained, as perceived by EFWs was in the range of 'to some extent' and 'to a considerable extent'. As many as 42.6% of EFWs reported that farmers attained 'to a considerable extent' an understanding on 'grow a healthy crop', 'conserve natural enemies' (19.1%), 'conduct regular field observation' (34.0%) and 'farmers become expert' (31.9%). These results are in agreement with Kenmore (2002) who concluded that FFS is a training approach that trains farmers to compare new techniques in systematic field assessment and it prepares extension agents for their new roles

as facilitator and representatives of public problems and difficulties such as environmental conservation, health, social involvement and organization. Agricultural extension executes IPM programmes to assist farmers build up their analytical skills, critical observation, and creativity and create confidence to take better decisions. Once farmers become expert, the extension agent takes back seat and guides them when asked to do so.

The study revealed that extension field workers/facilitators performed efficiently in Nat-IPM programme for cotton during 2001-2004. It appears that EFWs improved farmers' knowledge, skills and behavioral change in attitude towards IPM through FFS training. Effects of FFS training exist, even after seven years of termination of the cotton IPM programme. These results present a confirmation of the adoption and a validation of IPM-FFS as a successful training methodology of agriculture extension. Further, FFS training has potential to empower farmers in connection to agro-ecological sound IPM practices. This created inter-personal trust between extension worker and farmer that is essential for working mutually and a favorable process for learning and field experiment.

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