An Assessment of the Impact of Farmer Field Schools on Integrated Pest Management Dissemination and Use:

Evidence from Smallholder Cotton Farmers in the Lowveld Area of Zimbabwe

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Abstract

Many technological innovations have been developed to improve agricultural productivity in Sub Sahara. However, the adoption of these innovations has been low. Appropriate extension models are often seen as the missing link between adoption and the achievement of productivity gains. Although, Zimbabwe's agriculture continues to be a vital cog in the economy, a barrage of economic ills such as high inflation rates faces it. The cotton sub sector in particular faces many challenges, which include the skyrocketing production costs, at the farm level. Integrated Production and Pest Management was initially touted as a placebo to the ever-rising costs. However, its introduction was met with revulsion as farmers viewed it as difficult to implement. Thus, appropriate extension methods had to be identified to integrate this approach into small farmer systems. Thus, the crux of the matter in this project was to evaluate the impact of farmer field schools, an extension methodology used to propagate IPPM among farmers. The study used methods of analysis namely stochastic efficiency analysis, regression models, technical knowledge scores and gross margin analysis in the evaluation process. These parameters were used as indicators of effectiveness of this extension approach. Sanyati communal area was used as the study site as it is one of the main cotton production belts in the country. Structured interviews, key informants and focus group discussions were employed to collect data. Data collected was for two seasons namely 2001/02 and 2002/03 seasons. The results of the survey indicated that crop yields, cotton incomes and technical knowledge scores for participants were greater than for non-participants. It was also shown that technical knowledge was a significant variable in explaining cotton income variance. In addition, cotton income variance for participants was more efficient than for non-participants, which reveals stability due to participation. Although, farmer field schools can be considered as an extension option for small cotton farmers largely because of their participatory nature. However, more needs to be done to appraise their sustainability within the context of land and agrarian reforms in Zimbabwe.

Key Words: Integrated Production and Pest Management, Farmer Field Schools, Socio-economics, smallholder cotton, Zimbabwe

Introduction

Background

Zimbabwe's agricultural sector continues to be a vital cog to the country's economic vista. It has generally contributed between 15-20% to the GDP since the country's attainment of independence (Rukuni, 1994) and more recently 10% to the GDP because of the structural re-organization through the land and agrarian reforms (FAO, 2001). Over the years, tobacco and cotton have been eminent in terms of foreign currency generation and employment creation. However, with advent of worldwide anti smoking campaigns and the ratification of the Framework Convention on Tobacco Control by the World Health Organization (WHO), the country has witnessed a drive to diversify the export base. Horticulture and the cotton sub sectors are increasingly becoming important to the country's smallholder agriculture especially within the context of the land reforms in the country. However, given that horticulture is capital intensive, most rural and resource poor farmers cannot consider it as an option for enhanced livelihoods. Therefore, cotton remains the main sector that is consistent with the socio-economic and institutional setting that characterized small farmers in the country. Viability of small cotton farmers have been threatened over the years by a multiplicity of factors, which are *inter alia*, high costs of fertilizers and chemicals, the incidence of pests and diseases, severe droughts, declining soil fertility as well as lack of price incentives from cotton buying agents such as COTTCO. Studies have shown that chemical pesticides alone can account for 70% of the variable costs in cotton production (Mudimu, 1995). This scenario thus condemns the small farmer into a vicious cycle of poverty.

Development of integrated production and pest management and farmer field schools

Integrated Production and Pest Management (IPPM) is the equivalent of Integrated Pest Management (IPM) used in other countries. This technological innovation was used initially in Indonesia among rice farmers to reduce the use of pesticides. Evidence from Indonesia revealed that there was a substantial reduction in pesticide use coupled with crop yield gains among rice farmers. In Zimbabwe, IPPM is broader in that it incorporates crop management strategies that enhance crop yields. Its use gained momentum in the country as a consequence of a series of projects under the auspices of FAO Global Facility and the Ministry of Lands and Agriculture (IPPM report, 1999). However, the hype associated with its use almost ended since it was a pilot project and farmers participated to gain material benefits. Other factors that contributed to low adoption were the general dearth of technical expertise among farmers (Kujeke, 1998).

It is against this background that *Farmer School Groups* or *Farmer Field Schools* have been enunciated as vehicles to propagate or disseminate information on IPPM practices. Farmer field schools were developed after the realization that the traditional or conventional extensions efforts were not congruous with the smallholder farmers' priorities, or gave recommendations that were inappropriate or with no tangible benefits (IPPM Report, 1999). Farmer field schools, which originated from Indonesia, are based on an innovative, participation, learning by discovery approach and proponents indicate that this approach enables farmers to acquire an understanding of the principles of IPPM in any situation. They are therefore an informal farmer driven “bottom-up” education approach, which emphasizes farmer empowerment through participatory technology development and transfer as well as the acknowledgement of the indigenous knowledge of farmers and their experience (Nyambo and Kimani, 1998). This approach offers opportunities through which key stakeholders (farmers, extension workers, and researchers) interact as partners to develop IPM options.

Study focus and justification

Smallholder agriculture in Sub Sahara continues to be inundated with new technological innovations to boost agricultural productivity. A plethora of extension methodologies under the clout of ‘participatory rural appraisal’ methods have been used package these technologies to enhance use and adoption. Zimbabwe’s cotton sub-sector reeling under high costs of chemicals has come under the spotlight in recent years. The farmer field schools concept, an import from Indonesia, was used to promote use of IPPM in Zimbabwe among small cotton farmers in the country particularly in the low veldt areas that are the major cotton production belts in the country. Given the dichotomy that can be drawn between agro-ecological conditions in Indonesia and Zimbabwe, it was found prudent to evaluate and investigate the relevance of this approach in influencing outcomes at the farm level. To date, few studies that attempted to assess the role and impact of farmer field schools in the country such as Siziba (1999) in smallholder horticulture showed that farmer field schools should be considered as an option in other sectors. This study has been prompted by the fact that cotton is Zimbabwe’s second most important crop and that its prominence is likely to increase in the near future. In addition, few studies have evaluated the impact of farmer field schools in the country within the context of the land and agrarian reforms as well as the changes in the economic outlook of the country.

Materials and Methods

Research context

The research was carried out in Sanyati communal area of Zimbabwe that is located in the low veld area. The major characteristic of this zone is that it is a rain deficit area, which implies that drought tolerant crops such as cotton and sorghum are the predominant crops. The physical characteristics of the low veld are shown in Table 1.

Table 1 characteristics of the low veld area of Zimbabwe

Characteristic	Description
Farming area classification	Communal
Natural region	III and IV
Average temperature ‘C	22
Major agricultural activity	Cotton
Average rainfall mm	450-800

Sampling process

The sampling frame or target population in the research consisted of all small cotton farmers in the low veld area. However, due to limitations imposed by financial resources it was found prudent to include the area in which farmer field schools were developed. Thus, a purposive sampling approach was used to choose the study site, Sanyati communal area. Within this site, the researcher further identified villages within which farmer field schools were promoted and used over two seasons namely 2001/02 and 2002/03 cropping seasons. In addition, controls within each sub site were identified to circumvent the problem of over-estimation of benefits of farmer field schools. Table 2 shows the villages included in the sample for the three seasons.

Table 2 sites included in the research over three seasons

Farmer field school location	Number of farmers trained
Havadi	17
Rwambiwa	19
Mazivanhanga	22
Chivanga	15
Total	73

Selection of the control group of farmers

The control group was selected from the same village from which the FFS was located. Selection of farmers in control group from the same village is justified because they manage the same farming systems and agro-ecological conditions. This ensures that differences in productivity will not be due to weather, soil and price variations that are likely to be eminent if different wards were to be used for the selection process.

The actual selection of units included in the control group in the village was done in a snowball fashion. If a household did not participate in the FFS then it potentially is a member of the NFFS. That household would then indicate other households, which were not involved in FFS until 73 farmers were obtained from that same community.

Data collection tools

The overall research methodology comprised of both qualitative and quantitative techniques to data collection. Structured questionnaires were developed and administered over three seasons to participants in farmer field schools (FFS) and non-participants (NFFS). Semi structured schedules, which include key informants such as agricultural extension workers, and focus group discussions were conducted with participants to discuss the merits of IPM in terms of technical knowledge, constraints faced in the field, and assess general perceptions of farmers towards the extension approach to IPM dissemination.

Results and Discussion

Impact of farmer field schools on technical knowledge scores

The research investigated the impact of participation in farmer field schools by administering pre- and posttests to both participants and non-participants. The tests were prepared with the assistance of local agricultural extension workers who were conversant with the cotton growing conditions as well as the pests and diseases affecting the cotton crop in the lowveld. The results of the pre tests revealed that participants had a mean score of 65% while non-participants had 61% and there was no statistically significant difference at the 5% level. The posttest results are shown in Table 3.

Table 3 technical knowledge scores for participants and non-participants

Pest effect on the cotton crop	N (FFS)	Frequency	N (NFFS)	Frequency
Aphids suck sap from plant (Yes)	65	82.9	31	34.3
Red spider mite sucks sap from plant (Y)	61	71.4	12	17.1
Heliothis defoliates plant (Yes)	67	85.7	69	88.6
Grasshopper defoliates plants (Yes)	72	94.3	73	100
Red bollworm eats fruit and causes drop (yes)	57	68.6	50	57.1
Rudo (stainers) eats fruit (yes)	54	71.4	50	57.1
Large spider eats red spider mites (yes)	68	88.6	16	25.7
Ladybirds feeds on aphids (yes)	53	62.9	33	50
African bollworm eats fruit of plant	62	74.3	36	60
Mean score	68	76	40	56

Source: Survey results, 2003

Studies in other countries have shown that lack of knowledge about the effect of the pests on the cotton crop contributed to the overuse of chemical pesticides (Rola, 1997). The test also involved testing whether the farmer knew the exact effect of a particular pest on the cotton crop.

The mean score for knowing the actual effect of the pest on the cotton crop for FFS and NFFS was 76 and 56% respectively and different at the 5% level. The calculated t value is 3.54 and the critical t is 1.98 at the 5% level of significance. The results suggest that participation did result in enhanced technical knowledge scores when compared to the control group of farmers.

Effect of technical knowledge scores on cotton income variance

Having ascertained whether participation in farmer field schools had an effect on technical knowledge scores, the research then established the extent to which technical knowledge scores affects cotton income variance. To this end, a multi regression model was used in which the dependent variable is cotton income variance. The results of the analysis are shown in Table 4.

Table 4 results of the multiple regression model

VARIABLE	OLS coefficient	Significant t
Human capital		
Age	-105.156	.873
Sex	-433.880	.562
Education	766.928	.703
Household Size	340.301	.046
Knowledge score	179.950	.002
Physical Capital		
Size of arable land	-265.943	.041
Financial capital		
Cattle	297.007	.248
Credit	.379	.383
Constant	-2628.013	
Multiple R	-	
R squared	.7120	
Adjusted R squared	.6534	
Durbin Watson (DW) test statistic	2.156	
F value	8.226	.0011

The results of the multiple regression model showed that technical knowledge scores, household size and land size had a statistically significant effect on cotton income variance. Thus, participation in farmer field schools influenced technical knowledge, which in turn was translated into greater household incomes and enhanced livelihoods.

Impact of farmer field schools on cotton income variance

The survey also explored the effect of participation in farmer field schools on the efficiency hence the stability of cotton income. The dispersion around the mean was used as a means of assessing efficiency.

Table 5 Gross margin results of FFS and NFFS

	FFS	NFFS	Calculated t values
Average cotton yield (number of bales)	4.86	3.58	2.466*
Expected cotton returns (gross)	1578000.1	1134000.2	2.382*
Cost of producing cotton	780014.3	900453.6	0.563
Gross margin contribution for the cotton crop	553000.07	225243.06	2.2.36*
Percentage of pesticides as a proportion of total costs	0.33	0.67	1.007
Pesticide cost per unit acre	111634.19	196857.58	2.478*
Average number of sprays per season	8.1	14.6	0.034

Source: Survey results, 2003

Table 5 reveals the gross margin contribution of the cotton enterprise. Average yields for FFS were greater than for farmers using agro ecosystems analysis attribute NFFS and this to the fact that IPPM also involved the incorporation of better management practices. The total number of sprays per season was significantly reduced to 8.1 as compared to 14.6 for non-participants who sprayed prophilactically. The significant reduction in pesticide cost also means higher gross margins for the farmer and this was found to be significant at the 5% level.

It is important to note that there are some factors that may account for the observed income differences such as selection biases in which good cotton producers were chosen to participate in the farmer field schools naturally resulting in better outcomes. However, there is a strong case for the impact of the farmer field school approach since technical knowledge scores, levels of pesticide use and scouting practices were better among farmer field school farmers against their NFFS counterparts.

Conclusion

At the farm level, the farmer field school extension approach was found to be effective in enhancing farm incomes, technical expertise and yields. From a sustainability point of view, it is recommended that the farmer field school approach be continued as a means or platform for disseminating IPPM technology among farmers. This recommendation is also consistent with related studies in Zimbabwe such as Siziba (1999).

Farmer field schools are participatory by nature, and to make IPPM to become more of a community asset rather than an individual farmer asset, findings point to the fact that there is need to involve all local structures through social assessments. In this manner, it is possible to achieve quantum reductions in pesticide use through use of environmentally benign methods of production inherent in IPPM technology.

Technical knowledge scores were found to be positively influencing farm incomes among farmers. This finding suggests that one of the ways policy makers can enhance equity and sustainability and ensure poverty reduction is through development and promotion of agricultural innovations that reduce production costs such as IPPM. This can be achieved by increasing the number of extension workers knowledgeable about IPPM at the institutional level. Increased access to extension coupled with farmer participatory approaches such as farmer field schools should see IPPM technology trickling down to the user level that is the smallholder farmer in Zimbabwe and the sub region.

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