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Assessing Potential Impact of a Farmer Field School Training on Perennial Crop in Cameroon

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Abstract

This study is an attempt of the combination of multiple data sources referring to the same time period and to the same farmer population, it aims at assessing the potential impact of a cocoa Farmer Field School Training on Integrated Pest Management in Cameroon. Using a combination of a latitudinal and a longitudinal comparison, the results indicate that FFS-trained farmers have significantly more knowledge about crop husbandry practices than those in the non-participant comparison group. A 32% production increase and 45% income increase relative to the non-participants was estimated in the latitudinal analysis. The longitudinal comparison is showing significant adoption rates of 94, 93, 90, 66 and 35 % respectively for shade management, phytosanitary harvest, pruning, improved spraying practices and grafting of improved materials. There was a 47 % reduction in the frequency of spraying fungicides and a 17 % reduction in the number of sprayers applied per treatment following the implementation of the training. Labour inputs increased significantly for *pruning, phytosanitary harvest, and shade management* but decreased for *spraying*. A partial budget analysis reveals that the IPM practices lowered overall costs of production by 11 % relative to previous practices. The two different analytical tools (longitudinal and latitudinal) are convergent in their results, showing more evidence about the higher potential impact of the farmer field school training on the restructuring process of the cocoa sector in Cameroon

Key words: integrated pest management, farmer field school, adoption rate.

Introduction

Knowledge is an important factor to realize productivity increases in agriculture in developing countries. The generation and diffusion of knowledge on sustainable farming practices has long been a problem in promoting rural development especially in Africa. (6)

A new concept of farmer training called the "Farmer Field School" (FFS) was developed in the 1980s by the Food and Agriculture Organization (FAO) in Indonesia for the promotion of integrated pest management (IPM), and promised to be an effective tool to extend knowledge to farmers (4). It has been shown that FFS helps to increase farmer knowledge (2), and studies in several Asian countries demonstrated that FFS can be effective in reducing the excessive use of chemical pesticides (8; 9; 5). Operationally, the FFS are organized around a season-long series of weekly meetings focusing on biology, agronomic and management issues, where farmers conduct agro ecosystem analysis, identify problems and then design, carry out and interpret field experiments using IPM – non-IPM comparisons.

The Sustainable Tree Crops Program (STCP) is testing the Farmer Field School (FFS) approach in integrated pest management in Cameroon. The IPM Farmer Field School combines an approach to pest management and an approach to farmer education. This combination compounds the difficulties in assessing and measuring impacts. The measurement of impact is complicated for several reasons. First, IPM involves more than one field variable and context-specific decision-making. Thus, practicing IPM is not merely a matter of adoption or non-adoption of a technology, but field level decisions are made at various levels of advancement based on someone's understanding. The intended utility of this study is to contribute to the further refinement and adaptation of a farmer field school impact assessment methodology.

Materials and Methods

The sampling survey

In this study data sources from different angles with different objectives are combined. A systematic sampling got the first sample of this study from a list of graduates of the 2003 farmer field school year. A second random sample of farmers was drawn from the population of non-participating cocoa growers living in the same villages where the STCP farmer field school programs took place.

Although choosing the control group from the same community may present a potential bias due to participant farmer to non-participant farmer knowledge diffusion, it was felt that this potential bias was slight due to the short time lag and the relatively complex nature of the knowledge acquired in the farmer field school which would prohibit its easy transfer. On the positive side, selecting control farmers from the same village would tend to eliminate bias due to inestimable village effects such as microclimate, soil type, and pest and disease pressures.

Analytical methodology

A combination of a longitudinal comparison (before and after training) and a latitudinal comparison (trained and untrained farmers) is using as the impact assessment tool of this study.

A latitudinal comparison of mean yields is not sufficient for establishing the impact of the farmer field school if there are situational differences in farmer field school participants and the control group. To avoid these confounding effects, a multivariate regression analysis of production is conducted.

Regression analysis of FFS impact on cocoa production

To explore in more depth the relative contribution of

numerous variables affecting household cocoa production, a regression analysis was conducted. The purpose of the estimation is to test if the FFS training

induces a technological bias on household cocoa production. The model specified was:

$$prodcacao_i = \delta_0 + \sum_{i=1}^{9} \delta_i x_i + \varepsilon_i \qquad (1)$$

Where $prodcocoa_i$ is the quantity of cocoa sold in the 2004/2005 cocoa season by a household *i*.

The independent variables can be grouped into four categories, those related to human capital/labor, management practices, the age and quality of tree stock and cocoa land, and agrochemicals.

Results and Discussions

Longitudinal comparison-Application of IPM practice by respondent

The purpose of this section is to present the degree of application (adoption) of IPM technologies exposed to the respondents by the FFS.

Table 1 above reveals that shade management has the highest average rate of adoption (94.38 %). Phytosanitary harvest ranked second with an average rate of 93.33 %. Pruning also had a high adoption rate of 89.89%. Improved spraying practices and grafting occupied the second to the last and the last rank with adoption rates of 65.56 and 34.78 % respectively.

The overall adoption rate was 75.59%. This is slightly lower than the findings of Bahadur and Siegfried (2004) where the rate of adoption was 78.3 % but lower than those of Belle (2003) where only 36.78 % was recorded.

Change in farm management practices

This section presents the change in spraying practices, sprayings per seasons and number of sprayers per farm. Before the FFS a small percentage of the farmers (26.4%) applied the recommended spraying practices, i.e. spray until fungicide had moistened cocoa pods, but would not spray until runoff (table 2). However, some farmers (32.2%) still apply the wrong spraying practices after receiving the FFS training. This could be attributed to their usual habit spraying practices ie spray until fungicides would runoff cocoa pods. There was a significant change in spraying methods (table 2). This implies graduates in the majority no longer spray until saturation of cocoa pods.

Sprayings per season and number of sprayers per farm

It is important to note that there was a significant reduction in the number of sprayings per season between the pre and post program periods. The mean number of sprayings reduced from 7.37 during the pre program period to 3.86 after the farmer field school training. Therefore there was a 47.22% reduction in the frequency of application of fungicides. The significant change could be as result of the fact that most farmers, did not depend on the calendar bases to spray but take decision to spray based on the powers of observation in the field. Significant changes did not

Table 1: Application of IPM practice by respondent

IPM technology	Number of respondent exposed to	Number of adopter	Average adoption rate
Pruning	89	80	89.89
Shade management	89	84	94.38
Grafting	69	24	34.78
Phytosantitary harvest	90	84	93.33
Improved spraying practices	90	59	65.56
Overall adoption			75.59

Table 2: Pre and post program spraying practices

Spraying Practices	Year	Number	Percentage
Spray until fungicide would run off cocoa pods	2002(N=87)	64	73.6
	2004(N=87)	28	32.2
Spray until fungicide had moistened cocoa pods, but would not spray until runoff	2002(N=87)	23	26.4

only occur with the number of sprayings per season but also with the number of sprayers per farm(s).

The average number of sprayers per farm(s) by participants was found to be 18.86 before the program intervention; the average number of sprayers per farm(s) by participants was found to be 15.65 after program intervention. Thus, there was a 17.02 % reduction in the number of sprayers applied by participants.

Change in Labour Input and Amount of Fungicides use

Also reported in Table 4 are the fungicide costs incurred. In effect we see that labour is substituted for fungicide. Both variables show significant differences in the pre- and post-FFS situations. In terms of the sum total costs the post-FFS costs are slightly higher than the pre-FFS cost although not significantly so. But it is important to note that the farmer has reduced his cash outlays for fungicides by nearly 40%. Given the cash constraints facing poor households this seemingly modest outcome can offer an important incentive for adoption.

Latitudinal comparison

There is a possibility that the cocoa production technologies may differ across the two groups perhaps as a result of FFS training. To test this hypothesis a likelihood-ratio (LR) test for overall parameter stability was conducted for the two groups. The null hypothesis that the specific production functions are the same for all cocoa farmers was tested after estimating the pooled production function. The value of the LR statistic was 16.96, which is highly significant. The LR statistic is defined by $\xi = -2\{ln[L(H_0)/L(H_1)]\} = -2\{ln[L(H_0)-ln[L(H_1)]\}$, where $ln[L(H_0)]$ is the value of the log likelihood function for the production function estimated by pooling the data for all cocoa and $ln[L(H_1)]$ is the sum of the values of the log likelihood functions for the FFS participants and non participants production function. The degrees of freedom for the Chi-square distribution involved are 10, the difference between the number of parameters estimated under H_1 and H_0. This result strongly suggests that FFS participants and non participants cocoa production functions are not the same. This result was confirmed by the structural change test. In general, the results indicated that the participation to the FFS training induces a structural change among cocoa production farmers. These changes can be reduced to the parallel shift of the cocoa production function. Results of the structural change test are reported in table 6. Let's assume that the parameter differences between the control and FFS group regressions are attributable to the FFS training received. Then the estimated production for the representative FFS producer using control group

Table 3: Pre and post sprayings per season and number of sprayers per farm

		Mean	Std	Min	Max	2-tail sig
Number of sprayings per season	2002	7.3671	3.830	0.00	16.00	0.00
	2004	3.8608	2.341	0.00	19.00	
Number of sprayers per farm(s)	2002	18.86	19.693	0.00	98.00	0.00
	2004	15.6456	18.646	0.00	90.00	

regression model results in an output of 465; which is 149kg less than the actual output achieved with the FFS model. On this basis, we estimate that FFS-trained farmers achieved a 32% production increase relative to their predicted production in the absence of training.

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Table 4: An evaluation of the effect of farmer field school training on the cost structure of cocoa farming

Management practices	Pre FFS2002 labour quantity (man/day)	costs	Post FFS2004 Labour quantity (man/day)	costs	Change in cost (FCFA)	T-test	Prob
Sub total labour	41.5	41,534	47.362	47,362	5,827	7.72	0.0000
Fungicide use (sachets)		37,215		22,876	(14,339)	-2.84	0.0063
Total		78,749		70,238	(8,511)	-1.26	0.2122

Table 5: Regression model results

Variables	Latitudinal comparison			
	FFS (N=90)	Non-FFS (N=83)	Pooled without FFS dummy (N=173)	Pooled with FFS dummy (N=173)
Intercept	2.720***(2.97)	5.35***(5.20)	4.011***(5.78)	4.036***(5.92)
Educ	0.321(1.23)	-0.129(-0.88)	-0.249(-0.202)	-0.055(-0.45)
Gender	-0.232(-0.64)	-0.164(-0.33)	-0.073(-0.241)	-0.044(-0.15)
Labor	0.404**(2.47)	0.082(0.50)	0.184(1.59)	0.163(1.43)
Prune	0.46*(1.76)	-0.112(-0.42)	0.145(0.74)	0.121(0.63)
Phyto	-0.260(-1.62)	0.277(1.41)	0.081(0.694)	-0.013(-0.11)
Hybrid	0.646**(2.03)	0.183(0.50)	0.459*(1.92)	0.453*(1.93)
Prodarea	0.363***(3.28)	0.617***(4.37)	0.513***(5.87)	0.516***(6.01)
Cocoage	0.418**(2.32)	-0.013(-0.058)	0.26*(1.85)	0.248*(1.79)
Pestspray	-	-		-
Fertilizer	-	-	-	-
Pesticide	0.044**(2.05)	0.027(1.32)	-	0.029**(2.013)
FFS	-	-	0.032**(2.17)	0.313**(2.59)
Ajusted R^2	0.33	0.16	0.23	0.26
F-statistic	5.92***	2.74***	6.81***	7.016***
DF1; DF2	9; 80	9; 73	9; 163	10; 162

Values in parenthesis are t-ratio. *** P<0.01; ** P<0.05; * P<0.1.

Table 6: Empirical results of the structural change test (Chow test)

	Latitudinal comparison		
	Sample size	Sum of squared error	F-statistic
FFS participants	90	SS1=35.90	$F1_{(11,151)}$=1.98
FFS non-participants	83	SS2=46.49	(0.034)**
Pooled without restriction	173	SS3=93.28	$F2_{(10,150)}$=2.05
Pooled with restriction	173	SS4=89.58	(0.032)**

Source: computed by the authors;

Entries are test statistics with P-values in parenthesis; **, *** refer to the rejection of the null hypothesis at 5% and 1% level of significance respectively.