EFFECT OF UTILISATION OF INDIGENOUS PEST MANAGEMENT METHOD ON POVERTY STATUS OF RURAL HOUSEHOLDS IN OSUN STATE

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ABSTRACT

The continuous use of the synthetic chemicals to mitigate the damage by pests is generally fraught with problems of undesirable poverty-inducing effects. These problems necessitated the use of indigenous method by rural farmers as a possible alternative. However, there is a paucity of information on the potential ability of the indigenous method to improve the welfare of farmers. Hence, this study examined the utilisation of indigenous pest management method and poverty status of cocoa farmers in Osun State. Cross sectional data were collected from 300 cocoa farmers used for study. The data were analyzed using descriptive statistics, poverty depth analysis and propensity score matching method. Results indicated that poverty lines estimated for the users and non-users showed different levels of welfare for the two categories of farmers. The poverty incidence, depth and severity were 25%, 7% and 2.9% for the adopters respectively while 33%, 9% and 3.1% were for the non-adopters. The propensity score matching estimates revealed a positive and significant effect ($t= 5.51$ at $p < 0.05$) of the indigenous method on adopter's income. The study concluded that the adoption of indigenous pest management method has positive effect on welfare of cocoa farmers.

Key words: Indigenous Pest Management, Poverty, Rural Household

INTRODUCTION

Although conventional method of pest and disease management in the form of synthetic pesticide (mainly imported) exists, the continuous use of the synthetic chemicals to manage the pests and diseases of crops is generally fraught with problems of undesirable side effects. Many pesticides pose substantial short and long term health risks (Rahman, 2003), occupational and health hazards (Sosan et al., 2010), substantial environmental damage or contamination (Conway and Pretty, 1991) and secondary pest outbreak (Tijani and Omondiagbe, 2006).

Due to the adverse effects associated with the use of synthetic chemicals, the adoption of botanicals mixed with locally available materials to manage pest and disease of crops among resource-poor farmers in the rural areas has generated increased interest in the literature (Agboola, 2006; Tijani and Omondiagbe, 2006; Mugisha-Kamatenesi *et al*. 2008). The locally developed pest management method involves the combination of neem (*Azadiracta indica*) parts, siam weed (*Eupatorium odorata*) and tobacco (*Nicotiana tabacum*) to form solutions with other materials such as ashes, water and local soap.

Using indigenous knowledge of farmers in developing appropriate technologies has been increasingly recognized as a method of attaining sustainability in agricultural and rural development programmes (Warren and McKiernan, 1999). This cultural approach to development is highly needed in most of the developing countries especially Nigeria where the current emphasis of development concentrates on the rural areas where a majority of her people reside. What the local people know and want for improvement must be fully understood and used to develop a participatory development model. In this case, indigenous knowledge becomes the key to local level development.

Several studies have examined the impact of innovation adoption and diffusion decisions of farm households in both developed and developing countries. There is dearth of literature on impact of adoption of alternative pest management method on outcomes such as income and consequently the

poverty status of farm households. The few studies that have carried out similar analyses have often ignored the fact that technology adoption is not randomly assigned but that there is self-selection into treatment. Ignoring this issue in the estimation procedure leads to biased estimates and wrong policy recommendation (Abdulai and Binder, 2006). Hence, this study examined the effects of adoption of indigenous pest management method on poverty status of cocoa farmers using a non-parametric method of estimation that is objective and control self-bias.

METHODOLOGY

This study was carried out in Osun state. The study covered the farmers registered with a Non Governmental Organisation (NGO), the Rural Development Programme (RUDEP) coordinated by Osogbo Catholic Diocese. A multi-stage sampling procedure was employed to select 300 cocoa farmers in the study area. Cross sectional data were collected, using a structured questionnaire, from the cocoa farmers in rural communities of Osun State. The data were analyzed using descriptive statistics, poverty depth analysis, and propensity score matching method.

Measures of poverty

Poverty was estimated using Foster-Greer-Thorbecke (FGT) class of poverty measures which has some desirable properties (such as additive decomposability), and they include some widely used poverty measures (such as the head-count and the poverty gap measures). The FGT poverty measures are defined as

$$P_{\alpha=}\int_{0}^{z}\left[\frac{z-x}{z}\right]^{\alpha} f(x)\,dx\alpha \geq 0, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where x is the household income, $f(x)$ is its density (roughly the proportion of the population income), z denotes the poverty line, and α is a non-negative parameter. Higher values of the parameter α indicate greater sensitivity of the poverty measure to inequality among the poor. This study is concerned with the estimation of poverty measures P for α = 0, 1, and 2, which respectively define the head-count index (H), the poverty gap index (PG), and the squared poverty gap index (SPG). Headcount index (H) and poverty gap index (PG) as given by Datt (1998) are presented as:

$$H = \frac{q}{n} = 1 - \frac{z}{\mu} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

$$PG = H - \left(\frac{\mu}{Z}\right) L(H) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where: q= no of poor household, n = total no of household, z = poverty line, μ = mean expenditure and L = slope of the Lorenz curve$\left(\frac{z}{\mu}\right)$.

The SPG for the Foster- Greer- Thorbecke measure of P_2 is given by Ravallion (1992) as

$$P_2 = \frac{PG^2}{H} + \frac{(H - PG^2)}{H} CV_p^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

Where; PG = Poverty gap index, H = Headcount index, CV_p^2 = squared coefficient of variation of income among the poor. These three measures were obtained for the adopters and non-adopters of indigenous pest control method.

The Lorenz curve

Propensity Score Matching

The main purpose of using matching was to find a group of treated individuals (adopters) similar to the control group (non-adopters) in all relevant pre-adoption characteristics, where the only difference was that one group adopted indigenous pest control method and the other group did not. For the Propensity Score Matching method, several studies (Rosenbaum and Rubin

1983; Dehejia and Wahba 2002; Heckman *et al*. 1998; Caliendo and Kopeinig 2005; Smith and Todd 2005, Mendola, 2007) among others were referred to. The most common evaluation parameter of interest is the 'average adoption effect on the adopter' known as average treatment effect on the treated (ATT), defined as ATT = E (Y^1 - Y^0 | P =1) = E [Y^1| P = 1] - E [Y^0 | P =1], which answers the following question: 'How much did indigenous method adopters benefit compared with what they would have benefited without adopting the technology?.

Estimation of the average treatment effects on the treated (ATT) group using matching methods rely on two key assumptions. The first was the conditional independence assumption (CIA), which implies that selection into the treatment group, is solely based on observable characteristics (selection on observables). The second assumption is the common support or overlap condition. The common support is the area where the balancing score has positive density for both treatment and control units.

RESULTS AND DISCUSSION

Socio economic characteristics of respondents

Table 1 presents the socio economic characteristics of respondents. The mean age of the two categories of farmers, adopters and non-adopters were 57.9 and 57.16 years with standard deviation of 10.15 and 11.97 respectively. The modal age classes were 58-66 for both adopters and non adopters of indigenous pest management method. The adopters had mean farm size and years of experience of 6.85ha and 25.34 years, respectively. Non-adopters of indigenous pest management method with mean farm size of 5 hectares were the most experienced in cocoa farming. The mean number of years of experience in cocoa farming was 29 years. The non-adopters had largest mean family size of 8 while the adopters had the lowest of 6 with more than 50% of each categories having family size of 2-6.

Low level of formal education was observed for both adopters and non adopters with more than 50% of each category having no formal education. Farming was their major source of income. Majority of the respondents who had formal education were primary and secondary school leavers. About 5% of adopters had tertiary education while 2% of non adopters had tertiary education. Most of the respondents did not earn off farm income.

Table 1: **Socioeconomic characteristic of respondents**

Item (units)	Adopters		Non adopters	
	Frequency	%	frequency	%
Age Group				
22-30	0	0	5	3.6
31-39	7	5.1	7	5.1
40-48	20	14.6	23	16.8
49-57	35	22.2	27	19.7
58-66	41	29.9	42	30.7
67-75	31	22.6	26	19
76+	3	2.2	7	5.1
Total	137	100	137	100
Mean	57.9	-	57.2	
Standard deviation	10.15	-	11.97	
Family Size				
2-6	86	62.8	71	51.8
7-11	46	33.5	41	29.9
12-16	5	3.7	11	8.0
17-21	-	-	10	7.3
22-26	-	-	2	1.5
27+	-	-	2	1.5
Total	137	100	137	100
Mean	6.18		8.11	
Standard deviation	2.38		5.28	
Farming experience				
3-11	14	10.2	23	16.8
12-20	44	32.1	16	11.7
21-29	38	27.7	35	25.5
30-38	20	14.6	23	16.8
39-47	11	8.0	22	16.1
48-56	9	6.6	17	12.4
57+	1	0.7	1	0.7
Total	137	100	137	100
Mean	25.34			29.18
Standard deviation	12.08			14.58

Farm Size				
1.1-5.5	72	52.6	94	68.5
5.6-10.0	37	27.0	40	29.2
10.1-14.5	18	13.1	3	2.2
14.6-19.0	9	6.6	0	0
19.1+	1	0.7	0	0
Total	137	100	137	100
Mean	6.85		4.87	
Standard deviation	4.05		1.93	
Level of Education				
Never attended school	78.2	57.1	71.79	52.4
Primary	35.9	26.2	45.62	33.3
Secondary	16.3	11.9	16.03	11.9
Tertiary	6.6	4.8	3.29	2.4
Total	137	100	137	100
Off Farm Income				
Artisans	21..65	15.8	19.45	14.2
Trading	11.51	8.4	6.576	4.8
Civil servants	7.67	5.6	6.576	4.8
No source	93.71	70.2	104.39	76.2
Total	137	100	137	100

Source; Data analysis, 2010

Estimated Incidence, Depth and Severity of Poverty

The values for the poverty measures, Head-count index (H), poverty gap index (PG), and Foster-Greer-Thorbecke's measure of poverty severity (P_2), are presented in Table 3. The headcount index (incidence of poverty) computed for both adopters and non adopters of indigenous pest control method were 0.18 and 0.45 respectively. The results implies that the proportion of the cocoa farming households whose per capita income fell below the poverty line among the adopters of the indigenous method was 18% while it was 45% for non-adopters. In other words, the results imply that 45% of the non-adopters are poor in the study area. The poverty gap index (depth of poverty) which is the mean distance of the income of poor households from the poverty line for adopters and non-adopters were 4.5% and 9.7%, respectively. The squared poverty gap index had a value 0.017 and 0.031 for adopters and non-adopters, respectively. These results showed that severity of poverty among the adopting cocoa farming households was 1.7%, and 3.1% for non-adopters.

The result of the descriptive analysis of poverty status (incidence, depth and severity) by adoption status as shown in Table 2 showed that the incidence of poverty, depth and severity were lower among the adopters of indigenous pest management compared to the non-adopters. This result underscores the role of the use of indigenous approaches to poverty reduction among rural households in areas such as crop pest management (increasing cocoa yield) and reduction or absence of health and occupational hazards.

Table 2 Poverty Analysis by adoption status

	Poverty Indices			
	Headcount	Depth	Severity	N
Adopters (%)	18.2	4.5	1.7	137
Non adopters (%)	44.5	9.7	3.1	137
All samples (%)	17.2	5.8	2.3	274

Source: Data Analysis, 2010

Estimated Adoption Effect

The effect of adoption of indigenous pest control method on poverty status of adopting households was estimated with nearest neighbour matching. The results are presented in Tables 3. The overall matching estimates showed that adoption of indigenous pest control method had a positive and robust effect on income, an indication of poverty reducing effect. The matching procedure applied to the probability of the house-hold to be poor indicated that adopters were less likely to be poor by about 36% points (Table 3). This is consistent with *a priori* expectations. As income of cocoa farmers increases due to the effect of adoption, poverty level is expected to reduce. In this case, a unit increase in income due to adoption of indigenous pest management method would decrease adopters' propensity to fall below the poverty line by 36 percent. This finding qualitatively agrees with Mendola, (2007) and is

statistically significant at 5% level. This result answers the counterfactual question which would be of value in predicting the effects of adopting an alternative cocoa pest management method.

This result suggest that, directly alleviating poverty among resource-poor farmers through better targeting of indigenous methods have an important causal effect in terms of household wellbeing. Thus, indigenous pest management adoption would contribute to the improvement of the income condition of poorer cocoa farmers.

Table 3: Estimation of ATT: Effect of Adoption of Indigenous Pest Control Method on Poverty of Adopting Household

Outcome	ATT	Standard error	Treated	Control
HH Poverty*	-0.360**	0.181	0.551	0.912

****,** significant at 5%

*, household poverty was measured as dummy

Source: Data Analysis, 2010

CONCLUSIONS

The use of imported chemicals to control the damage by pests is generally associated with undesirable effects which necessitate the adoption of an indigenous alternative. This study examined the effects of adoption of indigenous pest management method on poverty status of cocoa farmers in Osun State. Our findings lead to the conclusion that adopting indigenous pest management method is a positive way of improving the welfare of cocoa farmers.

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