

ASSESSMENT OF COCOA FARMERS CHEMICAL USAGE PATTERN IN PEST AND DISEASE MANAGEMENT IN ONDO STATE

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ABSTRACT

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Cocoa farmers use a wide range of chemicals to limit losses from pests and diseases in cocoa production. This study was carried out between January and April 2006 in two local government areas of Ondo State. High incidence of pests and diseases continues in the cocoa farms despite heavy reliance on chemicals in diseases and pests management. The study therefore assessed the agrochemical usage pattern of cocoa farmers for pests and diseases management in Ondo State. The objectives of the study are to determine the personal characteristics of cocoa farmers; usage pattern and types of chemicals being used by cocoa farmers and ascertain the constraints facing farmers to obtain agrochemicals in the study area. The respondents were randomly selected from the study area. Out of 16 local government areas (LGAs) in Ondo state, two LGAs namely Idanre and Ondo East were randomly selected and three villages were selected from each LGA. Questionnaire was administered to 15 farmers each of the three LGAs to make a total of 90 respondents. Descriptive statistics and inferential statistics were used to analyse data from the study. 61.1% of the respondents were above 46 years of age, most (86.7%) were married, and 58.9% had no formal education while 55% had between 6-10 children. Educational status ($p=0.01$, $r^2= 10.05$), farm size ($p=0.04$), income ($p=0.03$) were significantly related to farmers' chemical usage pattern. Consideration of the right time to spray had the highest mean score (3.83), followed by spraying using any nozzle (3.24) while consideration for health precautionary measures (3.83) had the least mean score. The study identified inadequate government support (2.89) as the most serious constraint, followed by problem of adulterated chemicals (2.79), while poor price of cocoa bean (2.38) was considered to be the least serious problem. The study further shows that constraints such as high cost of chemicals, low access to government inputs and poor price of cocoa beans militating against farmers' chemical usage were significantly related to farmers' chemical usage pattern. The study concludes that farmers' chemical usage pattern is poor in the state. Government should assist farmers to eradicate or minimize the constraints affecting the chemical usage pattern. Also extension agents of ADP should take up challenges of educating cocoa farmers on appropriate pattern of chemical usage in Ondo State.

Key words: Cocoa farmers, chemicals usage pattern and disease management

INTRODUCTION

Cocoa is among the world's most important tree crops (Edwin and Master 2005). Nigeria is currently the 4th largest world producer of cocoa (*Theobroma cacao*) with 165,000 metric tonnes in 1999/2000 (Adejumo 2005). In the early 70s Nigeria used to occupy the second position in cocoa production after Ghana; the fourth position occupied at present could be attributed to problems such as incidence of pest and diseases and problem of old age of most cocoa trees in Nigeria. Adegbola (1979) opined that many diseases affect cocoa on the field, some of them are Phytophthora black pod disease, Phytophthora seedling blight, cocoa swollen shoot virus (CSSV) disease, cherelle wilt, charcoal pod rot and collar crack disease. But those of economic importance in Nigeria are three: black pod disease, swollen shoot virus, and cherelle wilt (Opeke, 1987).

Bateman (2006) stated that there is an increasing appreciation of cocoa value for land rehabilitation, maintenance of biodiversity, and provision of subsistence income in less developed regions. However, cocoa like other crops is attacked by a number of pest species including fungal diseases, insects, and rodents. He further posited that pesticides are used in all cocoa growing areas such as Latin America, West Africa and South East Asia where much pesticide application takes place using low cost, manual, (hydraulic) knapsack sprayer.

Prominent among the pesticides are copper sulphate (a fungicide popular in the treatment of black pod infection); Benzene Hexachloride (BHC) (an insecticide for control of cocoa mirids); Aldrin/Dieldrin or Aldrex 40 (to control mealy bugs); carbamate, unden, (an insecticide which is effective in controlling cocoa mirids in West African countries) (Tijani 2006). Others according to him are kokotine Apeco, Berenode, Arkoline, Didimac 25, Basudin and Brestan.

The wrong use of chemicals on cocoa farms exposes farmers to some risks due to the hazardous effects of these chemicals. The residual effect of the chemicals on cocoa also constitutes concern if the chemicals are not properly handled. According to Atu (1990), pesticides are toxic and can have serious health hazards to human beings. To guard against these dangerous effects, Idowu (1996) recommended precautionary measures in chemical application these include; wearing of nose shield to avoid inhalation, putting on of protective clothing, rubber gloves and boots, refraining from smoking, eating and drinking, covering of food and water to avoid contamination.

Farmers' inability to comply with some of these precautionary measures and inappropriate handling of chemicals due to ignorance or carefree attitude may influence the chemical use pattern.

Chemical usage pattern is defined in this study as the processes in terms of frequency and approach followed by cocoa farmers in the usage of agrochemicals to ensure derivation of maximum benefits from the agrochemicals used. The processes are followed to increase output from the cocoa farms, produce cocoa of low chemical residue, reduce hazardous effects of the chemicals on themselves and the environment.

This study therefore aimed at assessing the chemical usage pattern of cocoa farmers in Ondo State, Nigeria.

The objective of the study was to investigate the chemical usage pattern of cocoa farmers in Ondo state of Nigeria. In specific terms objectives are as follows. To

- determine the personal characteristics of cocoa farmers in the study area;
- find out types of chemicals being used by cocoa farmers in the study areas;
- identify the farmers chemical usage pattern in the study area; and
- ascertain the constraints facing farmers to obtain agro-chemicals in the study area

Hypotheses tested are:

- There is no significant relationship between cocoa farmers' personal characteristics and chemical usage pattern in Ondo state.
- There is no significant relationship between the constraints facing cocoa farmers' access to chemical and the chemical usage pattern in Ondo state.

METHODOLOGY

This study was carried out between January and April 2006. Multistage sampling technique was used to select the sample for the study. Two high cocoa producing local government areas namely Idanre and Ondo East were randomly selected out of the 16 Local Government Areas (LGAs) planting cocoa in Ondo state. Three high cocoa producing cocoa growing communities were selected from each of the two high coca growing LGAs to make six high cocoa growing communities. The communities selected in Ondo East LGAs include; Olorunfemi, Obun Ondo and Bolorunduro while Alade Idanre, Atosin, and Ita Olorun were selected in Idanre local government areas. From each of the communities, well-structured questionnaire was administered to 15 respondents to make a total of ninety respondents for the study.

The variables measured in this study for the purpose of analysis include constraints facing cocoa farmers and farmers' chemical usage pattern. The chemical usage pattern was measured at four level namely; not at all =1, rarely = 2, often = 3 and very often = 4.

RESULTS AND DISCUSSION

Age

Table 1 revealed that many of the respondents (44.4%) were between ages 46-60 years; few 18.9% were below 30 years while 16.7% were above 60 years. Generally the study revealed that majority of the respondents (61.1%) was over 45 years. This implies that many of the respondents are old. This may have negative effect on their chemical usage pattern since old people tend to stick to their old ways of applying chemicals while younger ones are more receptive to new ideas.

Table 1: Frequency distribution of respondents personal data

Factors	Category	Frequency	Percentage
Age	<30	17	18.9
	31 – 45	18	20.0
	46 – 60	40	44.4
	61 – 75	10	11.1
	> 75	5	5.6
	Total	90	100.0
Marital status	Married	80	88.9
	Single	10	11.1
	Total	90	100.0
Education	No Formal Education	53	58.9
	Primary School Certificate	13	14.4
	Secondary School Certificate	19	21.1
	University Education	5	5.6
	Total	90	100.0

Source: Field survey, 2006

Marital status

Table 1 revealed that majority (88.9%) of the respondents was married. This implied that cocoa farmers might likely get assistance from their wives in carrying activities related to chemical application on their farms. This could help to reduce cost on labour in chemical application.

Educational status

In addition, Table 1 showed also that many of the respondents were non-literate with only 26.7% having secondary school certificate and above while 58.9% had no formal education. The low level of education may have influence on the chemical usage pattern of the respondents; hence the chemical usage pattern of respondents would most likely be influenced by this factor. Since most of the respondents are non-literate, it may have a negative effect in the respondents’ ability to use the chemicals most especially in the area of reading the instructions on the chemicals’ containers and thereby influencing the chemical usage pattern of the respondents negatively.

Number of Children

Figure1 showed that many of the respondents (55%) had between 6-10 children while few (10%) had more than 15 children. This implies that farmers in the area have access to family labour if the children show willingness to assist their parents on the farm. This will go a long way to reduce cost on labour in chemical application in cocoa farms.

Respondents’ cocoa farm size

The study shows in Figure 2 revealed that majority of respondents owned small hectare of cocoa farm. Only 10% had more than 15 hectares of cocoa while 53.3% had 1-5 ha of cocoa farms. This implies that the farmers may not necessary rely heavily on the use of chemical in pest and disease management but rather concentrate on farm maintenance to manage the pests and disease on their cocoa farms since most of the farms are of manageable sizes.

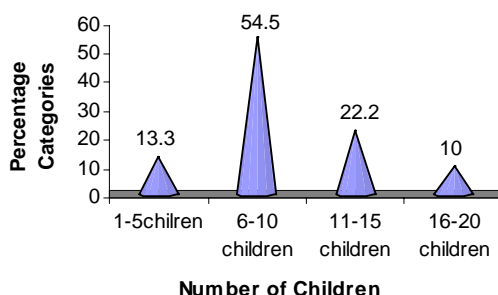


Figure 1. Conical chart showing number of Respondents Children

Source: Field Survey 2006

FARMERS AGRO CHEMICAL USAGE PATTERN

Cocoa farmers’ spraying methods

On farmers’ ways of spraying cocoa, Table 2 revealed that 76.7% of the respondents used blanket-spraying methods to spray their cocoa farms, while the remaining 23.3% used spot spraying method. This implies that farmers waste more chemical during chemical application as a result of run-off from the crop. Bateman (2004) reported that massive amount of pesticides are wasted by run-off from the crop and in to the soil. This will also increase cost of production. Hence, it is necessary to encourage farmers to use the spot spraying method, which are more economical, time and energy saving compare to the blanket spraying method.

Table 2. Frequency Distribution of Farmers’ Spraying Methods

Spraying Methods	Frequency
Blanket Spraying	69
Spot Spraying	21
Total	90

Source: Field Survey 2006.

Types of chemical used by cocoa farmers in pests and diseases management

Table 3 revealed that majority of the farmers 93%, 88% and 63% applied Basudin 600 EC, Copper sulphate and Gammalin 20 respectively on their farms, while very few 24.0%, 22.0% and 2.0% of the farmers made use of Perenox, Unden and Electron 50 respectively. None of the farmers make use of Dursban 40 and Thiodan 35 on their farms. The continuous use of Gammalin 20 by farmers needs to be discouraged because of the hazardous effect on farmers’ health and its residual effect on cocoa bean, hence need to sensitize farmers on the dangerous effects of the use of this chemical among cocoa farmers is necessary.

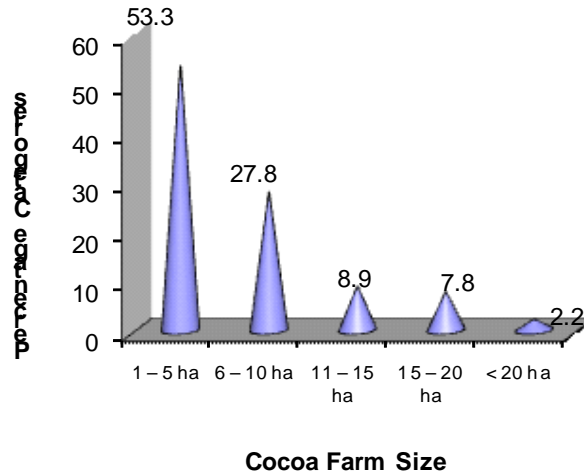


Figure 2. Conical chart showing Respondents’ Farm size

Source: Field Survey 2006

Table 3. Frequency Distribution of Chemicals used by Farmers in Pest and Diseases Control

Agro Chemicals	No		Yes		Do not know	
	Freq.	%	Freq.	%	Freq.	%
Gammalin 20	33	37.0	57	63.0	-	-
Copper Sulphate	11	12.0	79	88.0	-	-
Ridomil Plus	41	46.0	49	54.0	-	-
Perenox	68	76.0	22	24.0	42	47.0
Basudin 600 EC	06	7.0	84	93.0	-	-
Unden	70	78.0	20	22.0	10	11.0
Elocron 50	88	98.0	2	2.0	60	70.0
Dursban 48	90	100.0	0	0	53	59.0
Thiodan 35	90	100.0	0	0	49	54.0

Source: Field Survey 2006.

Sources of farmers’ agro-chemical

Table 4 revealed that majority (70%) of the respondents purchased their chemicals from open market, 24.5% obtained it from cocoa buyers while 5.5% sourced for theirs from ADP/Ministry of Agriculture. None of the respondents reported to have obtained any chemical from National Cocoa Development Committee (NCDC) or any of the Commodity Associations. This shows that the chemicals being sold to farmers by NCDC at subsidized rate do not get to cocoa farmers. It shows that government needs to ensure that these chemicals do not end up in the hands of “political farmers”, effort has to be made to ensure that real cocoa farmers benefit from the use of these chemicals.

Cocoa farmers’ sprayer ownership and usage

Table 5 revealed that 76.7% of the respondents own sprayer, out of this 76.7% only 23.2% rented their sprayers, the remaining bought their sprayer from the market while none of the respondent was given sprayer freely. On sprayers’ operation, the study shows that 90% can operate sprayer, out of the remaining 10%, 66.7% rely on their children to operate sprayer while knapsack operators (hired labour) assist 33.3% to operate the sprayer. Lastly many (72.2%) are aware of availability of sprayers provided by government and sold at subsidized rate to farmers through NCDC, despite high level of awareness, only 5.5% have benefited from the government

intervention. This study shows that government efforts in the area of input provision are not getting to the farmers this is due to the inability of farmers to access these inputs. The study also revealed that majority of the farmers claimed to have the skill of operating the sprayer; this is a development in a positive direction because farmers will not have to spend extra money to acquire labour to carry out spraying operation that they could have been done without incurring extra cost.

Table 4. Frequency Distribution of Respondents' Sources of Agro-Chemicals

Sources	Frequency	%
Open Market	63	70
Cocoa Buyers	22	24.5
NCDC /Commodity Association	-	-
Ministry of Agric./ADP	5	5.5
Total	90	100

Source: Field Survey 2006.

Table 5. Cocoa farmers' sprayer ownership and usage

Sprayer Ownership				Sprayer Operation				Awareness of sprayer provided by government				Availability of Govt. Sprayer			
Yes		No		Yes		No		Yes		No		Yes		No	
F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
69	76.7	21	23.3	81	90.0	9	10.0	65	72.2	24	27.8	5	5.5	85	94.5
Operators of Sprayer								Sprayer Sources							
Knapsack Operators (hired labour)				Operator				Rent		Purchase		Given free			
Children		Fellow farmer		F		%		F		%		F		%	
1		0		6		66.7		0		0		16		23.2	
3		33.3		0		0		0		0		16		23.2	

Source: Field Survey, 2006 F=Frequency

Constraints facing farmers to obtain agro-chemicals

Table 6 shows the constraints faced by cocoa farmers in agro-chemical usage. The constraints identified include high cost of chemicals, weak extension linkages, inadequate government support, problem of adulterated chemicals, and low access to government input such as chemicals and poor price of cocoa bean. The study identified inadequate government support ($\bar{x} = 2.89$) as the most serious constraint, followed by problem of adulterated chemicals ($\bar{x} = 2.79$), while Poor price of cocoa bean ($\bar{x} = 2.38$) was considered to be the least serious problem. This implies that government must make necessary efforts to minimize or eradicate all these constraints; this is necessary to minimize the threat posed by the constraints to cocoa farmers' ability to access good and quality agro chemicals. Farmers' inability to access good and unadulterated chemicals could be disastrous to cocoa industry and social well being of cocoa farmers in the country.

Table 6: Frequency distribution of constraints facing farmers to obtain chemicals

Constraints	Yes		Degree of Constraints if yes						Mean score (\bar{X})
	F	%	Mild		Severe		Very Severe		
			F	%	F	%	F	%	
(1) High cost of chemicals	86	94.5	7	8.1	4	4.7	75	87.3	2.79
(2) Weak extension linkages	69	76.7	9	13.0	10	14.5	50	72.5	2.59
(3) Inadequate govt. support	72	80	3	4.2	1	1.4	68	94.4	2.89
(4) Problem of adulterated chemicals	75	83.3	4	5.3	8	10.7	63	84.0	2.79
(5) Low access to govt. input	84	93.3	9	10.7	5	6.0	70	83.3	2.73
(6) Poor price of cocoa bean	88	97.7	16	18.2	23	26.1	49	55.7	2.38

Source: Field Survey, 2006

Table 7. Patterns of Chemical Usage

Patterns of Chemical Usage	Not at all		Rarely		Often		Very Often		Mean Score (\bar{X})
	F	%	F	%	F	%	F	%	
(1) Decide to spray only when it is necessary	42	46.7	38	42.7	4	4.4	6	16.7	1.71
(2) Blanket spraying	21	23.3	-	-	9	10.0	60	66.7	2.53
(3) Spray based on recommendations	-	-	48	53.3	35	38.9	7	7.8	2.47
(4) Spray using any nozzle	15	16.7	5	5.6	13	14.4	57	63.3	3.24
(5) Consider health precautionary measure while spraying	75	83.3	5	6.7	9	10.0	-	-	1.24
(6) Consider right time to spray (e.g. time of the day, direction of wind and weather condition).	15	16.7	20	22.2	10	11.1	45	50.0	3.83
(7) Spray pod until it is soaked with the chemicals	6	6.7	25	27.8	20	22.2	39	43.3	3.02
(8) Calibration of sprayer before spraying on their cocoa farm.	48	53.3	16	17.8	17	18.9	9	10.0	1.86

Source: Field Survey, 2006

Respondents' patterns of chemical usage

Table 7 shows that many of the respondents 83.3% spray their cocoa farms without considering necessary health precautionary measures an act that could expose them to health hazards, 46.7% do not spray when it is necessary, they assume chemical spraying is a necessity and must be carried out when insects are seen on the farm. Also 42.2% rarely spray when it is necessary only very few 16.7% spray their cocoa farm only when it is necessary, majority 81.2% of the cocoa farmers used blanket method of chemical spraying this will result into chemical wastage on the farm and increased cost of production.

All respondents sprayed based on recommendations, although 53.3% did this rarely while 38.9% did it often. Very often, 63.3% sprayed using any nozzle while 53.3% sprayed without calibrating the sprayer. The use of any nozzle and failure to properly calibrate the sprayer will encourage wastage during spraying. The Table also showed that many (63.3%) of the respondents spray the pods until they are soaked with the chemicals, this definitely results to chemical wastage as the pods require only the fume of the chemicals for the control of pests and diseases. Lastly half of the respondents 50% consider the right time i.e. time of the day and weather condition and wind direction before spraying chemical on their farm.

The mean scores for the chemical usage pattern shows that, Consideration of the right time to spray (e.g. time of the day, direction of wind and weather condition had the highest mean score (\bar{x} =3.83), followed by spraying using any nozzle (\bar{x} = 3.24) while consideration for health precautionary measures (\bar{x} =3.83) had the least mean score. The pattern based on Table 9 revealed that cocoa farmers need programme that would enlighten them on appropriate way of applying these chemicals to avoid wastage and reduce the hazardous effects of the chemicals on cocoa farmers and the environment.

Testing of hypotheses

H_{01a} = There is no significant association between respondents' personal characteristics and chemical usage pattern.

Chi-square analysis in Table 8 showed the significant association between respondents' personal characteristics and pattern of chemical usage in pest and disease management among cocoa farmers. The chi-square analysis shows that a significant association exists between educational status ($\chi^2 = 10.05$, $p = 0.01$) and cocoa farmers chemical usage pattern in Ondo State. Variable such as sex and marital status were not significantly associated with farmers' chemical usage pattern. The high contingent coefficient of 0.7 for educational status shows high level of association between the two variables

Table 8. Chi square analysis showing association between respondents' personal characteristics and chemical usage pattern

Variable	Df	CC (contingent coefficient)	χ^2	p	Decision
Sex	1	0.04	7.89	0.92	NS
Marital Status	2	0.04	8.92	0.93	NS
Educational Status	3	0.7	10.05	0.001	S

Source: Field Survey 2006, Significant Level $p = < 0.05$.

H_{01b} – There is no significant relationship between the constraints facing cocoa farmer in access to chemical and the chemical usage pattern.

From Table 9, the PPMC analysis shows that farm size ($p < 0.05$) and farmers' income ($p < 0.05$) are significantly related to the farmers' chemical usage pattern. This implies that the farm size and farmers' income significantly influenced farmers' chemical usage pattern. The low coefficient of determination shows that a weak relationship exists between the two variables and farmers' chemical usage pattern.

This implies from the Chi square and PPMC analysis that for the chemical usage pattern of the respondents to be improved, effort has to be made to increase farmers' income and knowledge of appropriate chemical usage pattern.

H₀₂- There is no significant relationship between the constraints facing cocoa farmers' access to chemical and the chemical usage pattern in Ondo state.

Table 9. Pearson Product Moment Correlation showing the relationship between selected personal characteristics and chemical usage pattern

Variable	r	r ²	COD	Probability value	Decision
Age	0.60	0.36	36%	0.062	NS
Farm Size	0.48	0.23	23%	0.003	S
Farming Experience	0.64	0.41	41%	0.07	NS
Farmers' income	0.26	0.07	7%	0.0001	S

COD: Coefficient of Determination
Source: Field Survey, 2006

From Table 10, constraints militating against cocoa farmers in chemical usage have a significant relationship with the chemical usage pattern. The high coefficient of determination shows that a strong relationship exists between the two variables. This implies that for the chemical usage pattern of the respondents to be improved, adequate attention must be given to address constraints facing these farmers in respect of chemical usage and acquisition.

Table 10. Pearson Product Moment Correlation showing the significant relationship between constraints and chemical usage pattern

	r	r ²	(COD)	Probability value	Decision
Constraints					
Vs	0.83	0.69	69%	0.001	S
Chemical usage pattern					

COD: Coefficient of Determination
Source: Field Survey, 2006

CONCLUSIONS

The study concluded from the analysis above that farmers' chemical usage pattern is poor in the state. Based on the findings of the study, the following are therefore recommended for an improvement to be achieved in farmers' chemical usage pattern in Ondo State.

1. Farmers should be encouraged to form strong organisations that will enable them to work as a team in order to eradicate or minimize the constraints they are facing in the area of having access to good and unadulterated chemicals. They should through the various organisations ensure that inputs from government should be properly channeled for "real farmers" to benefit from such inputs
2. Extension agents of ADP and other agencies such as NGOs should take up challenges of educating cocoa farmers on appropriate pattern of chemical usage in Ondo State.
3. Regular training should be organised for cocoa farmers on chemical usage since the study revealed that many of the farmers do not have formal education and education has significant effect on the chemical usage pattern in the area.

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