Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 1, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

AGROCHEMICAL BASED INFORMATION USAGE AMONG FARMERS: A PATHWAY TO SUSTAINABLE COCOA PRODUCTION IN OSUN STATE, NIGERIA

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Abstract

The study accessed agrochemical based information usage among cocoa farmers in Nigeria with a view to determine the sustainability of information sources for an increased cocoa production in the study area. Simple random sampling was used to select 120 cocoa farmers using structured interview schedule. Results showed that farmers were in their 50s with about 12 years of formal education. Radio (mean = 2.56) ranked highest among the sources of information while about 60 percent of the respondents indicated a very high level of usage of agrochemical information in cocoa production. Results of Pearson Product Moment Correlation showed a significant relationship between farmers' perception (r = 0.365; p≤0.01) and usage of agrochemical based information. The findings conclude that the use of mass media as the most frequently used among farmers for agrochemicals in cocoa production may be sustainable. It is therefore recommended that the use of mass media for agrochemicals usage in cocoa production should be reinforced in passing other information to cocoa farmers.

Key words**:** *agrochemicals, information, sustainability, pathway*

INTRODUCTION

Cocoa scientifically called *Theobroma cacao* is an important cash crop in Nigeria that contributed as high as 15 percent to the total Nigerian export in the 1970s [10]. Historically, cocoa was introduced to Nigeria in 1887 [4] and "in the 1960s, Nigeria became the first producer in Africa and the second largest producer in the world" [1]. This therefore made cocoa to be the most important agricultural export crop in the 1960s/70s, as it contributed significantly to the foreign exchange earnings of the country.In the early 70s, the production increased to about 308,000 metric tons and this put Nigeria as the largest producer in West Africa [8]. However, the production suffered a declined trend after 1971 farming season. Specifically, export declined to 216,000 and 150,000 metric tons in1976 and 1986 respectively. This decline in production reduced the country's market share to about 6 percent, thereby making Nigeria the fourth largest producer in the world after Indonesia, Ivory-Coast and Ghana and third largest exporter in West Africa after Ivory Coast and Ghana [6]. According to [6] the International Cocoa Organisation reported that the current cocoa production status stood as 248,000 Metric tons in 2013/2014 cropping season, while 195,000 Metric tons was estimated to be the total production in 2014/2015 cropping season and projected that the country would experience a slight increase of 5,000 Metric tons in 2015/2016 in addition to the 2015/2016 production. Thus, 200,000 Metric tons was forecasted to be produced in 2016/2017. At a time, cocoa bean produced in Nigeria became unacceptable due the type and nature of agrochemicals used [7]. Agro-chemical is a generic term for the various chemical products used in agriculture. In most cases, agro-chemical refers to the broad range of pesticides which includes insecticides, herbicides, fungicides and nematicides, rodenticides, molluscides, avicides, repellents and attractants used in agriculture, public

health, horticulture, food storage or a chemical substance used for a similar purpose (National Agency for Food and Drug Administration Control [11]. It may also include synthetic fertilizers, hormones and other chemical growth agents, concentrated stores of raw animal manure. Agrochemical usage in Nigeria has been on the increase ever since its introduction in early 1950s for cocoa production..It is worthy of note that appropriate use of agrochemicals can boost the production of cocoa, poor agrochemical coverage resulting from the use of inefficient application equipment, wrong timing, irregularity and wrong technique of spraying are capable of accelerating the rate at which insects and pests develops resistance to agrochemicals. Along with the screening of new agro-chemicals such as insecticides, fungicides and herbicides, new spraying pumps are usually evaluated by the Cocoa Research Institute of Nigeria (CRIN), for their efficiency before they are recommended for use in the application of cocoa agrochemicals. CRIN has the mandate to screen and recommend potential cocoa agrochemical and spraying equipment in Nigeria. However, with the new European Union (EU) Legislation on Maximum Residue Levels (MRLs) allowed on cocoa beans and products, some of the agrochemical especially pesticides are still undergoing screening and the previously recommended pesticides were banned [5].Similarly, inappropriate 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 [8]. Generally, pesticides are toxic and can have serious health hazards to human beings. Lack of quality and timely information about the agro-chemical, farmer's inability to comply with some of these precautionary measures and inappropriate handling of agrochemical due to carefree attitude may influence the agrochemical usage [3]. Therefore, cocoa farmers in Nigeria may be limited in knowledge of the above mentioned conditions that may increase cocoa production and if not properly managed may pose a serious health hazard. However, access to certified information sources may be of great help. Nevertheless, information as to the usage among farmers remains largely un-documented in literature, especially in Osun State where production has been on the increase over the years due to its proximity to Ondo State which is the largest producer of cocoa in Nigeria, hence the need for this study.

Objectives of the study

The specific objectives of the study were to:
i. describe the socio-economic characteristics of cocoa farmers in Osun State;
ii. identify sources of agro-chemical based information among cocoa farmers;
iii. determine the cocoa farmers perception of agro-chemical based information; and
iv. examine usage of agro-chemical based information among cocoa farmers in the study area

MATERIALS AND METHODS

The study was conducted between February and June 2017 in Osun State of Nigeria. The State is situated in the southwestern part of Nigeria. Osun State lies within latitude 7^{o} and 8^{o} 02' N and longitude 4^{o} and 5^{o} 04' E. Osun State has an area of approximately 14, 875 square kilometres and a population of 3,423,535 by the 2006 National Population Census figure . Agro-ecologically, Osun State is divided into three agricultural zones by the Osun State Agricultural Development Programme (OSSADEP). These zones are Osogbo zone with 13 Local Government Areas (LGAs), Ife/Ijesa zone with 10 Local Government Areas (LGAs), and Iwo zone with 7 Local Government Areas (LGAs). A multistage sampling procedure was adopted to select the sample for this study. In the first stage, purposive sampling technique was used to select Osun State for the study because it is the third largest cocoa producing State in Nigeria. At the second stage, purposively sampling procedure was used to select six (6) cocoa producing LGAs across the three (3) agricultural zones of the State. The six (6) LGAs were Ede South from Osogbo zone, Ife-South, Ife-North, Atakunmosa West,

Atakunmosa East, from Ife/Ijesha zone while Irewole was selected from Iwo zone. Two (2) farming communities were then purposively chosen based on the predominance cocoa plantation from each of the six (6) LGA to give a total of twelve (12) communities selected for the study. Simple random was used to select twenty (20) respondents from register of cocoa farmers in each community to give a total of 120 respondents for the study. Data generated were analysed using descriptive like frequency, percentages, mean and appropriate charts while Pearson's Product Moment Correlation was used to make inferences from the data. The usage of agro-chemical based information was measured by listing and scoring the content of information against four-point rating scale of Very often (3), Often (2), Rarely (1), Never (0).

RESULTS AND DISCUSSIONS

Result in Table 1 show the mean age of the respondents was 49.75±16.19 years. The findings show that the population of cocoa farmers in the study area were in their middle age. The inference is that older people were involved in the cultivation of cocoa in the study area more than young ones. This may not be unconnected to the fact that cocoa production kept decreasing since crude oil was discovered and exploration started in the 70s. This has taken away government attention from agriculture as government is no longer investing much in agriculture through the payment of subsidy and the provision of facilities thus leading to massive exit of youth from cocoa production. This agrees with the findings of [13] that the mean age of the cocoa farmers in Ogun and Ondo States was 52.8 years. The implications of these is that the preponderance of older folks in cocoa production will affect the extent of usage of agro-chemical information usage as compared to youths who are more prone to innovation usage and has the ability to take risk. Similarly, results showed that majority (90.8%) of the respondents were male. This result indicated that there were more male cocoa farmers than female cocoa farmers in Osun State, Nigeria. A probable reason for this could be that cocoa production requires more physical strength and labour that may not be at the advantage of women as men have been reported to engage in more muscular activities in farming than women [9].

In addition, majority (79.2%) of the respondents were married. This result indicated that cocoa production attract more married people. The reason for this may not be farfetched as older farmers were initially indicated to be engaged in the production of cocoa. This may be as an advantage as more family labour may be available for use as spouse and children may be of great assistance to their parents in the cultivation of cocoa. Furthermore, the results show that the mean household size was on the average of 8 persons per household. The implication of this finding is that more family labour for cocoa production would be readily available since relatively large household size is an obvious advantage in terms farm labour supply. This agrees with the submission of [13] that the higher the household size of the farmers, the higher the supply of family labour to cocoa production activities in Ogun and Ondo States.

The mean year of education of cocoa farmers in the study area was 12.5 ± 3.8 years. This implies that the cocoa farmers were literate which allows them to have the capacity to effectively read, write, communicate verbally and understand things more thereby giving them more access to derive information from available sources, especially on agrochemical usage in the cultivation of cocoa with a view to increasing productivity. This finding is in agreement with that of [2] which reported that increase in education of farmers positively influence adoption of improved practices. Also, the mean annual income of the respondents in cocoa production was ₦525, 504 ± 467325.6. The high standard deviation implies that there was a wide gap between farmers' income in cocoa production in the study area. This result contradicts that of [12] that found the mean income of cocoa farmers in Osun and Edo States at ₦51,000. The high income of cocoa farmers may be as a result of

high price of cocoa beans in the last few years at the international market. High income of cocoa farmers should afford them the opportunity of using the recommended agrochemicals and protective wears.

Table 1. Distribution of respondents by their socio-economic characteristics

Variables	Freq	Percentage	Mean ± SD
Sex			
Male	109	90.8	
Female	11	9.2	
Marital Status			
Single	14	11.7	
Married	95	79.2	
Separated	1	0.8	
Widowed	10	8.3	
Age (Years)			
25-34	23	19.2	49.75 ± 16.19
35-44	26	21.7	
45-54	28	23.3	
55-64	14	11.7	
65+	29	24.2	
Income (₦)			
35,000-100,000	11	9.2	
120,000-185,000	18	15	
200,000-350,000	24	20	525,504 ± 467,326
400,000-850,000	48	40	
1,000,000-3,000,000	19	15.8	
Household size			
2-7	56	46.7	
8-13	56	46.7	7.63 ± 3.72
≥14	8	6.7	
Years of Formal Education			
0-6	15	12.5	
7-12	58	48.3	12.54 ± 3.84
≥13	47	39.2	

Source: Field survey, 2017.

Sources of agro-chemical based information in cocoa production

Results in Table 2 showed that with respect to sources of information by respondents on cocoa agro-chemicals, radio ranked highest with mean of 2.56. This was followed by agro-chemicals retailers ($\overline{x}$ = 2.38), newspaper and magazine ($\overline{x}$ = 2.30), farmer's cooperative ($\overline{x}$ = 2.27), fellow farmers and friends ($\overline{x}$ = 2.25). However, extension workers ($\overline{x}$ = 1.55) and Agricultural show/workshop ($\overline{x}$ = 1.54) ranked least source of information on cocoa agro-chemicals by the respondents. These results indicate that information sources most accessible to cocoa farmers were the radio, agro-chemical retailers, newspaper and magazine, farmer's cooperatives, fellow farmers and friends. The implication of this is that governmental/non-governmental organizations could use these avenue or media to provide relevant cocoa agro-chemical based information to the cocoa farmers in the study area. The findings therefore contrast the submission of [12] that interpersonal sources of information like fellow farmers, extension agents, sales agents and cocoa merchant were major source of information on cocoa agro-chemicals.

Table 2. Sources of information to agrochemicals usage among farmers

Sources of Agro-chemical information	Mean	SD
Radio	2.56	0.61
Agro-chemical retailers	2.38	0.60
Newspapers and magazine	2.30	0.72
Farmer's cooperative	2.27	0.71
Fellow farmers and friends	2.25	0.83
Television	2.22	0.80
Cocoa Association Nigeria	2.21	0.78
NGOs in agriculture	2.12	0.79
Cell phone	2.02	0.70
Internet	1.88	0.87
Community leaders	1.75	0.73
Village head	1.74	0.54
Live drama	1.66	0.78
OSSADEP extension worker	1.55	0.62
Agricultural show/Workshop	1.54	0.59
Video production	1.50	0.65

Source: Field survey, 2017.

Perception of respondents on agro-chemical information usage

Result in Table 3 revealed that he grand mean was 3.05 with standard deviation of 0.34. The perceptional statements with mean greater than 3.39 (3.05+0.34) were the statements such as there should be regular awareness

creation on radio and/or television on the usage of recently prescribed cocoa agro-chemical, trained in the use of agro-chemical, regular training on banned agro-chemical should organised, government should provide subsides on approved cocoa pesticides and making them available. The perceptional statements with mean less than 2.71 (3.05-0.34) were the statement such as mixing of two or more agrochemical to control cocoa diseases is an ideal practice, I am not aware of any international /national prohibition of pesticides, I do experience some discomfort during/after use of agro-chemical while those mean between 2.71 and 3.39 were moderately perceived.

Table 3. Rank-order of respondents' weighted mean score on the perception of cocoa farmers towards agro-chemical information usage

Perception	Mean	SD	Rank
There should be awareness creation on radio and/or television on the usage of recently prescribed cocoa agro-chemical	3.90	0.44	1st
Trained in the use of agro-chemicals	3.73	0.62	2nd
Regular training on banned cocoa pesticides should be organised	3.65	0.90	3rd
Government should provide subsidies on approved cocoa pesticides and make them available	3.54	1.05	4th
Use of banned agro-chemical is more profitable to me than prescribed agro-chemical	3.27	1.19	5th
The containers of agro-chemical are properly disposed after use	3.23	0.84	6th
I have never been admitted at hospital due to poisoning due to agro-chemicals	3.22	1.29	7th
I do not read the labels of agro-chemicals	3.04	1.02	8th
Agro-chemicals have hazardous effect on human health	3.00	1.28	9th
I am not too concerned about expiry date of agro-chemicals	2.99	1.00	10th
Wearing of protective clothes before use of agro-chemicals is a common practice with me	2.98	1.12	11th
Some of the banned pesticides are cheaper therefore government should lift ban on them	2.95	1.39	12th
Agro-chemicals do not have any effect on the environment	2.79	1.28	13th
Mixing of two or more agro-chemicals to control cocoa diseases is an ideal practice	2.54	1.38	14th
I am not aware of any national /international prohibition of pesticides	2.41	1.34	15th
I do experience some discomfort during/after use of agro-chemicals	1.53	1.09	16th

Grand mean =3.05±0.34
Source: Field survey 2017.

Usage of Information on Agro-chemical

The result in the Table 4 below show the usage of information on agro-chemical by cocoa farmers. The information on proper storage of agro-chemicals ranked highest with the mean score (2.66), followed by do not drink anything during spraying with mean score (2.57), do not eat anything during spraying with mean score (2.53), use of recommendation dosage with mean score (2.52) were used at a very high level. Information on seeking prompt medical attention due to poisoning from agro-chemical usage (2.46), observance of expiry date of agro-chemical (2.38), avoidance of use of banned agrochemical (2.23), reading labels of agro-chemical before use (2.20), proper disposal of containers (2.15) were used at high level while information on posting of treated field with mean score (0.52) are used at low level. The grand mean was 2.06 with standard deviation 0.39. The information with mean greater than 2.45 (2.06+0.39) were the respondents' proper storage of agro-chemical, do not eat anything during spraying of agro-chemical, do not eat anything during the spraying of agro-chemical, use of recommendation dosage and seeking of

prompt medical attention due to poisoning from agro-chemical usage. Further analysis to determine the level of agrochemical usage revealed that about 60 percent of the respondents recorded high usage in agrochemical usage. The ranking implies that there should be more information on cocoa agro-chemical based information on "do not spray agro-chemical against the direction of the wind", "wash your body and cloth after spraying of agro-chemical", "posting treated field" through various channel or media of passing information as shown in Table 4 and Figure 1.

Table 4. Usage of Information on Agro-chemical

Content of information	Mean	S.D
Proper storage of agro-chemicals	2.66	0.54
Do not drink anything during spraying of agro-chemical	2.57	1.02
Do not eat anything during spraying of agro-chemical	2.53	1.06
Use of recommendation dosage	2.52	0.57
Seeking prompt medical attention due to poisoning from agro-chemical usage	2.46	1.02
Observance of expiry date of agro-chemical	2.38	0.83
Avoidance of use of banned agro-chemical	2.23	1.00
Reading labels of agro- chemical before use	2.2	1.03
Proper disposal of containers	2.15	0.86
Avoidance of mixing two or more agro-chemicals for diseases and pest control	1.71	1.16
Putting on protective wears when using agro-chemicals	1.68	1.09
Do not spray agro-chemicals against the direction of the wind	1.59	0.95
Wash your body and cloth after spraying of agro-chemical	1.58	1.12
Posting treated field	0.52	1.09

Grand Mean = 2.06±0.36
Source: Field Survey, 2017

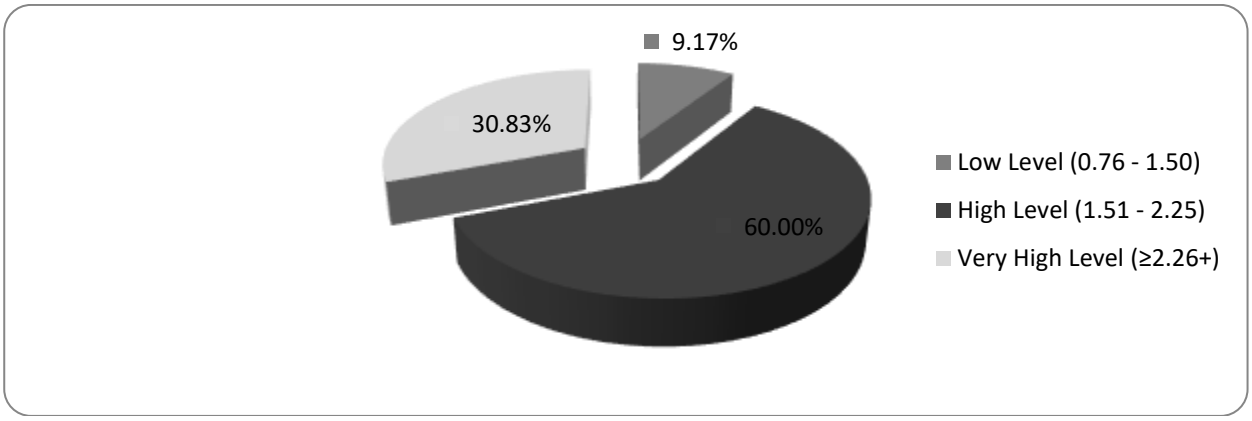

Figure 1. Level of Usage of Information on Agro-chemicals
Source: Field Survey, 2017.

Relationship between farmers' perception and usage of agrochemical information

The results in the Table 5 show the results of correlation analysis of perception of farmers towards agro-chemical based information and agro-chemical based information usage. The result showed that at 0.01 level of significance, positive significant relationship existed between famers' perception towards agro-chemical based information and agro-chemical based information usage. This implies that perception of the farmers toward agro-chemical is of high relevance towards agro-chemical based information usage. This is evidence that demonstrates that farmers had favorable perception towards the use of agrochemical based information that will have positive effect on productivity. The study conforms to the findings of [14] that established that favourable disposition towards information sources will be an added advantage in decision making in agricultural enterprises.

Table 5. Results of correlation between perception of farmers and agrochemical usage

Variable	R	r^2	P-Value
Perception of agrochemical information	0.365**	0.113	0.01

**Correlation is significant at the 0.01 level (2 tailed)
Source: Field survey, 2017

CONCLUSIONS

Based on the major findings, it was concluded that the main sources of agro-chemical information among the respondents were through mass media such as radio, and interpersonal sources like agro-chemical retailers, fellow farmers and friends; the respondents had favourable disposition to the information usage on agrochemicals and usage of information on agro-chemicals was high. It recommended that main sources of agro-chemical information should be reinforced in passing other information to the cocoa farmers.

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