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Analysis of Agro-Chemical Inputs Use in Maize Production among Small-Scale Farmers in Iwo Local Government, Osun State, Nigeria

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Abstract

In spite of the development of various improved cultivars of maize, yield in Nigeria has continued to be hampered by the over cropped nature of most farmlands as well as a wide range of pests and diseases. This study therefore carried out an analysis of agro-chemical inputs' use in maize production among small scale farmers in Iwo Local Government Area of Osun State. Specifically, the study investigated the relationship between agro-chemical inputs' use and maize yield in the study area. It determined the factors affecting agro-chemical inputs' use and the major constraints to its usage. Data was collected using a structured questionnaire from 105 respondents obtained through a two stage random sampling procedure. Analytical tools employed for the study included Pearson Moment correlation and linear regression analysis. The study revealed a 78.5% positive and significant relationship between agro-chemical inputs' use and maize yield ($p< 0.01$). High cost and irregularity of supplies, insufficient farm income and fear of health hazards were the major constraints to the use of agro-chemicals. The determinants of agro-chemical inputs' use among the farmers were; farm size, income at $p<0.01$ and educational status and household size at $p<0.1$. The study concluded that a strong positive relationship existed between agro-chemical inputs' use and maize yield in the study area. It is recommended that there should be guaranteed minimum price for agricultural produce and that farmers should be empowered to increase their farm size through agricultural mechanization.

Keywords:
Agro-chemicals, Maize, Iwo Local Government Area, Pearson moment correlation, linear regression

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INTRODUCTION

In terms of area under cultivation and total production, Maize (*Zea mays*. L.) is the world's third most important crop coming after wheat and rice (Purseglove, 1992). With average yield of 4.47tons per hectare as compared to 2.67 and 3.84 of wheat and rice respectively in 2003 (FAO, 2004), it can be concluded that aside from being one of the oldest crops in the world, maize is undoubtedly the highest yielding grain crop (Monlruzzaman *et al.*, 2009). It is a basic staple food for the teeming population of developing countries and hence significant to world food security (FAO and ILO, 1987). Africa contributes 6.5% of worldwide maize production of 785million tons while Nigeria; the largest African producer contributes about 8 million tons (IITA, 2013b). Land area cultivated with maize in Nigeria is about 3% of the world's total of 158million hectares (FAO, 2007). In Nigeria, Maize is becoming the miracle seed for the country's agricultural and economic development. Being an integral component of most cropping patterns, it provides food for man, feed for livestock and raw materials for some agro-based industries (Ahmed, 1996; Iken and Amusa, 2004; Onuk *et al.*, 2010). The dependence of many Nigerian rural families on income derived from the cultivation, processing and marketing of Maize (in various forms) has been observed to be significant and hence its contribution to rural livelihood (Degrande and Duguma, 2000).

According to Bello *et al.* (2010), agro-chemical inputs such as inorganic fertilizers, pesticides and herbicides are of immense importance to agricultural production because they eliminate drudgery, excessive operation cost, problem of scarcity of labour and improve both quality and quantity of output. Fertilizers are inorganic chemicals that are applied to the soil by crop farmers to improve production. Biggs and Courtney (1989) opined that farmers generally are favorably inclined to use fertilizers because of its wide range of benefits which include; their cheapness, cleanliness and ease of handling, storage and transport. The guaranteed composition of inorganic fertilizers makes it easier for users to determine the rate of application and to predict the effect upon yield. Iken and Amusa, (2004) emphasized the need for the application of the right form, combination and quantity of fertilizer and stressed the importance of nitrogen, phosphorus and potassium alongside micro nutrients such as sulphur, zinc and magnesium to good growth and yield in maize production. For West African savannas, a combination of NPK 15:15:15 at 50kg/ha and 50kgN/ha in the form of urea has been found to be most adequate (IITA, 2013a).

In spite of the existence of over 50 species, several of which are improved cultivars developed to resist known pests and diseases of the crop, Maize yields have continued to suffer from a range of diseases which have varied over the years in intensity (IITA, 2013; IITA 2013; Oladipo *et al.*, 1993) listed downy mildew, rust, stalk and ear rots, maize streak virus, leaf spot and leaf blight as major diseases of maize in Nigeria. Stem borers, grain borers, beetles, moths, rootworms, white grubs, army worms, termites, grasshoppers and weevils have been reported as major pests causing losses to maize production (Iken and Amusa, 2004). Though a number of grassy and broadleaf weeds have been associated with the maize plant, striga is about the most devastating weed of the plant which has been known to cause significant losses by attacking maize plants underground (Carsky *et al.*, 2000). According to Dugje *et al.* (2006), lamdacyhalothrin, cypermethrin, maricozeh, glyphosphate, alachor, oxidiaxone, propanil, altrazine and paraquat are some of the most common pesticides used in maize production in Nigeria.

While an increase of over 44% has been recorded in Nigerian maize production over the immediate past decade, more of this has been attributed to increase in area cultivated rather than yield (US Department of Agriculture, 2013). Demand for the plant has however continued to increase with increase in population and its increasing status as a commercial crop in high demands by agro-allied industries. Inadequacy of agro-chemical input use in maize production can significantly reduce yield thereby worsening the already existing gap between demand and supply of the crop (Crawford *et al.*, 2006; Daramola, 1985; Iken and Amusa, 2004).

Knowledge of existing relationship between agro-chemical input usage and maize production will provide a basis for favorable policies on agro-chemical input promotion so as to enhance its accessibility to smallholder farmers. It is also possible that certain socio-economic factors affect agro-chemical input usage among the farmers. Scientific information on the possible constraint militating against the use of agro-chemicals by maize farmers will provide insight for decision making on best ways of enhancing its use among farmers. It is against this background that the study is designed to answer that following research questions;

1. What are the socio- economic characteristics of maize farmers in Iwo Local Government, Osun State?
2. What is the relationship between agro-chemical input use by the farmers and their maize Yieldproduction?
3. What are the challenges militating against agro-chemical input use among maize farmers in the study area?
4. What factors affect agro-chemical input use among maize farmers in Iwo Local Government, Osun State?

Objectives of the study

The general objective of the study is to carry out an analysis of agro-chemical inputs use in maize production among small scale farmers in Iwo Local Government, Osun State, Nigeria. Specifically, the study;

(1) Highlights the socio-economic characteristics of maize farmers in Iwo local Government of Osun state.

(2) Assessed the relationship between agro-chemical input usage and maize yield.

(3) Examined the constraint militating against the use of agro-chemical inputs among maize farmers in the study area

(4) Identify the factors affecting agro- chemical input use in maize production in the study area.

MATERIALS AND METHODS

Study area

The study was carried out in Iwo Local Government Area (LGA) of Osun State, Nigeria. The local Government is one of the 30 LGAs in Osun State. Iwo LGA consists of 15 wards namely; Oke adan 1, Oke adan 2, Oke adan 3, Gidigbo 1,Gidigbo 2, Gidigbo 3, Molete 1, Molete 2, Molete 3, Isale oba 1, Isale oba 2, Isale oba 3, Isale oba 4, Oke oba 1, Oke oba 2. According to the 2006 Census report, Iwo is the most populous Local Government in Osun State with a population of 191,346. Iwo is situated north east of Osun State on latitude 7.58°N and longitude 4.28° E. The primary economic activity in Iwo LGA is agriculture as the soil and climatic condition in the area is favourable to plant growth. Iwo LGA is well known for maize cultivation given its vast savanna land area. Other crops produced in the area include; cocoa, Palm oil, cassava, vegetables, and yam.

The population for the study comprised of all maize farmers in Iwo LGA. The sampling frame for the study was prepared in conjunction with all the wards associations. A two-stage random sampling technique was used to select a total of 105 respondents used for the study. The first stage comprises of random selection of one community from each of the 15 wards that constitute Iwo LGA. The second stage was random selection of seven farmers from each of the selected communities based on the list of maize farmers.. The instrument for data collection was a structured questionnaire.

A combination of descriptive and inferential statistical tools was employed to analyze data collected. Frequency distribution, percentages and mean were used to present the socio-economic characteristics of the respondents. The Pearson moment Correlation analysis (PMCC) was used to test the relationship between usage of agro-chemical by the respondents and their maize production. A four point Likert-type scale was used to elicit information on the extent to which the respondents considered specific challenges to constitute constraints to their usage of agro-chemicals. A list of possible constraints drawn from literature was presented against which the farmers responded as to their severity using the Likert-type scale graduated thus;

Not serious=1, moderately serious=2, very

serious=3, extremely serious=4

A mean score was obtained for each constraints and this was used to rank the constraints in order of severity. The regression analysis was used to determine the factors affecting agro-chemical input use in maize production among the respondents. The regression model in its implicit form is given as;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, U)$.....1

Where:

Y= Investment in agro-chemical input measured in Naira

X_1 = Farm Size measured in hectares

X_2 = Total Income measured in naira as the addition of farm income, non farm income and available income from other household members

X_3 = Age measured in years

X_4 = Highest Educational Attainment measured as a dummy variable 1 for the possession of formal education and 0 otherwise

X_5 =Gender measured as a dummy variable. 1 for male and 0 for female

X_6 = Farming Experience measured as number of years spent in farming

X_7 = Household size measured as the number of persons living under the same roof and eating from the same pot

U = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics of Maize farmers

This study examined selected socio-economic characteristics of maize farmers. This was with a view of determining gender, age, educational status, farming experience, income, farm size and labour use among the farmers. Table 1 presents selected socio-economic characteristics of the respondents. Table 1 reveals the dominance of maize cultivation in Iwo Local Government by male as over 97% of the respondents were

Table 1: Socio-economic characteristics of the respondents

Socio-economic Characteris	Frequency	Percentage
Gender		
Male	102	97.1
Female	3	2.9
Total	**105**	**100**
Age		
<30	28	26.7
30-50	60	57.1
>50	17	16.0
Total	**105**	**100**
Educational status		
No Formal Education	8	7.6
Quoranic Education	4	3.8
Adult Education	7	6.7
Primary Education	71	67.6
Secondary Education	12	11.4
Tertiary Education	3	2.9
Total	**105**	**100.0**
Farming experience		
≤10years	47	44.8
>10years	58	55.2
Total	**105**	100.0
Farm Size		
<1ha	56	53.3
1-2ha	45	42.9
>2ha	4	3.8
Total	**105**	**100.0**
Household size		
≤6	24	22.9
>6	81	77.1
Total	**105**	**100.0**

Table 2: Result of Pearson correlation between agro-chemical usage and Maize yield

		Agro-chemical use	Maize Yield
Chemical used	**r**	1	0.785***
Significant			0.00
N		105	105

*** p<0.01

found to be male. This may be a pointer to the fact that women are more into its processing and possibly marketing of the crop. With a mean age of 38years and only 16% of the respondents being of over 50 years in age, it can be inferred that there was evidence of active participation of the younger generation in the production of maize in the study area. This is particularly remarkable because of its positive implications for the sustenance of the interest of the youth in agriculture given the effect of rural urban migration on agriculture in Nigeria. Table 1 also reveals that only 7.6% of the respondents had no formal education while about 14% had a minimum of secondary school education. Majority of the respondents (67.6%) had primary school education. More than half of the respondents (55.2%) had been farming for an upward of ten years. This goes to show that majority of the respondents were experienced farmers who were likely to be conversant with agrochemicals. The mean farm size of the respondent was 1.2ha and only few (3.8%) had more than 2 ha of farmland. On the average, the household size of the respondents was considerably high with a mean of 8. Over 77% of the respondents had household sizes of above 6persons with positive implications for availability of labour to carry out farming activities including the application of agro-chemicals.

Relationship between farmers' Agro-chemical input use and Maize production

In order to determine the relationship between the agro-chemical input use and maize production, Pearson correlation was used to test the correlation between the amounts spent on agro-chemical input and maize yield.

As shown in Table 2, the correlation coefficient (r) was estimated at 0.785 which was significant at 1% level. This implies that there was a relationship of about 78.5% between amount spent on agro-chemical inputs (fertilizer, herbicide and pesticide) used by the farmers and their maize yield. This relationship was positive and therefore as the amount of chemical used by the farmers increased, the maize yield also increased.

Constraints to Agro-chemical input use among respondents

This sub-section analyzed the constraints to the use of agro-chemical inputs among maize farmers in the study area. Table 3 presents the major constraints to its use as well as ranked the constraints in order of severity. Table 3 shows some variations in the respondents' aggregate ranking of the severity of the various constraints as it affects fertilizers, herbicides and pesticides. The major constraints to the use of fertilizers among the respondents were high

Table 3: Major constraints to Agro-chemical use among respondents

S/N	Constraint	Fertilizer		Herbicide		Pesticide	
		M	Rank	M	Rank	M	Rank
1	Irregular Supplies	2.10	2	1.71	7	1.72	7
2	High Cost of Supplies	2.16	1	3.16	1	2.15	2
3	Poor Knowledge of Application	1.42	7	2.96	2	2.42	1
4	Health Hazard	1.71	6	2.10	4	2.09	4
5	Large Farm Size	1.90	4	1.91	5	1.93	5
6	Insufficient Farm Income	2.10	2	2.90	3	2.10	3
7	Long Distance from Source	1.77	5	1.76	6	1.73	6
8	Poor Quality	1.36	8	1.10	8	1.43	8

Table 4: Determinants of Agro-chemical Input Use in Maize Production

Variables	Co-efficient	p-value
Constant	14413.952	.423
Farm Size	7978.215***	.000
Income	.050***	.000
Age	.991	.865
Education	2.690*	.075
Gender	1.079	.813
Farming Experience	-18.895	.787
Household Size	-810.053*	.084

Dependent Variable: Investment in Chemical Use. *** (p<0.01), * (p<0.1)
R^2 = 0.759, Adjusted R^2 = 0.742

cost of supply with the highest mean score of 2.16, irregular supplies and insufficient farm incomes with mean scores of 2.10 each. High cost of supplies with a mean score of 3.16 was also the most sever constraints to the use of herbicides among the respondents. This was followed in order of severity by poor knowledge of application, insufficient farm income and health hazards with mean scores of 2.96, 2.90 and 2.10 respectively. However, poor knowledge of application was the most severe constraint to the use of pesticides among the respondents with a mean score of 2.42. Other constraints considered to be severe included high cost of supplies, insufficient farm income and fear of health hazards.

Factors affecting Agro-chemical input use among respondents

This sub-section determines the factors affecting agro-chemical input use among maize farmers in the study area. Table 4 presents the result of linear regression analysis carried out to establish the determinants of agro-chemical input use among the respondents.

To determine the factors affecting chemical inputs use in maize production, regression model was fitted to determine the effect of some independent variable on the investment in chemical use. The Durbin-Watson statistics (2.226) shows that the data fitted well with the model. The coefficient of determination (R square adjusted) with value 0.745 shows that the explanatory variables explained about 74.5% of the variations in the use of chemical inputs on the maize farms leaving about 24.5% unexplained. The F statistic ($df_{9,97}$, 43.743) was significant at α=1.0%. This shows that the variables have joint significant effect on the investment on chemical use.

Table 4 shows the effect of each independent variable on the dependent variable (investment on chemical use). The farm size (ha) has a coefficient of 7,978.215. This was significant at α= 1.0%, this implies that if the farm size is increased by 1 ha, the investment on chemical input use will increase by #7,978.28. Another factor with significant effect on the investment of chemical input use was income of the farmers. The variable had a coefficient with value of 0.050. This was also significant at α=1.0%. This implies that if the farmers' income increased by #1.00, the investment on chemical use by the farmers will increase by #0.050. The coefficient of highest educational attainment was also found to be significant at α=5% meaning that the more educated the farmers were, the more their chances of investing in the use of agro-chemicals. This is likely due to the established relationship between education and the rate of adoption of innovation. The household size with coefficient of -810.053 was however found to be though significant, inversely related to investment in agro-chemical input use. An increase in household size therefore will result in a reduction in agro-chemical input use. It is possible that high household size presents a drain on the family income and hence a reduction in the available income to procure agro-chemical. The large family size could also provide the necessary manpower to carry out manual weeding as opposed to the use of herbicides.

CONCLUSION AND RECOMMENDATIONS

The study concluded that a strong positive relationship existed between agro-chemical input use and maize yield in the study area. It identified high cost of supplies, poor knowledge of application, insufficient farm income, and irregular supplies as the major constraints faced by farmers in the use of agro-chemicals in maize production. Farm size, income, educational attainment and household size were found to be the determinants of usage of agro-chemical inputs in Iwo Local Government Area of Osun State, Nigeria. The study therefore recommends as follows;

• There is a need to monitor and ensure that the farmers actually are the beneficiaries of government's subsidies to agriculture either directly in form of providing agro-chemicals at reduced prices or by removing import duties on them.

• Manufacturers of the various agro-chemicals should be encouraged to adopt packaging with user friendly labels which could be self explanatory to farmers.

• Farmers in the study area should take advantage of adult literacy classes to improve upon their levels of education, awareness and adoption of innovation.

• Agricultural extension units within the study area should sensitize farmers on preventive measures against the health hazards of agro-chemicals.

• There should be guaranteed minimum price for agricultural produce and that farmers should be empowered to increase their farm size through agricultural mechanization

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REFERENCES

1- Ahmed, B. (1996). *Economic analysis of fertilizer used on Maize production in the Northern Guinea Savannah of Nigeria,* Unpublished dissertation, Department of Agricultural Economics And Rural Sociology, Ahmadu Bello University, Zaria, Nigeria

2- Bello, M., Ibrahim, H.I., & Salau, E.S. (2010). Factors influencing the adoption of agro-chemical technology by small-scale farmers in Kwali Area Council of Abuja, FCT, Nigeria. *Journal of Environmental Issues and Agriculture in Developing Countries*, 2 (1), 176-190

3- Briggs, D., & Courtney, F. (1989). *Agriculture and environment.* Longman: London

4- Carsky, R.J., Berner, D.K. Oyewole, B.D. Dashiell, K., & Schulz, S. (2000). Reduction of striga hermonthica parasitism on Maize Using Soybean Rotation. *International Journal of Pest Management,* 46,115–120

5- Crawford, E.W, Jayne, T.S., & Kelly, V.A. (2006). *Alternative approaches for promoting fertilizer use in Africa. Agriculture and rural development discussion* - Washington, DC: World Bank. pp. 22

6- Daramola, A.M. (1985). Comparative effectiveness of carbofuran and carbaryl for the control of maize stem borers. *Nigerian Journal of Plant Protection*, 9, 54-59.

7- Degrande, A., & Duguma, B. (2000) Adoption potential of rotational hedge row intercropping. *Humid and Extension Network*, 103, 1-7

8- Dugje, I.Y., Kamara, A.Y., & Omoigui, L.O. (2006). Infestation of Crop Fields by Striga species in the Savanna Zones of North-East Nigeria. *Agriculture, Ecosystems and Environment*, 116, 251–254.

9- FAOSTAT (2004). Food and Agriculture Organization, Retrieved at 2005.

10- FAOSTAT (2007). Food and Agriculture Organization, Retrieved at 2008.

11- FAO and ILO (1987). *Maize in human nutrition intermediate level handbook*. FAO and ILO publication, Rome, Italy

12- IITA (2013a). Maize. Retrieved on 16th June, 2013 from www.iita.org/maize

13- IITA (2013b) Best Practices for Maize Production in the West African Savannas, IITA R4D Retrieved on 16th June, 2013 from www.iita.org/c/document_library/get_file?uuid=8330df34-cb4f...

14- Iken, J.E. & Amusa, N.A (2004), Maize research and production in Nigeria. *African Journal of Biotechnology,* 3, 301-307.

15- Monlruzzaman, M. S., Rahman, M., Karim, K. & Alam, Q. M (2009). Agro-economic analysis of Maize production in Bangladesh: A farm level study. *Bangladesh Journal of Agricultural, Resources*, 34(1), 15-24

16- Oladipo, J.L., Fajemisin, J.M., & Olanya, O. (1993). Diseases of maize damage and control in Nigeria. Maize improvements, production and Uti-

lization in Nigeria, pp. 1181-1188
17- Onuk, E.G., Ogara, I. M., Yahaya, H., & Nannim, N. (2010), Economic Analysis of Maize Production in Mangu Local Government Area of Plateau State, Nigeria. *Production, Agriculture and Technology,* 6 (1), 1-11
18- Purseglove, J.W. (1992). *Tropical crops: Monocotyledons*. Longman Scientific and Technical, New York. Pp. 300 – 305
19- US Department of Agriculture (2013). Nigerian corn production by year. Retrieved on 16th June, 2013 from http://www.index mundi.com/ agriculture? country=ng&com

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