EFFECT OF MALARIA ON FARM HOUSEHOLD INCOME IN IFEDORE LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA.

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Abstract
The study examined the effect of malaria on farm household income in Ifedore Local Government Area of Ondo State, Nigeria. The specific objectives were to: describe the socioeconomic characteristics of the respondents, ascertain the effect of malaria on farm household income, and identify the various preventive measures adopted by farm households for malaria control. A three staged random sampling technique was used in selecting 120 farmers. Data obtained though structured questionnaire were analyzed using descriptive statistics, OLS multiple regression and mean score from a three point Likert type of scale. Results showed that farmers in the area were married males with a mean age and farming experience of 43 years and 23 years respectively. The average farm size recorded was 3 hectares. The coefficient of malaria treatment cost and days lost (incapacitation) due to malaria was inversely related to farmers' income at 99% and 90% confidence level respectively. The findings further indicated that farm households in the area always clean their environment (M= 2.3), used insecticide treated nets (M= 2.0) and suspend farm work on sunny days (M= 2.0). Reduction in malaria treatment cost and construction of primary health centres in farming communities were recommended.

Keywords: Farm Income, Ifedore, Incapacitation, Malaria, *Plasmodium*

Introduction

Malaria is an infectious disease due to the presence of parasitic protozoa of the genus *plasmodium*. It is a health problem that results from a specific bite of mosquito, precisely the female anopheles *mosquitoes* which are infected and feeds on human blood. Malaria parasite can either belong to the *Plasmodium falciparum, P. vivax, P. ovale, P.malariae and P.*knowles (Hussain, *et al.* 2009). However, Abiodun and Abayomi, (2013) pointed out that malaria infection from *plasmodium falciparum* is the most deadly and most predominant in Africa. Apart from Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) and Tuberculosis, malaria is the highest cause of death due to single agent infection diseases, accounting for 2.2% of such deaths (Asenso-Okyere, *et al.* 1994).

Malaria attacks an individual on the average of about four times in a year and 10 to 14 days of incapacitation with respect to labour availability (Alaba and Alaba, 2002). Studies on malaria and agricultural productivity vis-à-vis farmers' income are not far-fetch, (Abdullateef and Adebayo, 2011; Abiodun and Abayomi, 2013; Asenso-Okyere, 1994; Cephas and Beujuung, 2006; Egbetokun, *et al* 2014; and Onwujekwe, *et al.* 2000). However, little empirical evidence exists with respect to Ondo state and the study area in particular. Such evidence could be relevant in policy formulation and developmental programmes that will improve the health status and productivity of rural farmers in the study area and the country at large. In furtherance, Opeolu and Oluwalana (2005) reported a positive relationship between health status and labour productivity. It is suffice to say that, malaria predominates as a common health risk among rural farmers in Ondo state.

There is a common maxim that health is wealth. Health status is important because it is a major form of human capital (Savedoff and Schultz, 2000). Good health and productive agriculture are important in the economy of any nation especially in poverty reduction. Health enhances work effectiveness and the productivity of an individual through increase in physical and mental capacities. Hence, productivity and income losses from malaria infection can be perfectly linked to growing poverty among rural households.

Ugobomoiko (2013) submitted that hundreds of millions of people living in Sub-Saharan Africa were afflicted with malaria parasite, while about 25% of them may simultaneously experience one or more infections. Data from WHO (2012) indicated that between 2005 and 2009, expenses by Federal Government of Nigeria (FGN) excluding all costs at the sub-national levels, donor agencies like the World Bank (for monitoring and evaluation), Global Fund (for Human Resources and Technical Assistance), United States Agency For International Development (USAID) for anti-malaria medicine, WHO and United Nations International Children's Emergency Fund (UNICEF) (for Diagnostic and Insecticide Treated nets) rapidly increases.

The study mainly assessed the effect of malaria infection on farm household income in Ifedore local government area of Ondo state, Nigeria. Specifically, the study described the socioeconomic characteristics of farming households, ascertained the effect of malaria infection on farm household income, and

identified malaria preventive measures used by the farm households.

2.0 Methodology

The study was carried out in Ifedore Local Government Area of Ondo State, Nigeria with its headquarters at Igbara Oke. It is located between Latitude $6^0 20'$ and $7^0 50'$ north of the Equator and Longitude $5^0 00'$ and $5^0 30'$ east of the Greenwich Meridian. It lies wholly within the Tropics. In the northwest, it shares boundaries with Ekiti Southwest local government area, in the east it is bounded by Akure and Owo local government areas. In the west, it is bounded by Ondo and Ifesowapo local government areas. In terms of spatial coverage, it occupies about 2,000 Sq Km. in area. It has two distinct seasons: dry and wet. The rainy season lasts for more than eight months in the year (April-October) and the annual rainfall total decreases from 2000 millimeters in the southern parts to about 1,150 millimeters in the northern parts. Ayoade (2004) observed that there is variation in the distribution, duration and intensity of rainfall amount from the coastal area to the hinterland. The major occupation of the people is farming. Agriculture is the main stay of the economy and means of livelihood. The major cash crops are cocoa, oil palm, Kola-nut and timber. The subsistence food crops include yam, cocoa-yam, cassava, rice, plantain, beans, maize and variety of vegetables.

A three staged random sampling technique was adopted for the study. First, two farming communities were selected from the local government area. Second, five farming villages were randomly selected from each community, making a total of ten farming villages. Third, twelve farmers were randomly selected from each farming village. A total of 120 respondents were used for the study.

Primary data obtained through structured questionnaire were analysed using descriptive statistics (frequency counts, mean, and percentages), Ordinary Least Square (OLS) regression, and mean score from a three point Likert type of scale. Three functional forms viz: linear, semi-log and double log were tried and the lead equation chosen based on econometric criteria such as number of significant variables, F-value, value of the coefficient of determination (R^2) and conformity with *apriori* expectation. The OLS model used is specified below:

Linear form

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \mu$$

Semi-logarithm form

$$Y = \alpha + ln\beta_1 X_1 + ln\beta_2 X_2 + ln\beta_3 X_3 + ln\beta_4 X_4 + ln\beta_5 X_5 + ln\beta_6 X_6 + ln\beta_7 X_7 + \mu$$

Double-logarithm form

$$lnY = \alpha + ln\beta_1 X_1 + ln\beta_2 X_2 + ln\beta_3 X_3 + ln\beta_4 X_4 + ln\beta_5 X_5 + ln\beta_6 X_6 + ln\beta_7 X_7 + \mu$$

Where:
Y= Farm income (naira)
X_1 = Cost of malaria treatment (naira)
X_2 = Household size (number)
X_3 = Years spent schooling (years)
X_4 = Distance to health centers (km)
X_5 = Farm size (ha)
X_6 = Farming experience (years)
X_7 = Days lost to malaria (number)
μ = error term
α = intercept and β represents the coefficient of the explanatory variables.

Likert type of scale was used to identify the major preventive measures used by farm households for malaria control as specified below:

Opinion	Point
Always	3
Rarely	2
Not at All	1

The mean response to each item was calculated using the following formula:

$$\overline{X} = \frac{\sum FX}{N}$$

Where: $\overline{X}$ = means response, $\sum$ = summation, F = number of respondents choosing a particular scale point, X = numerical value of the scale point and N = total number of respondents to the item

Decision Rule: the mean of these weights is 2 [(3 + 2 + 1) ÷ 3 = 2]. A mean score of 2 or more implied that farm households in the area always used such preventive measure for malaria control.

3.0 Results and Discussion

3.1 Socioeconomic Characteristics of the Respondents

Socioeconomic characteristics of farm households in the study area are presented in Table 1. The result indicated a mean age of 43 years which could be seen as a productive age. Farming households in the

area were majorly headed by males (71.7%). This is a common practice in most African households were male assumes the "headship" position. The high percentage of males could also translate to more involvement of male in farming activities sequel to its labour requirement which is intensive and energy demanding.

Table 1: Socioeconomic Statistics of Farm Households

Socioeconomic Variables	**Frequency**	**Percentage**	**Mean/Mode**
Age			
below 20	4	3.3	
20 – 30	10	8.3	
31 – 40	45	37.5	
41 – 50	23	19.3	**43 years**
51 – 60	19	15.8	
Above 60	19	15.8	
Total	**120**	**100**	
Sex			
Male	86	71.7	**Male**
Female	34	28.3	
Total	**120**	**100**	
Marital Status			
Single	07	5.8	
Married	92	76.7	**Married**
Widowed	16	13.3	
Separated	02	1.7	
Divorced	03	2.5	
Total	**120**	**100**	
Household Size			
1-5	46	38.3	
6-10	46	38.3	**7 members**
11-15	22	18.4	
Above 15	06	5.0	
Total	**120**	**100**	
Educational Status			
No formal education	71	59.2	**No formal education**
Primary education	25	20.8	
Secondary education	22	18.3	
Tertiary education	02	1.7	
Total	**120**	**100**	
Farming Experience (years)			
1 – 10	07	5.8	
11 – 20	26	21.7	
21 – 30	42	35.0	**23 years**
Above 30	45	37.5	
Total	**120**	**100**	
Primary Occupation			
Farming	102	85.0	**Farming**
Trading	15	12.5	
Civil service	03	2.5	
Total	**120**	**100**	
Farm Size (Hectares)			
1 – 2	20	15.8	
2.1 – 3	19	16.7	**3 hectares**
Above 3	81	67.5	
Total	**120**	**100**	

Source: Field Survey, 2015

Table 1 further shows that majority (76.7%) of the respondents were married with an average family size of 7 members. It is obvious that farming activities require more labour for land preparation, weeding, planting, spraying, harvesting and processing for consumption or sale. Hence, members of the family often constitute the labour force. However, more family members could also mean

more responsibility. Ajani and Ashagidigbi (2008) reported that increase in farm household size increases family expenditure and reduce income. The educational status shows that most (59.2%) of the rural farmers could not read and write. Education could affect farmers' decision on methods of treating illness such as malaria with its effect on days of incapacitation. Farmers in the area had a mean farming experience of 23 years and an average farm size of 3 hectares. High farming experience could mean higher income because more farming skills and techniques are expected to be gained over time. Agbamu (2003) reported that experience impacts positively on innovation adoption with its reward on increased farm income.

3.2 Effect of Malaria on Farm Household Income

The OLS estimates on the effect of malaria on farm household income is shown in Table 2. The semi-log functional form was chosen as the lead equation. The output of the semi-log model shows an R^2 value 0.622 which implies that 62% of the change in farm income was explained by the independent variables. The remaining 38% is attributed to error term. F-value of 3.653 which was significant at 1% indicates the significance of the entire model. The coefficients of cost of malaria treatment, distance to health centers, farming experience and days lost to malaria incidence were negatively related to farm income, while years spent schooling, farm size and household size were positively related to farm income.

The coefficient of cost of malaria treatment was negatively related to farm income and significant at 1%. The inverse relationship implies that the higher the cost of malaria treatment, the lower the farm income. As farmers spend more money in buying drugs and going to health centers to treat malaria, it reduces their farm income. This finding is not surprising as malaria incidence is very common virtually in all farming household in the study area. This finding agree with Ajani and Ashagidigbi, (2008) who reported same result in similar study carried out in Oyo state, Nigeria.

Table 2: OLS Estimates on the Effect of Malaria on Farm Household Income

Variables	Linear	Semi-log	Double-log
Constant (α)	225536.317	-1444732.665	9.295
	(2.323)**	(2.572)**	(5.691)***
Cost of treatment (₦)	15.994	-180220.393	-0.353
	(3.110)***	(3.038)***	(2.048)**
Household size (number)	10583.727	95824.346	0.292
	(1.627)*	(1.062)	(1.115)
Years spent schooling (years)	-846.347	102972.80	-0.027
	(0.142)	(0.883)	(0.080)
Distance to health centers (km)	-380.242	-4033.525	-0.095
	(0.046)	(0.049)	(0.395)
Farm size (ha)	25421.047	45224.985	0.291
	(3.794) ***	(0.576)	(1.277)
Farming experience (years)	-7273.522	-36634.989	-0.109
	(2.924)***	(0.405)	(0.413)
Days lost to malaria (number)	-3003.626	-164426.861	-0.301
	(0.618)	(1.937)*	(1.220)
R^2	0.24	0.622	0.492
F- Value	4.894***	3.653***	2.235**

Source: Computed from Field Survey, 2015. Note: figures in parenthesis are t- values. *,**and*** = coefficient significant at 10%, 5% and 1% respectively.

The coefficient of days lost to malaria was also negatively related to farm income at 10% level of significance. This implies that the higher the number of days lost to malaria vis-à-vis days of incapacitation, the lower the farm income. Farmers' income decreases with the number of days they were not available for farming activities as a result of malaria incidence. This finding agrees with Shaibu, *et al.* (2015), Onuche *et al*., (2014) and Asenso-Okyere *et al*., (2009) in their separate report on an inverse relationship between days lost to ill-health and the naira value of farm output.

Estimates on Table 2 further indicated that household size, years spent schooling and farm size were directly related to farm income. However, the relationship was not significant at the level of measurement. The direct relationship implies that an increase in any of these variables, all things being equal, will increase farm income. Findings on household size, education and farm size agrees with Ibitoye, *et al.* (2015) when they reported a positive relationship between these variables and farm output. The result in Table 2 further shows that farming

experience and distance to health centres were negatively signed. The inverse relationship implies that, holding other things constant, an increase in farming experience and distance to health centres will reduce farm income in the area.

3.3 Malaria Preventive Measures

Means score result of various malaria preventive measures used by the respondents is shown in Table 3. Findings in Table 3 shows that farm households in the area always clean their environment ($\overline{\times}$ = 2.3), used insecticide treated nets ($\overline{\times}$ = 2.0) and suspend farm work on sunny days ($\overline{\times}$ = 2.0). Bush clearing and environmental sanitation will boost farmers' production efficiency and income. The practice of good hygiene in homes and on farms is crucial to malaria control. The high mean score with respect to environmental sanitation could be attributed to successes recorded by the Ondo state government who made it mandatory for every house to maintain cleanliness and healthy environment. This finding agreed with Eboh and Ekeibunor (2005), who reported that, malaria can be prevented through the cleanliness of environment. Also, the use of mosquito net will invariably reduce the rate at which farmers get infected with malaria parasite. Abiodun and Abayomi, (2013) reported that malaria cases in households decrease with the use of insecticide treated nets (ITNs). Result on suspension of work when it is sunny is also a preventive measure used by the respondents. Farmers in the area generally believed that working under the sun will lead to malaria infection and days of incapacitation. Cephas and Beujuung (2006) reported that working under sun can lead to malaria infection.

Table 3: Respondents' Responses on Preventive Measures for Malaria Control

Preventive measures	Response			Mean
	Always	Rarely	Not at All	Score
Clean Drainage system	44	22	54	1.9
Use of window net	48	12	60	1.9
Use of insecticide treated net	45	33	42	2.0
Use of mosquito coil	17	45	58	1.7
Suspension of farm work on sunny days	20	76	24	2.0
Environmental sanitation	55	46	19	2.3

Source: Field Survey, 2015

Conclusion and Recommendations

The study assessed the effect of malaria on farm income in Ifedore local government area of Ondo state. It can be concluded from the findings that malaria still remain an economic burden among rural farmers. This is evident as the cost of malaria treatment and days of incapacitation as a result of malaria infection significantly reduced farm income. Hence, reduction in the rate of incidence could improve agricultural productivity and farm income. Considering the negative effect of malaria on farm income, the following recommendations are made:

i. Government at all levels should make healthcare service affordable and accessible to rural farmers. This will help in improving the health status of farmers with its multiplier effect on increased farm income.
ii. Construction of Primary Health Centres (PHCs) in rural communities to ease accessibility.

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