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# Socio-economic Burden of Malaria Disease on Farm Income among Cocoa Farming Households in Nigeria

*K.A. Oluyole, M.O. Ogunlade and S.O. Agbeniyi*

Cocoa Research Institute of Nigeria, P.M.B. 5244, Ibadan, Nigeria

**Abstract:** Malaria is one of the most common tropical diseases affecting both the rural and urban areas in Nigeria. The disease has posed a threat to the socio-economic status of the rural dwellers. In view of this, this study was carried out to examine the effect of the disease on the overall farm income of cocoa farming households in the study area. Stratified random sampling procedure was employed for the selection of fifty respondents from the study area. The data collected from the respondents were analysed using descriptive statistics and multiple regression techniques. Descriptive statistics revealed that the mean farm income of the respondent farmers was ₦578,250 per annum as at January, 2010. The mean days of incapacitation due to malaria attack was 22 days per year while 20% of the total respondent farmers did not use any preventive method against malaria attack. The result of the regression analysis shows that age of the respondent farmers ($p<0.01$), farming experience ($p<0.01$), number of days of incapacitation ($p<0.01$), total income lost due to malaria attack ($p<0.01$), cost of malaria treatment ($p<0.05$) and educational status of the respondent farmers ($p<0.1$) significantly affected farmers' farm income. The study recommended that there should be government policy that will promote the awareness of the preventive methods against malaria attack. Also, medication that can reduce the days of incapacitation should be intensified and made available to farmers at affordable prices in order to improve the quality of life and productivity of farmers.

**Key words:** Malaria · Socio-economic burden · Farm Income · Preventive Methods · Medication

## INTRODUCTION

Malaria is caused by a parasite called Plasmodium which is transmitted via the bites of infected mosquitoes. In the human body, the parasites multiply in the liver and then infect red blood cells. Symptoms of malaria include fever, headache and vomiting and usually appear between 10 and 15 days after the mosquito bite. If not treated, malaria can quickly become life-threatening by disrupting the blood supply to vital organs [1]. Worldwide, there are 350-500 million clinical malaria episodes annually out of which an estimate of between 700,000 and 2.7 million people die annually from malaria. Over 75 percent of these mortality figures are African children [2]. In addition to its health impact, malaria is an obstacle to social and economic development. According to recent estimates the direct and indirect costs of malaria exceeded US $2 billion in 1997 and this figure is likely to increase every year [3]. Furthermore, between 400 and 900 millions of children under the age of 5 years experience acute malaria annually in the malaria endemic region of the world and this number may double by year 2020 if effective control measures are not implemented [2]. In Africa, malaria is among the major diseases that are common in the continent and it is one of the greatest threats facing development in Africa today. The American Association for the Advancement of Science in 1991 claimed that approximately 80-85 percent of the cases of population morbidity and mortality in Sub-Saharan Africa are attributable to Malaria. It attacks an individual on average of four times in a year with an average of 10 to 14 days of incapacitation [3]. Constituting 10% of the overall disease burden, malaria places a substantial strain on health services and costs Africa about US$12 billion in lost production each year [4]. In terms of resource loss, households in Africa spend between $2 and $25 on malaria treatment and between $20 and $15 on prevention each month [5]. In Nigeria, malaria is endemic and it occurs throughout the year. According to Federal Ministry of Health, Nigeria [6], there are over 100 million people at risk of malaria every year in Nigeria

**Corresponding Author:** K.A. Oluyole, Cocoa Research Institute of Nigeria, P.M.B. 5244, Ibadan, Nigeria. E-mail: kayodeoluyole@yahoo.com.

and indeed it is estimated that about 50% of the adult population experience at least one episode yearly while children less than 5 years have up to 4-8 attacks of malaria annually. As much as 13 percent of total small farming households expenditure in Nigeria is currently being used in treating malaria, while many are simply too poor to pay for adequate prevention and treatment of the disease [7].

In Nigeria, malaria is not only a health problem; it is also an economic problem. Malaria at the household level affects productivity of the people and their assets acquisition capacity. Households also frequently spend substantial share of their income and time on malaria prevention and treatment as well as an effort to control mosquitoes [8]. The cost of prevention and treatment consumes scarce households' resources. Also, as some household members spend their productive time caring for those under malaria attack, they themselves in turn seek rescue from the onslaught of the disease [5]. Malaria therefore has a direct impact on households' income, wealth, labour productivity and labour market participation of the sick. The loss to households may however be greater with the current trend in malaria resistance to traditional first-line drugs. Such loss has serious implication for poor households who are already malnourished, who live under pitiable condition and who constitute over 65 percent of the nation's population [9]. Malaria and poverty are intimately connected. It has long been recognized that a malarious community is an impoverished community [10]. This could also be said to be the same for malarious countries. Malaria is most intractable for countries in the poorest continent, Africa. The only parts of Africa free of malaria are the northern and southern extremes, which have the richest countries on the continent. India, the country with the greatest number of poor people in the world, has a serious malaria problem. Haiti has the worst malaria incidence in the Western Hemisphere and it is the poorest country in the hemisphere [10]. Malaria risk has always been geographically specific. Intensive malaria is confined to the tropical and subtropical zone. Almost all the rich countries are outside the bounds of intensive malaria [10].

Rural households unlike the fixed wage earners not only lose valuable working hours in treating the sickness but also lose income that would have been generated at this period. This poor health status thus directly affects the productive capacity of the households. This in turn translates into income loss and eventually poverty through the sick and the caregivers to the households. The main objective of this study therefore is to estimate the effect of malaria on the farm income of cocoa farming households in the study area.

**Methodology:** The study was carried out in Cross River state, Nigeria. The State is in the Southern part of Nigeria with tropical climate and swamp vegetation. These features made the state suitable for agricultural production. The major occupation of the inhabitants of the state is predominantly farming with significant proportion engaging in trading, artisan and civil service jobs. Farmers in the state grow mainly cocoa as cash crop; in fact, the state is the second largest cocoa producing state in Nigeria after Ondo state [11]. A total of 120,000 hectares of land are under cocoa cultivation with an annual production of 70,000 metric tonnes [11]. Stratified random sampling technique was used to select three cocoa producing Local Government Areas (LGAs) in the state. The selected LGAs are Etung, Ikom and Boki. Simple random sampling technique was used to select fifty cocoa farmers as respondents from the selected states. Information was collected from the respondents with the aid of structured questionnaire as well as personal interview. Information was collected on the socio-economic characteristics and also on malaria incidence as it affects cocoa farming household's health and their agricultural labour productivity. The information collection was done in January, 2010 and the data retrieved from the information were analysed using descriptive statistics, monetary value of man day loss as well as multi-variate regression model. Descriptive statistics was used to analyse the socio-economic characteristics of the respondents, distribution of the farmers according to the number of days of incapacitation, distribution of farmers according to the source employed for treating the disease as well as the distribution of farmers according to the preventive methods adopted.

The monetary value of man day loss as a result of malaria attack was estimated using the formula

$$\text{Economic loss (N)} = f(Ft, A_i) \quad [12]$$

Where:

Ft = average number of days loss by farmers as a result of malaria attack,

$A_i$ = average amount (N) a labour received per day.

Regression analysis was used to determine the effect of malaria on farmers' productivity. The model is represented thus:

$$Y_i = f(X)$$

Where; $Y_i$ is the vector of endogeneous variable and it represents farmers' annual farm income in Naira (₦); X is the vector of independent variables and the independent variables included in the model are:

AGE = Age of farmer (years);

EDU = Educational status of farmers (1 = No formal education; 2 = Primary education; 3 = Secondary education; 4 = Tertiary education);
EXP = Farming experience (years);
NDY = Number of days of incapacitation (in number);
COT = Cost of treating malaria fever (₦);
TTI = Total income lost due to malaria (₦).

## RESULTS AND DISCUSSION

The socio-economic characteristics of the respondents are described in Tables 1, 2, 3 and 4. Table 1 shows that the highest proportion (34.0%) of the respondents was between 41 and 50 years and the mean age for the farmers was 46 years. Hence, most of the farmers are still in the active age and this is a positive indicator to an increased farmers' productivity since the farmers at the age bracket will still have vigour to work more. Also, at this age, farmers will be less susceptible to malarial attack as it is believed that at this age bracket, there is more immunity to resist malarial attack than at the old age. Most (64.0%) of the respondent households had size of between 6 and 10 persons per household and the mean household size was 8 (Table 2). This may have a positive implication on the strength of farm labour supply as there would be more family labour for farm work. However, high household size may be a disadvantage because of its negative impact of overcrowding of residents in the home especially when there is no enough space. One of the causes of high incidence of malaria is environmental stress and overcrowding could cause this. Table 3 shows that the mean farm size was 5.0 hectares signifying that on the average, cocoa farmers in the study area are small scale farm holders. Concerning the farmers' farm income, 66.0% of the total farmers sampled earned between ₦0 and ₦500,000 per annum from their farms and the mean farm income of the farmers was ₦578,250 per annum.

Table 5 shows the number of days of incapacitation caused as a result of malaria attack. The table shows that 28.0% of the respondents were incapacitated for between 11 and 20 days per year while 2.0% of the farmers were incapacitated for as long as 81-90 days. Meanwhile, the mean number of days of incapacitation was 22 days per year. The implication of the finding is that during the period of incapacitation, farmers would not be able to do any work and hence would result in an economic loss to the farmer. As a result of this, the higher the number of days of incapacitation, the higher the economic loss incurred by the farmers.

Table 1: Age distribution of the respondents

| Age (years) | Frequency | Percentage |
|---|---|---|
| = 30 | 8 | 16.0 |
| 31-40 | 10 | 20.0 |
| 41-50 | 17 | 34.0 |
| 51-60 | 8 | 16.0 |
| 61-70 | 6 | 12.0 |
| > 70 | 1 | 2.0 |
| Total | 50 | 100.0 |
| Mean | 46 | |
| Standard deviation | 13.1488 | |

Source: Field survey, 2010.

Table 2: Household size distribution of the respondents

| Household size | Frequency | Percentage |
|---|---|---|
| 0-5 | 12 | 24.0 |
| 6-10 | 32 | 64.0 |
| 11-15 | 4 | 8.0 |
| >15 | 2 | 4.0 |
| Total | 50 | 100.0 |
| Mean | 8 | |
| Standard deviation | 4.0670 | |

Source: Field survey, 2010.

Table 3: Farm size distribution of the respondents

| Farm size (hectares) | Frequency | Percentage |
|---|---|---|
| 0-5 | 31 | 62.0 |
| 6-10 | 18 | 36.0 |
| >10 | 1 | 2.0 |
| Total | 50 | 100.0 |
| Mean | 5 | |
| Standard deviation | 3.2652 | |

Source: Field survey, 2010.

Table 4: Farm income distribution of the respondents

| Farm income (₦) | Frequency | Percentage |
|---|---|---|
| 0-500,000 | 33 | 66.0 |
| 500,001-1,000,000 | 9 | 18.0 |
| 1,000,000-1,500,000 | 2 | 4.0 |
| 1,500,001- 2,000,000 | 2 | 4.0 |
| 2,000,001-2,500,000 | 3 | 6.0 |
| 2,500,001-3,000,000 | 0 | 0.0 |
| 3,000,001-3,500,000 | 1 | 2.0 |
| Total | 50 | 100.0 |
| Mean | 578,220 | |
| Standard deviation | 705,340 | |

Source: Field survey, 2010.

Table 5: Distribution of farmers by number of days of incapacitation due to malaria attack

| Days of incapacitation/year | Frequency | Percentage |
|---|---|---|
| 0-10 | 12 | 24.0 |
| 11-20 | 14 | 28.0 |
| 21-30 | 13 | 26.0 |
| 31-40 | 6 | 12.0 |
| 41-50 | 2 | 4.0 |
| 51-60 | 1 | 2.0 |
| 61-70 | 1 | 2.0 |
| 71-80 | 0 | 0.0 |
| 81-90 | 1 | 2.0 |
| Total | 50 | 100.0 |
| Mean | 22.54 | |
| Standard deviation | 17.2168 | |

Source: Field survey, 2010.

Table 6: Distribution of respondents by the source utilized for treating malaria disease

| Source | Frequency | Percentage |
|---|---|---|
| By going to hospital | 33 | 60.0 |
| By going to chemist/patent medicine store | 16 | 29.1 |
| By going to herbalist | 1 | 1.8 |
| By self treatment | 4 | 7.3 |
| By taking rest only | 1 | 1.8 |
| Total | 55 | 100.0 |

Source: Field survey, 2010.

Table 7: Distribution of respondents by the use of preventive measures

| Preventive measures | Frequency | Percentage |
|---|---|---|
| Keeping surroundings clean of bush | 21 | 33.8 |
| Disallowing empty containers | 10 | 16.1 |
| Disallowing stagnant water | 12 | 19.4 |
| Spraying insecticide periodically | 14 | 22.6 |
| Using of mosquito net | 5 | 8.1 |
| Total | 62 | 100.0 |

Source: Field survey, 2010.

Table 8: Regression Analysis Result

| Variables | Coefficients | Prob. | Marginal Effect |
|---|---|---|---|
| Constant | 13.10433 | 0.000 | |
| AGE | -0.0311626*** | 0.001 | -0.0311626 |
| EDU | 0.1771531* | 0.062 | 0.1771531 |
| EXP | 0.0634312*** | 0.000 | 0.0634312 |
| NDY | -0.0203573*** | 0.004 | -0.0203573 |
| COT | -0.0000778** | 0.021 | -0.0000778 |
| TTI | 9.10e-06*** | 0.000 | 9.10e-06 |
| $R^2$ | 0.6939 | | |
| $R^{-2}$ | 0.6512 | | |
| Prob. | 0.0000 | | |
| F-Value | 16.25 | | |

Source: Field survey, 2010.
*** Significant at 1% level;
** Significant at 5% level;
* Significant at 10%.

Table 6 shows the different sources of treating malaria disease by the respondents. It shows that most (60.0%) of the respondents go to hospital for treatment anytime they have malaria attack. However, 29.1% of the respondents go to chemist/patent medicine store for treatment while only 1.8% of the respondents visit herbalists for malaria treatment. The implication of the finding is that most farmers are enlightened on the right place (hospital) to seek treatment anytime they have malaria attack. Meanwhile, few respondents (7.3%) are in the habit of utilizing self medication as a means of treating malaria disease. However, the total numbers of responses were more than the total number of respondents because there were multiple responses.

Findings on Table 7 shows the different preventive measures used against malaria attack. The table shows that the highest proportion (33.8%) of the respondents prevents malaria attack by keeping their surroundings clean of bush while 22.6% of the farmers spray insecticide to prevent malaria attack. Furthermore, 19.4%, 16.1% and 8.1% of the respondents prevent malaria attack by disallowing stagnant water around their houses, disallowing empty containers that could hold water in their surroundings and by using mosquito net respectively. Meanwhile 10 farmers representing 20% of the total farmers sampled did not adopt any preventive measures against malaria attack. It is quite interesting that the substantial proportion of the respondents adopted preventive measures. This has implication on preventive and curative steps taken by government to curb malaria attack thus justifying the huge sum of money spent on the "Role Back Malaria Campaign".

The study also revealed that an average of 23 days were lost by an individual attacked by malaria and going by an average amount (N800.00) a labour received per day, therefore a total of N18,400.00 was lost by an individual due to malaria attack.

The causal relationship between the farmers' productivity proxy (farm income) and malaria incidence was shown on Table 8. Three regression functional forms (linear, semi-log and double-log functional forms) were run to examine the relationship out of which semi-log functional forms was chosen as the lead equation based on the value of the coefficient of determination ($R^2$), the number of the significant variables, the apriori expectation, the significancy of the overall equation as well as the F-value. The result shows that R square value is 0.6939 showing that 69.39 percent of the change that occurred in the dependent variable could be explained by the explanatory variables. This also shows that the model produces a good fit for the data while the F-value of 16.25 shows that the overall equation is significant ($p<0.01$). Table 8 shows that all the six variables used in the analysis were found to have significantly affected farmers' income. The variables are age of farmer ($p<0.01$), educational status of the farmer ($p<0.1$), farming experience of farmer ($p<0.01$), number of days of incapacitation ($p<0.01$), cost of malaria treatment ($p<0.05$) and the total income lost due to malaria attack ($p<0.01$). Age was significantly and negatively affected farmers' income. The marginal effect of age on farm income is -0.0312 meaning that a unit increase in age decreases farm income by 0.0312. This shows that farmers' income decreases with increase in age. This is expected because productivity of farmers decreases as they approach old age because of loss of agility and strength. The finding is in consonance with [13] which shows that as the farmers'

age increases his income decreases. A unit increase in educational status of farmer increases the farm income by 0.1772. The significance of the educational status of the respondents was due to the fact that the more a farmer is formally educated, the more the ability to be efficient and hence be more productive. This is because formally educated farmers would be able to adopt new technologies more since they would be able to read the instructions guiding the adoption of such technologies. Findings with respect to farming experience of farmers revealed that a unit increase in farming experience increases the farm income by 0.0634. The result is expected because the more experienced a farmer is, the higher the productivity, hence leading to a more income. However, the positive beta coefficient is in consonance with the apriori expectation showing that the higher the farming experience, the higher the farm income. Farm income also decreases with increase in the number of days of incapacitation because the more the number of the days, the greater the loss incurred during treatment and the lesser the farm income. The negative beta coefficient shows that the higher the number of days of incapacitation, the lesser the farm income. As for the cost of malaria treatment, a unit increase in the cost of malaria treatment decreases the farm income by -0.0001. This is obvious because increase in the variable automatically increases the leakage to farmers income thus reduces the farmers income. The sign of the coefficient is in line with apriori expectation. Lastly, total income lost due to malaria attack also has a positive beta coefficient, which means that as income increases; income lost due to malaria also increases. This is true because high income earning farmers tend to lose more of their income due to better treatment they seek which attracts high cost and also because of income lost during the period of incapacitation which tends to be more compared to the low income earning farmers.

## CONCLUSION

Malaria is both a health and economic problem eating deeply into the financial base of the victims in the study area. Age, educational status as well as the farming experience had been found as the socio-economic variables affecting farmers' income. Hence, increase in the educational status as well as the farming experience of the farmers impact positively on the income level of the farmers while decrease in the age of farmers impact negatively on the income level of the farmers. Apart from this, large household size, which is a common feature of rural people, has been a cause of increase in malaria incidence. Families with large household size usually have low income, which in turn increases their poverty status and hence incapacitates such families from having an effective treatment against malaria disease. Furthermore, increase in the number of days of incapacitation, cost of malaria treatment as well as the total income that is lost due to malaria were found to have significantly affected farm income of the farmers.

## RECOMMENDATIONS

- There should be interventions in form of mobilizing resources, formulating and implementing policies and programmes that will promote awareness and measures that ensure effective prevention and control of the pandemic disease.
- Hospitals and clinics should also be easily accessible, readily available and affordable to the farmers in order to meet their health needs.
- Medication that can reduce the days of incapacitation should be intensified and made available to farmers at affordable prices in order to improve the quality of life and productivity of farmers.

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