PERCEIVED EFFECTS OF MALARIA DISEASE ON WELL-BEING STATUS OF RURAL FARMING HOUSEHOLDS IN NIGER STATE, NIGERIA

BY

ABDULLAHI, Abubakar
MTech/SAAT/2018/8172

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT
FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

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JANUARY, 2023

DECLARATION

I hereby declare this thesis titled: "**Perceived Effects of Malaria Disease on Well-being Status of Rural Farming Households in Niger State, Nigeria"** is a collection of my original work and it has not been presented for other qualification anywhere. Information from other sources (published and unpublished) have been duly acknowledge.

ABDULLAHI, Abubakar
MTech/SAAT/2018/8172

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SIGNATURE & DATE

CERTIFICATION

The thesis titled "**Perceived Effects of Malaria Disease on Well-being Status of Rural Farming Households in Niger State, Nigeria"** by ABDULLAHI Abubakar (MTech/SAAT/2018/8172) meets the regulations governing the award of the degree of Master of Technology (MTech) of Federal University of Technology, Minna and it is approved for its contribution to scientific knowledge and literary presentation.

DR. I. T. SALIHU
MAJOR SUPERVISOR _____
SIGNATURE & DATE

PROF. J. H. TSADO
CO SUPERVISOR _____
SIGNATURE & DATE

PROF. J. H. TSADO
HEAD OF DEPARTMENT
AGRICULTURAL EXTENSION AND
RURAL DEVELOPMENT _____
SIGNATURE & DATE

PROF. J. N. NMADU
DEAN, SCHOOL OF AGRICULTURE
AND AGRICULTURAL TECHNOLOGY _____
SIGNATURE & DATE

ENGR. PROF. O. K. ABUBAKRE
DEAN, POSTGRADUATE SCHOOL _____
SIGNATURE & DATE

DEDICATION

This thesis is dedicated to my lovely wife Rakiya Isah Bosso, which through her contributions brought me to completion of the Master Degree Programme.

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ABSTRACT

This Study assessed the perceived effects of malaria disease on well-being status of rural farming households in Niger State, Nigeria. Multi-stage sampling procedure was used to select one hundred and ninety nine (199) farming households in the study area. Data were collected from primary source using structured questionnaire complemented with interview schedule. The data collected were analyzed using both descriptive statistics such as means, percentages and frequency distribution and inferential statistics such as Ordinary Least Square, adoption index and Pearson Product Moment Correlation (PPMC). The results revealed that 79.9% of the rural farming households were male with average age of 42 years. The mean household size of the respondents was 8 persons, while mean years of farming experience was 22 years and mean annual households income was ₦503,394.5, most (77.4%) of the respondents have access to extension services, while 68.3% of the respondents belong to cooperative society. Perceived causes of malaria were mosquito parasite ($\bar{X}$ =4.52), poor sanitation ($\bar{X}$ =4.17), change of weather ($\bar{X}$ =3.55) and nature ($\bar{X}$ =3.17). The major sources of information on malaria treatment were through family and friends (93.5%) and mass media (89.5%).The most perceived effects of malaria on well-being status were malaria infection leading to loss of productive time ($\bar{X}$=4.46), decrease in households' income and food security ($\bar{X}$ =4.03) and reduced living standard of farmers ($\bar{X}$ =3.88). The most satisfied wellbeing indicators were community connectedness ($\bar{X}$ =6.75), personal relationship ($\bar{X}$ =6.75) and spiritual or religious activities($\bar{X}$ =6.43) ranked 1st, 2nd and 3rd, respectively. The coefficient of amount spent on malaria treatment (0.0003), farm size (2.4792), age (-0.5061), years spent in school (0.2288), credit (-4.2312) and output (3.3900), were the major determinants of the wellbeing status of farming households. The most preventive and control measures to mitigate malaria parasite as used in the study area were mosquito net ((94.5%) and immunization (92.5%), while the most serious constraints faced by rural farming households in treating malaria disease were high cost of treatment ($\bar{X}$ =2.75), favourable climatic condition for vector ($\bar{X}$ =2.47) and inadequate capital ($\bar{X}$ =2.43). The result of the hypothesis showed that there is a significant relationship between perceived effects of malaria disease and wellbeing status of the respondent. It is recommended that stake holders at all level should make provision for improved health care facilities within the farmers' vicinity. Roll Back Malaria (RBM) should increase distribution of treated mosquito nets and sensitize farmers on the need to maintain hygienic environment. Thus, rural household farmers should always maintain good hygienic environment in order to combat malaria vector.

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LIST OF ABBREVIATIONS

ADP: Agricultural Development Project

FAO: Food and Agriculture Organization

FOS: Federal Office of Statistics

GMAP: Global Malaria Action Plan

IRS: Indoor Residual Spraying

ITNs: Insecticides-Treated Nets

IWbAs: International Well-being Group

LGAs: Local Government Areas

LLINs: Long-Lasting Insecticidal Nets

MIM: Multilateral Initiative on Malaria

NAMDA: Niger State Agricultural Mechanization and Development Authority

NGOs: Non-Governmental Organizations

NPC: National Population Commission

NSGIS: Niger State Geographical Information System

PPMC: Pearson's Product Moment Correlation

RBM: Roll Back Malaria Partnership

WHO: World Health Organization

WHOPES: WHO Pesticide Evaluation Scheme

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Agriculture plays a key role in food security and economic development of most Nations especially developing countries. Most of the world's population living in rural areas depends directly or indirectly on agriculture for their livelihoods (Cardno, 2017). However, despite the overwhelming benefits embedded in agriculture, the agricultural activities in Nigeria have been affected by lots of health threatening diseases affecting farmers' production and well-being status. Malaria disease has been attributed to poverty in African countries (Anumudu *et al.,* 2006). Malaria disease is rated high in most rural areas of Sub-Sahara Africa and attacks farmers on average of four times annually with an average of 10 to 14 days of incapacitation (Alaba and Alaba, 2014). Report have shown that more than 2.7 million people die yearly from malaria related sickness. Also, more than 75 % of these mortality figures are African children (Multilateral Initiative on Malaria (MIM), 2015).

Moreover, malaria disease and agriculture are interwoven, this is because agricultural environments provide conducive environments for breeding of disease vector which causes malaria in human beings (Oluwatayo, 2014). The global effect of malaria on human health, productivity and general well-being is profound, and Africa has been badly affected by this menace that had led to high mortality among farming households (Kwadwo *et al.,* 2011). The malaria disease has also resulted to health and economic problem. At the farmers' household level, it affects productivity of the people thereby limiting farmers' ability to purchase assets, while at farm level, it hinder farmers from maximizing their output. Most households often spend exorbitant income and time on malaria disease prevention and treatment with a lot of efforts committed to control

mosquitoes around their environment. The cost of prevention and treatment often exhaust farmers' scarce resources that could have been used in production, while productive time are been spent caring for those under malaria attack (Ogunniyi *et al.,* 2015).

Malaria disease has a direct effect on farmers' income, wealth, labour productivity and labour market participation of both the sick and caregivers. In terms of resource wastefulness, more than 13 percent of total small farming households expenditure in Nigeria is on treating malaria disease, while many are simply too poor to pay for adequate prevention and treatment of the disease (World Health Organization (WHO), 2011). The loss to households could however be outrageous with the current trend in malaria disease resistance to traditional first-line drugs. Such loss has serious effect on poor households who are already malnourished, live under severe condition and constitute majority of the populace (Federal Office of Statistics (FOS), 2009).

More so, rural households unlike the fixed wage income earners not only lose valuable working hours in treating malaria sickness, but lose income that would have been generated at the period of sickness. This poor health status thus directly affects the productive capacity of the households which in turn translates into poor output and well-being status among the sick farmers and caregivers to the households.

1.2 Statement of the Research Problem

Malaria is a life threatening infectious disease cause by parasite called Plasmodium and it is transmitted by the female anopheles mosquito. Malaria disease exerts a huge social and economic burden on families, communities and country at large with an estimated annual loss of about 132 billion Naira in payment for treatment and prevention as well as hour not worked (Adeneye *et al.,* 2016). Rural farming households not only lose valuable

working hours in treating the sickness but also lose income that would have been generated at this period (Oladepo *et al.,* 2014).

Malaney (2013) posited that the heavy economic burden imposed by malaria disease on households could have significant micro-economic consequences as it interferes with household's ability to save and invest in education and physical capital. During an acute attack of malaria disease, the farmer complains of fever, weakness, headache and chilling sensations similar to influenza. The disease infection lead to loss of productive time, decrease in household income, decrease in living standard of farmers and exposes them to other life threatening diseases. This makes it easy to understand why malaria disease is one of the biggest farmers problem.

It is estimated that more than 70% of the working population employed in the agricultural sector did not have access to good health care facilities (Alaba and Alaba, 2014). This is common in Sub-Saharan African countries, with majority of farming populace in the rural areas. Malaria at the household level affect productivity of the people and their asset acquisition capacity. When farmers' health deteriorates, they cannot go to work in the farm thereby abandoning their farm activities. Also, the money that would have help them in obtaining farm inputs, improved implements or hire tractors and labourers is used for treatment of malaria and other related diseases resulting into reduce output.

However, there have been a neglect by researchers with respect to examining the effect of malaria disease on farming households which constituted a knowledge gap. Thus, it becomes pertinent to examine perceived effects of malaria disease on well-being status of rural farming households in Niger State. It is based on the aforementioned, that this study tends to answer the following research questions:

i. What are the socio-economic characteristics of the rural farming households in the study area?

ii. What are the perceived causes of malaria disease among rural farming households in the study area?

iii. What are the perceived effects of malaria disease on the rural farming household`s well-being status in the study area?

iv. What are the determinants of well-being status of the rural farming households in the study area?

v. What are the preventive and control measures to mitigate malaria disease in the study area?

vi. What are the constraints faced by the rural farmers in treating malaria disease in the study area?

1.3 Aim and Objectives of the Study

The aim of this study is to assess the perceived effects of malaria disease on well-being status of rural farming households in Niger State, Nigeria. The specific objectives are to:

i. describes the socio-economic characteristics of the rural farming households in the study area

ii. examine the perceived causes of malaria disease among rural farming households

iii. assess the perceived effects of malaria disease on the rural farming households well-being status

iv. examine the determinants of well-being status of the farming households

v. determine the preventive and control measures to mitigate malaria disease

vi. examine the constraints faced by rural farming households in treating malaria disease in the study area

1.4 Hypotheses of the Study

Two hypotheses were tested in the study and they are stated in null form as below:

$H0_1$: There is no significant relationship between socio-economic characteristics of the rural farming households and their well-being status.

$H0_2$: There is no significant relationship between perceived effects of malaria disease and well-being status of the rural farming households.

1.5 Justification of the Study

Sound health and productive agriculture are vital economic tools of a nation in the fight against poverty. The development of human capital through sound health is an indispensable input in agricultural production. Government at various points has embarked on free distribution of preventive measures like the insecticide and treated nets in order to curb the problem of malaria disease. However, the fact remains that the cost of controlling malaria disease is becoming too expensive for Government, especially as malaria programmes in affected African countries has to compete with other Government programmes for funds. Therefore, the study of this nature will be of great intellectual and practical value to every stakeholders, academia and scholars that have strong passion for malaria disease prevention.

Thus, the finding on socio-economic characteristics will assist the researchers to understand the socio-economic and demographic variables of the respondents in the study area. Information on factors that trigger the spread of malaria will be useful for achieving sustainable development goals and the roll back malaria for continual assessment of the level of prevalence on country and regional basis. It would also assist in assessing the malaria burden in Africa as well as improve the control programmes. Information on well-being status willenable the researchers to understand the condition of the farmers in the

study area which could further be used for future policy formulation that would be of immense benefit to farmers and institutions of higher learning. Information on perceived effect of malaria disease on well-being status of farmers will be useful for policy formulation by policy makers and researchers. It will be useful tools for proper policy formulation that will be of immense benefits to Government and Non-Governmental Organizations (NGOs) which would also benefits the rice farmers in the long run.

Generally, the findings from the study will give useful highlights to the Government and other NGOs involved in malaria prevention/control and also assist roll back malaria for effective execution of their responsibilities in malaria control. It will assist the farmers on how production could be improved by ensuring measures and strategies are put in place in order to prevent malaria and also enhance their well-being status.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Socio-Economic Characteristics of Rural Farming Households

Socio-economic has to do with relating the society and economic together. According to Advance Oxford Dictionary Learner (1995), a socio-economic class is a group of people with similar characteristics. These characteristics can include social and economic standing, occupation, income, level of education, wealth, where someone lives and ethnic background or heritage. Socio-economic characteristics of farmers in any community affect their productivity and income (Cathy-Austin and Nahanga, 2017). Thus, socio-economic characteristics influences outcome of events in different ways as it play a key role in influencing morbidity and mortality (Adler and Snibbe, 2003). People of lower socio-economic characteristics have inadequate access to health facilities, while those of higher socio economic characteristics have adequate access to health facilities, better housing and adequate nutrition (Adler and Snibbe, 2003).

Age is an important factor in production. Increase in number of years of farmers might result in additional experience to improve upon their level of productivity and income. Age could have influence on malaria incidence and crop production especially when young and productive farmers' are broken down due to malaria incidence, this is expected to have negative effect on farmers' output and well-being status. Akinbode and Dipeolu (2015) revealed that both younger and adult farmers were usually affected by malaria disease in Nigeria. Active and productive age could be seen as stage in which farmer's productivity is relatively high given a healthy living condition devoid of malaria and other productivity diminishing problem (Ajani and Ahagidigbi, 2015). Nwaru *et al.* (2016) stated that the older a farmer becomes, the more his efficiency drops, because his mental capacity to cope with symptoms associated with malaria disease could pose negative

effect on his immune system and demands of farm production activities, while his ability to do manual work bears directly on his production efficiency.

Similarly, household could be seen as the basis for labour availability necessary for crop production. Oluwatayo *et al.* (2014) revealed that most of the farmers that married more than one wife have a large family size and more access to family labour that could easily expose them to malaria attacks thereby making farmers to spend large percentage of their savings and income on malaria infection. Meanwhile, an increase by one person in a household could result to having more hands at work, thereby reducing the cost of labour and enhancing well-being status. Large households often depend on the pull of family labour to carry out farm operations. In addition, household members can contributes to taking care of sick members under the influence of malaria since labour is often allocated for the collective goal of profit maximization.

Also, large household size could pose a negative threat on the household well being, thereby affecting farmers' well-being negatively. Therefore, farmers with larger household size may be prone to malaria disease than those with smaller household size. People with smaller household size in the rural communities are far better than people with larger household because they might be in the right position to afford high cost of malaria treatments (Munongo and Chitungo, 2013). Generally it is expected that more healthy, educated, and adult members in a household contribute to their well-being status. If household members are not adult and educated, it will reduce their desire and attitude to work thereby resulting in low well-being status.

Years of experience in crop production could had positive impact on production system and household income among farmers in Nigeria, years spent in crop production could

lead to accumulation of practical experience over time and this could also assist farmers to take proactive measures that will control and minimize the menace associated with malaria infection (Enete *et al*., 2014). Nwaru *et al.* (2016) observed that farmers would count more on their farming experience for improved productivity rather than their educational attainment. This is because the number of years a farmer has spent in the farming business may give an indication of the practical knowledge he has acquired on how to cope with the inherent farm production, processing and marketing problems leading to higher levels of efficiency.

Education could help farmers in their approach towards malaria treatment and prevention, implying that education grants farmers' access to health care facilities and critically utilize the available drugs in order to curtail malaria infection. Also, education is expected to create enabling environments for farmers on measures put in place to avert malaria. However, farmer's level of education could also enhance their production and level of awareness on modern malaria treatment (Uwagbo *et al.*, 2016).

According to Uwagbo *et al.*(2016), level of education of a farmers will not only increases his productivity but also enhances his ability to understand and evaluate new production techniques. Education and training produce a labour force that is more skilled and adaptable to the needs of changing economy because educated farmers are more amenable to risk taking and change than non-educated ones (Nwaru *et al.*, 2016). According to human capital models, education is an important dimension of the non-homogeneity of labour. High educational attainment may imply a greater set of employment opportunities and specifically in the rural context, a better awareness of the full potential of new agricultural technologies and associated agricultural practices.

Income is very vital in production as availability of income could have positive or negative outcome on farmers' production. Farmers with low income might find it difficult to cope with effect of malaria disease unlike their counterparts with higher income (Munongo and Chitungo, 2013). This has implication on preventive and curative step taken to curb the infection of the illness, and to think of the fact that in this millennium, some set of people are still ignorant of preventive and curative measures suggests that deaths to this illness may still be regarded as an act of God. This does not justify the huge sums of money spent on the "Roll Back Malaria Campaign" (Ajani and Ashagidigbi, 2008).Access to extension is very vital in crop production. Access to extension service as at when due will not only enhance output but also expose farmers to preventive measures needed to combat malaria infection (Abiodun and Abayomi, 2013).

Access to extension and advisory services played important roles in malaria prevention and treatment. According to Thamaga-Chitja and Morojele (2014), smallholder farmers' across the Sub-Saharan Africa have been given little attention with regards to appropriate extension and research, and the situation is still similar today. Extension services available to farmers are inadequate and the number of extension officers is far much below the required to meet the needs of farmers thereby making them unable to access right knowledge on malaria. However, inadequate of extension services often results in the lost chance of improving farmers' knowledge on malaria control and prevention. Matungul *et al.* (2011) reviewed that extension officers visited households roughly once a year thereby making farming families fall victims of major illness like that of malaria which also negative affect their production. Agricultural extension, which takes best information on technology, input and practices directly to farmers, may spread benefits beyond higher yields. Extension access also has ability of reducing malaria infection among pregnant women and children thereby increasing labour force on the farm.

Agricultural cooperative society is association of farmers with common interest that voluntarily come together to improve their social and economic welfare. Rural farming households do have adequate attention with regards to cooperative society and they have more access to health facilities that could not be possible by individual rural poor farmer (Mure *et al.*,2012). According to Overseas Cooperative Development Council (OCDC) (2007), cooperative members learn about business operation that addresses his/her economic, democratic and social dimensions in rural areas as well as reduce poverty and the spread of malaria disease among rural farming households. Rural farming households can overcome malaria disease by actively being members of cooperative society than tackling malaria disease individually and this is pathway out of poverty (Birchall and Simmons, 2009).

Credit contribute in uplifting the living standard of the poor farmers by obtaining loan facilities that reduce their vulnerability to short term income. Credit boost production level of the poor farmers through financing investment in human and physical capital (Okurut *et al.*, 2004). Schindler (2010); Deb and Suri (2013) acknowledge that credit provide financial assistance to most rural areas. Thus, credit can transform self-image, boost productivity and well-being of the rural farmers. It will provide them with the required tools to prevent and treat malaria disease among farming households. Credit transform the livelihood of farmers by boosting their productivity which in turn enhance self-confidence and well-being status (Akudugu, 2011).

2.2 Perceived Causes of Malaria Disease among Farmers

Nyaga (2015) showed that majority of malaria infection in Africa was caused by cold. The Author further reported that majority of rural farmers believed malaria is caused by dirt, either through ingestion (drinking dirty water and eating dirty food) or

physical contact such as wearing dirty clothing. The mosquito was thought to cause and that malaria comes on its own. A worm in the head which children are born with was believed to cause malaria. Also, malaria is brought about by evil spirits from the lake. Other things mentioned as causes of malaria include sudden change of climate/weather, when a child cries a lot and getting in contact with a sick child (Praise *et al.,* 2015).

There were other agents that were believed to cause malaria in children. Such agents include, fresh evil spirits, breast milk of an infected mother, feeding children with cold food, performing tedious tasks, eating food cooked with modem cooking oils, tsetse flies, (mosquito-like insect) and dust. Praise *et al.* (2015) revealed that cerebral malaria was sometimes treated as a different kind of malaria from the "normal malaria". It was referred to as “strong malaria” or madness and is often associated with madness and leads to death of the victim (Onuche *et al.,* 2020). Various agents were perceived to cause this kind of malaria in young children. One such agent is a worm in the head which children are born with. This worm causes strong malaria by disturbing the brain if it is not calmed by putting a herb in the nose of a child before three months old. Acts of evil individuals, punishment by ancestors for breaking taboos and abrupt change of temperature are all believed to cause strong malaria.

Nyaga (2015) also stressed that some taboos that could lead to strong malaria and these were: failure to name a child after an ancestor, talking evil of the dead and failing to adhere to the procedure that should be followed during sexual relations within a polygamous household. This procedure requires that before any activity is carried out in the farm such as land preparation, planting, weeding or harvesting, the household

head should have sexual relations with his wives in the order in which they were married, i.e., first wife first followed by the second in that order to the last wife.

2.3 Effects of Malaria Disease on Agricultural Production

Malaria infection is capable of causing harmful effect on agricultural production in Nigeria. Malaria can cause morbidity, disability, or death; and all those three effects have direct and indirect costs that can affect labour availability and productivity, and ultimately on economic development. The direct costs of malaria treatment and control, and the impacts of these costs on the ability of farm households to adopt new agricultural technologies and improved wellbeing, are the bane of agricultural underdevelopment and poverty in many countries of Sub-Saharan, including Nigeria (Munongo and Chitungo, 2013). The social costs of government spending on malaria control and treatment exerts a tremendous pressure on the financial portfolios of poor countries. In the most heavily affected regions, malaria accounts for 40% of public health spending (Purdy *et al*., 2013). Equally important are the indirect costs of seeking health care and taking care of children and others who are infected by malaria and the relationship of the indirect costs to the farm labour supply and productivity.

The World Health Organization (2010) reported that there were 300 to 500 million cases of malaria each year, with about 1 and 3 million deaths mostly of children were attributed to malaria disease, so much so that every 40 seconds a child dies of the disease, resulting in a daily loss of more than 2,000 young lives worldwide. According to the World Health Organization (WHO), malaria kills over a million people each year, mostly in Africa where more than 90 percent of deaths in 2006 came from malaria disease. According to US Embassy in Nigeria (2011), malaria disease is a major public health problem in Nigeria where it accounts for more cases and deaths than any

other country in the world. Malaria is a risk for 97% of Nigeria's population; the remaining 3% of the population live in the malaria free highlands.

Roll Back Malaria (2001) stated that effect of malaria disease on the farm income of rural households is commonly associated with poverty and hindrance to economic development. This was supported by Abiodun and Abayomi (2013), who emphasized that malaria disease affects the health and wealth of Nations and individual's alike. In African today, malaria disease is responsible for poverty and other diseases likewise in Nigeria because malaria is a plague of life that a child is born into. Malaria disease is not only a health problem but also an economic problem. Malaria at the household level, affects productivity of the people and assets acquisition capacity (Ajani and Ashagidigbi, 2015).

More so, malaria burden on the rural households creates both psychological and economic imbalance on the rural populace. Incapacitation is also common, since agricultural household labour is disabled temporarily while others work absentmindedly. According to Ajani and Ashadidigbi (2015), malaria is both a health and economic problem eating deeply into the financial base of rural households. It has become a menace in Africa especially in rural area because of the low level of awareness and use of modern preventive measures against mosquitoes that cause malaria. Rural households unlike the fixed wages earners not only loose valuable working hours in treating the sickness but also lose income that would have been generated at the period of attack.

Generally, poor health has been observed to impose sizable economic burden on households. Although, households are constrained by other factors in farm production decisions. Evidence suggests that illness affects farm yields by reducing household's labour supply (Pandey, 2010). Thus, poor health affects productivity of farm inputs, it

may not have direct productivity effect; rather, the disease may affect the household ability to effectively utilize resources (Abiodun and Abayomi, 2013). The effect is higher among poor households who spend a significant proportion of their income on medical expenditures, and are less able to rely on employed labour, thus reducing farm output significantly.

The economic burden of malaria was defined as the total loss or reduction in farm output, household income or wage earnings due to malaria morbidity and mortality. In the theory of production functions, labour is a key input determining the quantity of output that can be produced with a given technology. Other things being equal, the greater the quantity of labour, the larger the volume of crop output produced (Onwujekwe *et al.*, 2015). Poor health or premature mortality due to malaria, however, may have a substantial negative effect on productivity of households if the disease reduces the labour supply. Malaria morbidity in contrast reduces crop output by increasing absenteeism from work, and by reducing work capacity or effort of household members.

Onwujekwe *et al.* (2015) pointed out that ill-health directly affect the quality of labour supplied by the household. They further point out that changes in the health of the household members affect income by changing the household's available time, managerial abilities or productivity of work time. Available evidence show that a single malaria attack, depending on severity, leads to a loss of four or more working days, followed by additional days with reduced work capacity. Lost labour time due to illness implies lower farm output and reduced household capacity to earn income at a time when it needs additional income to pay for medical expenses. Malaria morbidity in contrast reduces output by increasing absenteeism from work, and by reducing work capacity or efficiency of individuals, leading to a decrease in hours of work.

According to Lucas (2014), malaria morbidity also affects intellectual development (cognitive skill, years of schooling and performance of children) considered important determinants of future variations in productivity. Based on this, it can be argued that malaria attacks are a major cause of loss in agricultural output, household income and earnings mainly due to withdrawal of labour from active participation in agricultural activities and from the labour market (Lucas, 2014).

2.4 Cost Implication of Malaria Disease

The cost implications on malaria are direct and indirect cost. The direct cost consist of households and governments expenditure on the treatment and prevention of malaria with associated impact on households` income, wealth, labour productivity and labour market participation of both the sick and caregivers. It is estimated that as much as 13 percent of total small farming households expenditure in Nigeria is used in treating malaria, while many are simply too poor to pay for adequate prevention and treatment of the disease (Oladepo *et al* 2014). The indirect cost of malaria encompasses mortality, morbidity and debility on individual, household and national labour supply with resultant effect on productivity and output. According to Alaba and Alaba (2014),direct cost of malaria includes the out-of-pocket expenditures on treatment and cost of transportation (round-trip) associated with receiving medical care. In this case, treatment costs include expenses on consultation (including laboratory test where relevant) and purchase of drugs.

Parasite malaria remains one of the most severe health problems worldwide and it is a major public health problem in Nigeria. It is the main cause of morbidity and mortality in Sub-Sahara Africa because the environment favours the multiplication and sustenance of the parasite causing the disease (Adeneye *et al.*, 2016). In the African region, Nigeria is known for high prevalence of malaria, bearing up to 25 percent of the disease burden in

Africa. The country contributes significantly to the one million lives lost per year in the region, which mostly consists of children and pregnant women (Oladepo *et al*., 2014).

More so, malaria exerts a huge social and economic burden on families, communities and the country at large with an estimated annual loss of about 132 billion Naira in payments for treatment and prevention as well as hours not worked (Adeneye *et al.,* 2016). Households spend huge share of their scarce resources on malaria prevention and treatment as well as on effort to control mosquitoes. Also, some household members spend their productive time caring for those under malaria attack. This explains why the adverse economic effect of malaria infection is discussed from two indicators: direct costs and indirect costs (Haggaz *et al.,* 2013). Malaria patient's loss of effective work time (number of working days) can be attributed to malaria- related morbidity (complete incapacity) and debility or partial disability. Rural farm households not only lose valuable working hours in treating the sickness but also lose income that would have been generated at this period (Oladepo *et al*., 2014). The loss to households may however be greater with the current trend in malaria resistance to traditional first-line drugs.

According to Oluyode *et al.* (2015), good health is a pre-requisite for a productive and economically viable life. Poor health condition could portend great hardships on farming households, including monetary expenditures, loss of labour, loss of days of works and sometimes death. The health status of family labour affects their ability to work, and thus underpins the welfare of the household. A report by WHO cited impact of poor health on the agricultural workforce as one of the major causes of chronic malnourishment (food insecurity) in Sub-Saharan Africa (Oladepo *et al*., 2014). The report further posited that in Africa, malaria disease is adjudged to be the disease with the most widespread impacts on growth and development among farming population. The implication of this is that

quality time is either lost as a result of incapacitation from malaria or caring for family members affected. This has implication for on- farm labour supply and agricultural productivity (Oladepo *et al*., 2014).

2.5 Effects of Malaria Disease on Well-being Status of Farmers

Malaria as a tropical disease has enormous effect on the well-being status of rural farming populace in Nigeria. The likely effect of malaria infection on farmers well-being status may be seen in the inability of farmers to acquire productive and household assets, lack of access to farm inputs and incentives, loss of productive time, giving rise to decrease in land area put under production, untimely farm operations and consequently decreasing household farm income and food security (Asenso-Okyere *et al.,* 2009). This view was also supported by DeLeire and Manning (2014) that an individual worker who experiences onset of health impairment or absolute illness becomes less productive or unproductive, respectively, while he is working at his or her current occupation. Two strands of effect of labour availability on individual's income established in economic theory are the role of health over wage rate and the part it plays in the decisions relating to supply of labour and, decisions on how many hours of labor to supply (Alaba and Alaba, 2013). According to Alves *et al.* (2014), healthy individuals are expected to possess a higher level of human capital, and would be more productive than those with poor health. At the household level, where fundamental decisions are made, malaria strips families of their main sources of financial and non-financial resources.

Moreover, malaria disease involves both direct and indirect costs; costs of treatment and prevention directly affect farmers well-being status, and often lead to not saving, thereby causing disruption in the economic and social prosperity of the farming populace. Often times, the household may engage some mechanisms such as sale of

productive and household assets, including cash borrowing to cope with cost of malaria treatment. Asenso-Okyere *et al.* (2009) noted that the direct cost of treating and preventing malaria could constrain households to adopt several measures, including reduction in area under cultivation, planting of less labour-intensive crops, changes in cropping patterns, adoption of labor-scarce innovations that may constitute less productive farming techniques and reduction in the use of farm inputs. They further noted that the potential impact of malaria for women engaged in food production can be very significant, especially in some parts of Africa where women account for about 70 percent of agricultural labor force and 60-80 percent of household food crops producers (Food and Agriculture Organization (FAO), 2010). Consequently, malaria infected households may resort to adoption of coping mechanisms such as household labour reallocation and the hiring of labour, these strategies have cost implications.

Malaney (2013) noted that the heavy economic burden imposed by malaria on households could have significant micro-economic consequences as it interferes with household's ability to save and invest in education and physical capital. In terms of education, agricultural experience may be acquired over time, especially in developing countries where majority of farmers do not have formal education. As reported by Oluyode *et al.* (2015), over 90 percent of farming population in agricultural communities in Nigeria did not have formal education. For this reason, farming knowledge represents an important incorporeal asset, which can be lost, especially through death of agriculturally resourceful farmer who may be responsible for spill-over technology adoption in his area.

2.6 Perception of Farmers on Malaria Infection

A number of studies show that African populations do not perceive malaria as a health problem because they do not think that it can lead to death. Oluwatayo (2014) argues that malaria is generally viewed as such a common disease that people scarcely recognize it as deadly. Alves *et al*. (2014) noted that "malaria, a disease associated with high mortality and morbidity, is regarded by many rural people in third world countries as an inevitable part of their lives and less important than poverty, hunger and lack of basic services such as roads, electricity, roads and employment". Oluwatayo (2014) also pointed out that in some hyper- endemic areas in Africa, malaria is so common that people perceive it as a "norm" that does not warrant expenditure of their limited resources.

Alves *et al*. (2014) emphasizes Etkin's point by highlighting that diseases people perceive as common are usually defined by them as routine illnesses such that they do not bother to prevent or treat them adequately. Also, most people do not believe that a person can die of malaria and hence transfer the blame to a human being, especially a witch (Nyamongo, 2012). The perceptual knowledge on the various aspects of malaria disease such as its causation, prevention, mode and agents of transmission, curability, treatment, symptomatology and consequences among other aspects, act either as enhancing or hindering factors in malaria control. As noted by Oluwatayo (2014), the low perception about malaria disease, greatly influences the management strategies that the people take when the disease occurs.

2.7 Management Strategies to Avert Malaria Disease

Federal government of Nigeria and WHO have put in place management strategies to avert malaria infections in the time past, however, year 2010 marked an important milestone on the way towards achievement of internationally agreed goals and targets for malaria control (Asenso-Okyere *et al.,* 2009). It was the date set by the World Health Assembly in 2005 to ensure that at least 80% of those at risk of, or suffering from, malaria

would benefit from major preventive and curative interventions, in order to reduce the malaria burden by at least 50% compared to the levels in 2000 (Alaba and Alaba, 2013).

In 2008, the UN Secretary General set a more ambitious objective: to halt malaria deaths by ensuring universal coverage of malaria interventions by 2010. The aim was to make Indoor Residual Spraying (IRS) and Long-Lasting Insecticidal Nets (LLINs) available to all people at risk of malaria, especially children and pregnant women in Africa, and for all public health facilities to be able to provide reliable diagnosis and effective treatment for malaria(Alaba and Alaba, 2013). Also in 2008, the Global Malaria Action Plan (GMAP) was launched by the Roll Back Malaria Partnership (RBM) as a blueprint for the control, elimination and eventual eradication of malaria, setting as its objective the reduction of the number of preventable malaria deaths worldwide to near zero by 2015.

The strategic approaches to malaria control come within two major domains: (i) prevention and (ii) case management. Together, these strategies work against the transmission of the parasite from mosquito vector to humans, and the development of illness and severe disease (Oluyode *et al.* 2015). Thus, the goals of malaria vector control are two-fold: to protect individual people against infective malaria mosquito bites and reduce the intensity of local malaria transmission at community level by reducing the longevity, density and human- vector contact of the local vector mosquito population. The two most powerful and broadly applied interventions are Long-Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS). These interventions work by reducing human-vector contact and by reducing the lifespan of female mosquitoes (so that they do not survive long enough to transmit the parasite).

Insecticide-Treated Nets (ITNs) which include both LLINs and conventional nets that are later treated with an insecticide, work both by protecting the person sleeping under the

net (individual level) and by extending the effect to an entire area (community level). Personal protection operates by preventing contact between the mosquito and the person under the net. The wider effect occurs when the insecticide in the net actually kills the mosquitoes that touch it, therefore affecting the vector population and lowering the overall intensity of transmission in the targeted area.

However, the protective effect of ITNs for people sleeping outside the net within the same household is less than for those sleeping under the net. Therefore, since 2007, WHO has recommended universal coverage with ITNs (preferably LLINs), rather than a pre-determined number per household (Malaney, 2013). IRS involves the application of residual insecticides to the inner surfaces of dwellings, where many vector species of anopheles mosquito tend to rest after taking a blood meal. IRS is effective in rapidly controlling malaria transmission, hence in reducing the local burden of malaria morbidity and mortality, provided that most houses and animal shelters (e.g. > 80%) in targeted communities are treated.

Achieving universal coverage with effective vector control requires a sustained programme of vector control delivery operations which are carried out correctly and on time (Adeneye *et al.,* 2016).This in turn requires specialized personnel at national and village level. As well as practical experience in the delivery of vector control interventions, these teams must also have the capacity to monitor and investigate vector-related and operational factors that may compromise intervention effectiveness, for which specialized entomological knowledge and skills are essential (Adeneye *et al.,* 2016).

World Health Organization (WHO) recommendations for vector control are the following: Insecticide-Treated Nets. As high coverage rates are needed to realize the full potential of vector control. It was recommended that in areas targeted for malaria

prevention, ITNs should be made available to all people at risk (i.e. “universal access”). However, because of the operational advantages of LLINs over ITNs, most of the vast majority of nets being procured and distributed today are indeed LLINs. In order to meet the target of universal access, it is currently proposed that one LLIN should be distributed for every two persons. At the household level, the distribution of one LLIN for every two members of the household will entail rounding up in households with an odd number of members (e.g. 3 LLINs for a household with 5 members, etc). Because of this rounding up, the achievement of “one LLIN for every two people” at household level requires an overall ratio, for procurement purposes, of 1 LLIN for every 1.8 people in the target population.

LLINs should be provided either free of charge or be highly subsidized. Cost should not be a barrier to making them available to all people at risk of malaria, especially those at greatest risk such as young children and pregnant women. Universal access to LLINs is best achieved and maintained by a combination of delivery systems. According to Malaney (2013), the basic concept is a combination of ‘catch up’ and ‘keep up’. Catch up means mass distribution campaigns, which can rapidly achieve universal coverage of LLINs.

However, it is essential to complement these campaigns with continuous ‘keep up’ delivery systems, particularly routine delivery to pregnant women through ante-natal services and to infants at immunization clinics. In malaria-risk areas, ensuring that these routine systems have the sustained LLINs stocks needed to provide an LLIN to all pregnant women receiving medical care, and to all infants receiving routine immunization, should be given as much4. In order to be protected, households must not only own LLINs, but also use them (Oladepo *et al*., 2014). Behaviour change interventions including information, education, communication (IEC) campaigns and

post-distribution “hang-up campaigns” are strongly recommended. Only LLINs recommended by the WHO Pesticide Evaluation Scheme (WHOPES) should be procured by national malaria control programmes and partners for malaria control.

At present there are 12 recommended products. Detailed guidance on good practice in the handling and use of pesticides, and on quality control in procurement, can be found on the WHOPES website. Independent quality control of products (including insecticides) should be undertaken before shipment, to ensure that sub-standard products are not delivered to countries. The supplier of pesticide should bear the cost of analysis, including for samples to be sent to an accredited or recognized laboratory for analysis for countries that do not have national quality control laboratories (Onah *et al*., 2014).

It is therefore recognized that the lifespan of LLINs is variable, among settings and among products. Therefore, all large-scale LLIN programmes (including those implemented by non-governmental organizations) should make efforts to monitor LLIN durability in the local setting, using standard methods published in 2011. The collection of local data on the comparative durability of alternative LLIN products, using rigorous and auditable methods, is expected to enable procurement decisions to be made on the basis of “price per year of protection” rather than unit price per net; this in turn is expected to bring rapid and potentially substantial cost savings. This is important because LLINs represent a large proportion of the global malaria control budget.

According to Oladepo *et al*. (2014), Indoor residual spraying (IRS) is applicable in many epidemiological settings, provided the operational and resource feasibility are considered in policy and programming decisions. IRS requires specialized spray equipment and techniques, and both the equipment and the quality of application must be scrupulously maintained currently, insecticides belonging to chemical classes are recommended by

WHOPES for IRS. An insecticide for IRS is selected in a given area on the basis of data on resistance, the residual efficacy of the insecticide, costs, safety and the type of surface to be sprayed.

DDT has a comparatively long residual efficacy (≥ 6 months) as an insecticide for IRS. The use of DDT in agriculture is banned under the Stockholm Convention, but countries can use DDT for IRS for as long as necessary and in the quantities needed, provided that the WHO guidelines and recommendations are followed and until locally appropriate, cost-effective alternatives are available for a sustainable transition from DDT Roll Larva control (Roll Back Malaria, 2001). In a few specific settings and circumstances, the core interventions of IRS and LLINs may be complemented by other methods, such as larval source control including environmental management. However, larval control is appropriate and advisable only in a minority of settings, where mosquito breeding sites are few, fixed and easy to identify, map and treat. In other circumstances, it is very difficult to find a sufficiently high proportion of the breeding sites within the flight range of the vector (Roll Back Malaria, 2001).

2.8 Constraints Associated with Malaria Disease Treatment

The introduction of malaria treatment is facing a number of challenges. It has resulted in over-prescription of antibiotics that pose a threat on drug resistance. There are also a number of shortcomings related to the performance and accuracy of the tests, which depend on test preparation and interpretation. Incorrect preparations and interpretation of test results could result into incorrect diagnosis, leading to unnecessary use of anti-malarial treatment and therefore failure to address the real cause of fever in patients who do not have malaria (Abiodun and Abayomi, 2013). Malaria disease rapid diagnostics are conducted

by detecting evidence of malaria parasites in human blood. The fact that the currently available treatment suffer from low sensitivity when used in individuals with low malaria parasitaemia emphasize the need for the test to be used in conjunction with other methods to confirm the results, characterize infection and monitor treatment.

2.8.1 High cost paid by farmers

The high costs treatment malaria, together with recognition of the importance of non-malaria fevers, has prompted a reconsideration of anti-malaria strategies based on evidence of malaria parasitaemia. WHO has recommended the need for parasitological confirmed anti-malarial treatment where possible and whenever malaria is noticed (Abiodun and Abayomi, 2013).

2.8.2 Inadequate human resources

Delivering public health services requires functional and effective country level system capable health leaders, qualified healthcare providers, effective human resource system, reliable health information, adequate physical infrastructure and many critical inputs (Oladepo *et al*., 2014). However, most of these are not always available in the diagnose, manage cases, prevent transmission and adequately track malaria.

2.8.3 Malaria surveillance

Despite the success recorded in malaria control in Nigeria, the disease surveillanc e system is weak. The effectiveness of a surveillance system and facility levels depends on the ability of staff to utilize the information properly. Since 2001, Nigeria has been making concerted efforts to strength its Integrated Disease Surveillance and Response

system. In this system, malaria is one of the priority diseases that are to be reported monthly (Njau *et al.,* 2013).

2.8.4 Inadequate local budget and donor-dependence

Majority of the activities in the strategic plan of the national malaria control programme in Nigeria is funded by donors. Much of the Nigerian successes in malaria can therefore be attributed to the financial support from the Global Fund to Fight AIDS, Tuberculosis and Malaria coupled with US Presidents Initiative. The Global Fund contributes two-third of the world's funding for malaria programme, and since its inception has supported distribution of more than 230 million ITNs and a similar number of doses of artemisinin based drug. Unfortunately, the donor funding has spawned dependency and expectation among its recipients in Nigeria (Njau *et al.,* 2013). The current malaria interventions are vertically planned and implemented and there is less involvement of the community. It is very vital for community to be fully involved and the leaders carry along in the treatment and control of malaria.

2.8.5 Resistance to common drugs

Resistance to drugs like artemisinin (a vital component of drugs used in the treatment of P. falciparum) malaria has been reported in a growing number of countries in Africa, pyrethroids, and the insecticides used in ITNs has been reported in 27 countries in Africa and 41 countries worldwide of becoming less effectives (Onah *et al.,*2017). Unless properly managed, such resistance potentially threatens future progress in malaria control in Nigeria.

2.8.6 Displacement due to communal clashes, conflicts and insurgency

Large non-immune populations to endemic areas, resettlement of refugees to deteriorated environments that favour vector breeding (e.g., inadequate sanitation, marginal land),

disruption of disease control programmes, breakdown of health systems and impeded access to populations for timely delivery of medical supplies (Onah *et al.*,2017). There is virtually no city in Nigeria that is not affected by communal clashes leading to a breakdown of health systems and impedes efforts in combating malaria.

2.8.7 Favorable climatic condition for vector breeding

Tropical areas such as Nigeria have the best combination of adequate rainfall, temperature and humidity allowing for breeding and survival of Anopheles mosquitoes. Temperature is an important factor through which its effect on the development of malaria parasite and vector greatly influences the geographical distribution of malaria transmission in general and malaria parasite species in particular.

The development of P. *falciparum* in the female adult Anopheles requires a minimum temperature of 20 °C whereas the other human malaria species can develop at temperature down to a minimum of 16 °C. Higher than the minimum temperature, the development of the parasite in the vector accelerate with increasing Temperature (Onah *et al.*, 2017).

2.8.8 Inadequate finance to control and prevent malaria

At the household level, poor housing exposes people to contact with infective mosquitoes, as insecticide treated nets are unaffordable to the poorest if they must pay for them, and lack of resources prevents people from seeking timely healthcare. Studies have revealed that a substantially higher prevalence of malaria infection occurs among the poorest population group and that the poorest were most susceptible to contracting malaria (Njau *et al.*, 2013).

2.8.9 Lack of knowledge about the causes and control of malaria

Misconceptions about the cause of malaria are reported in researches from all over the globe (Wakgari *et al.,* 2014). A study in Benue State, Nigeria showed that residents of both urban and rural areas still have misconceptions about the cause of malaria. Some attributed malaria to spirits/charm, poor nutrition and stress (Onah *et al.,*2011). These are major socio-cultural setbacks in malaria treatment and control. All these contribute to the discrepancies in health seeking behavior and may cause delay in seeking appropriate treatment.

2.8.10 Poor availability and access to standard health care system

Lack of good roads to the health centers, poorly equipped centers, inadequate drugs for malaria treatment, anti-malarial medicines and as well as available ratio of patients to a doctor is alarmingly high. As a result of this, this is encouraging patients to seek treatment from unauthorized local health service providers, which often lead to further complications (Onah *et al.,* 2017).

2.9 Theoretical Framework

2.9.1 Theory of human capital

The human capital theory, developed in the 1960s by Becker (1965) and Grossman (1972), implies that low health has repercussions on the productivity of the working population and thus on production, salaries and income. In seeking to check this theory, some economists, studying yields and productivity in the field of agriculture, have observed that the production and consumption of households can be modified as a result of the deterioration in the health of its members. In a study carried out in Côte d'Ivoire, Audibert *et al.* (2003) showed that households producing cotton, whose working

members were proportionately more infected with malaria, were less efficient than households whose working members were less or not at all infected.

In Indonesia, Gertler and Gruber (2002) assessing the aptitude of Indonesian households to maintain their consumption when illness occurs, demonstrated the major effect of health on the number of hours worked and on earnings. Based on the same arguments, this time in Vietnam, Wagstaff (2007) also observed the effect of illness on income. Behrman *et al.* (2009), studying health in the past (weight at the time of birth), demonstrated that it has an effect on future earnings of adults. In a study carried out in Côte d'Ivoire (Giradin *et al.,* 2004) found that households engaging in intensive vegetable production, whose active members were persistently infected by malaria disease, suffers produced about half the yields and half the incomes that healthy farmers did.

Sachs and Malaney (2002) in their studies come to conclusion that malaria disease have serious effect on socio-economic of rural households and slow down economic development through many ways, including but certainly not limited to quality of life, population growth, savings and investment, workers productivity and medical cost.

2.10 Conceptual Framework

The conceptual framework figure 2.1 shows the relationship between dependent, independents and intervening variables. The dependent variable of the study is well-being status, while the independent variables are; socio-economic characteristics are effect of malaria infection on rice production, prevalent measures put in place to avert malaria infection. The intervening variables include; culture, norms, government policy, beliefs and cooperative societies. Age is expected to have both negative and positive effect on malaria infection, elderly people in the rural farming families may find it difficult to produce rice in large quantity to enhance their well-being status, and this may be due to

malaria infection which may weigh them down. Education plays a vital role in the production of rice for better well-beings. The more educated the rural farmers are, the more likely they would produce rice for enhance well-being because of their level of awareness and exposure. Also, this may assist in reducing the incidence of malaria.

Rural farmers with higher income are more likely to produce rice for more improved well-being because of their privilege position to acquire more tools for rice production and they could easily access improved medical cares for malaria control. Rural farmers with large household sizes are expected produce more rice to improve well-being as a result of family pressure. They are also liable to spend substantial amount of their income in taking care of those affected by malaria within their household. Effect of malaria on rice production is expected to negatively influence farmers' well-being status. This might arise when farmers are down due to malaria infection which might have negative effect on their production, income and well-being status.

The cost implication of malaria is expected to influence rice farmers' well-being status negatively in the study area. Also, preventive measures put in place to avert malaria infection is expected to have positive effect on rice farmers well-being, implying that when preventive measures are put in place to avert malaria, it is expected that the output of rice farmers would improve and this will go a long way to enhance their well-being. More so, the constraints faced by farmers' on treatment malaria infection which among others include improper knowledge of farmers about preventive measures for malaria is expected to negatively influence their well-being. Intervening variables such as government policy, norms and culture influences rice production positively and negatively.

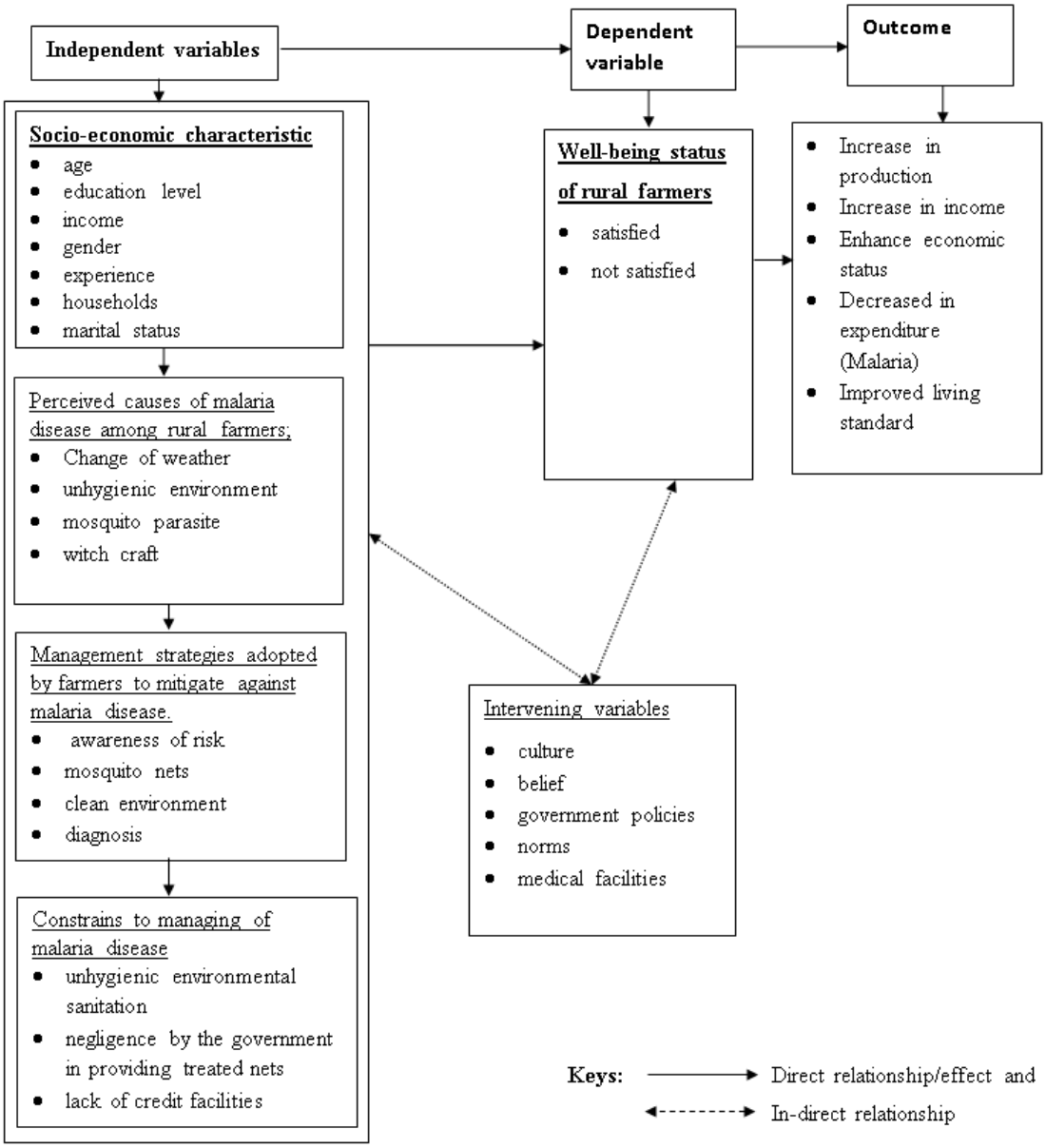

Figure 2.1: Conceptual framework showing effect of malaria disease on well-being of rice farmer and output

Source: Adapted and Modified from Afeez *et al.* (2018)

CHAPTER THREE

3.0 METHODOLOGY

3.1 The Study Area

The study was conducted in Niger State which is located in the Guinea Savannah ecological zone of Nigeria, the State has the largest land mass among the States in Nigeria with total land area of 76,364 km^2 accounting for about eight percent of Nigeria land areas. About 95% are good for arable land production of staple crops like rice, cassava, and guinea corn (Niger State Agricultural Mechanization and Development Authority (NAMDA), 2018). The State lies between Latitude 8^o 20' and 11^o 30' North and Longitude 3^o 30' and 7^o 20' East with a population of about 3,950,249 (National Population Commission) NPC 2006 with a growth rate of 3.9%. The State has an estimated population of 6,374,000 in 2018 (Niger State Geographical Information System (NSGIS), 2018). Ninety percent of the State populations are farmers (Aminu and Samuel, 2018). The State shares a common international boundary with the Republic of Benin at Babana in Borgu Local Government Area (NSGIS, 2018). Niger State consist of 25 Local Government Areas (LGAs) that are grouped into three (3) Agricultural zones I, II, III with the zones having eight, nine and eight LGAs, respectively.

Niger State experiences distinct dry and wet seasons with annual rainfall varying from 1,100mm in the Northern part to 1,600mm in the Southern parts. The average annual rainfall is about 1,400mm. The duration of the rainy season is approximately 180 days. The wet season usually begins in April/May to October, while the dry season starts from November and ends in March. Its maximum temperature is usually not more than 35^oC which can be recorded between December and January. The mean average temperature is around 32^oC as dry season commences in October. However, Nupe, Gwari and Hausa are the major ethnic groups in the State. There are other minor ethnic groups such as Koro,

Kakanda, Kadara, Baraba, Ganagana, Dibo, Kambari, Kamuku, Pangu, Dukawa, Gwada, Ingwai, Igboand Yoruba are the other tribes who settle in the State. The State is one of the richest in the country in term of her tourism. Some of the centre of attraction are Zuma Rock, Gurara falls, Baro empire hill and Lord Lugard colonial runs at Zungeru.

The most predominant soil type of the State is the ferruginous tropical soils. The soils are fertile, its hydrology permit the cultivation of most of Nigeria staple crops and still allows sufficient opportunities for grazing, fresh water fishing and forestry development. The State is blessed with abundant mineral resources such as gold, clay, silica, kyanite, marble, copper, iron, feldspars, lead, columbite, kaolin and tantalite (NSGIS, 2018). Some of the tree crops are Mango, citrus, coconut, cashew, banana and pawpaw. The inhabitants of the State also rear some livestock like goats, sheep, cattle and chicken among others. The other non-agricultural activities engaged in by men include blacksmithing, leatherwork, mat and basket making, trading, while women also engage in technical handicraft and trading (NSGIS,2018)

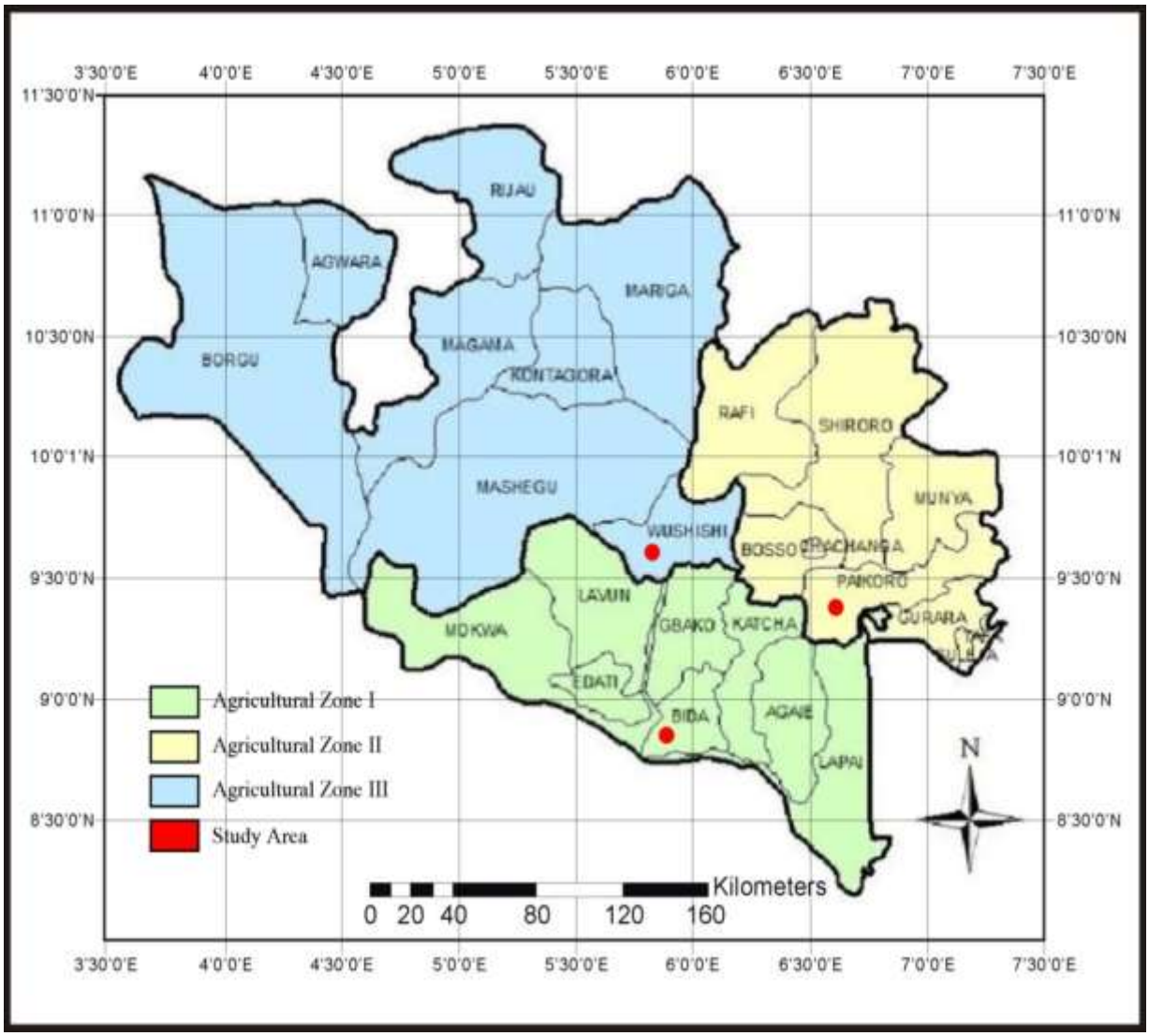

Figure 3:1: Map of Niger State showing selected Local Government Areas where study was conducted

3.2 Sampling Procedures and Sample Size

Multi-stage sampling procedure was used for the study. The first stage involved purposive selection of Agricultural Zone I (total extension blocks 63, number of cells 63 number of sub-cells 441), II (total extension blocks 14, number of cells 93, number of sub-cells 651) and III (total extension blocks 17, number of cells 75, number of sub-cells 525) (the state has total number of 46 blocks, 231 cells and 1617 sub-cells) in order to establish equal representation. The second stage involved random selection of one (1) Extension Block from each of the zones selected to get a total number of three (3) Extension Blocks. The third stage involved random selection of two (2) Extension Cells from each of the Extension Block to get a total number of six (6) Extension Cells. The fourth stage involved random selection of two (2) Sub-Cells from each of the Extension Cell to get a total of twelve (12) Sub-Cells. The fifth stage involved proportionate sampling by 10% the farming households based on the sampling frame of each sub-cells obtained from NAMDA, 2018. In overall, a total of 199 respondents was selected as the sample size for the study.

Table 3.1: Distribution of Respondents in the study area

Zones	Extension Block (46)	Cell (231)	Sub-Cell (1617)	Sampling frame	Sample Size (10%)
Agricultural Zone I	Bida	Kuchitagi	Kuchitagi	202	20
			Kupafu	172	17
(B 15, C 63, SC 441)					
		Ndakama	Mungorota	122	12
			Emishiru	137	14
Sub total		**2**	**4**	**633**	**63**
Agricultural Zone II	Paiko	Paiko	Tatiko	113	11
			Lugodan	116	12
(B 14, C 93, SC 651)		TunganMallam	BakaJeba	124	12
			Jedna	191	19
Sub total		**2**	**4**	**543**	**54**
Agricultural Zone III	Wushishi	Wushishi	Wushishi	252	25
			Bankogi	220	22
(B 17, C 75, SC 525)		Maito	Maito	182	18
			TunganKawo	181	17
Sub total		**2**	**4**	**816**	**82**
Grand Total	**3**	**6**	**12**	**1992**	**199**

Source: Niger State Ministry of Agriculture and Rural Development (2018)
Keys: B=Block, C=Cell, SC=Sub-Cell

3.3 Method of Data Collection

Primary data were used for this study. The data were collected by the researcher and trained enumerator with the aid of structured questionnaire complimented with interview schedule. Data were collected on socio-economic characteristics, cause of malaria, perceived effects, well-being, preventive/control measures and constraints. The period of data collection last for two months.

3.4 Measurement of Variables

3.4.1 Dependent Variable

The dependent variable of study is the well-being status of the rural farming households. This was determined using personal well-being index by Fatoki and Ajibola (2020). The personal well-being index is graduated using a scale ranging from 0 – 10. The scale measures the degree of well-being satisfaction that begins with no satisfaction at all (0),

extremely dissatisfied (1), very dissatisfied (2), dissatisfied (3), neither dissatisfied (4), undecided (5), neither satisfied (6), satisfied (7), very satisfied (8), extremely satisfied (9) and completely satisfied (10). Respondents were asked to indicate the level of their satisfaction with respect to well-being indicators such as condition of living despite malaria infection, personal health despite malaria infection, live achievement despite malaria infection, personal relationship despite malaria infection, personal safety despite malaria infection, community connectedness despite malaria infection, future security despite malaria infection, spiritual/religion despite malaria infection. This was aggregated (0+1+2+3+4+5+6+7+8+9+10=55) and then divide by 10 to obtain a mid point scale of 5.5 and above which was considered as satisfied, any mid point scores less than 5.5 was considered not satisfied.

3.4.2 Independent variables

(A) Socio-economic characteristics of the respondents

i. **Age: -** This was measured by the actual number of years of the farmers at the time of data collection.

ii. **Sex: -** This was measured as dummy variable either male or female as 1 was assigned for male and female was assigned 0

iii. **Farm size:** This was measured in hectares (ha)

iv. **Education:** This was measured by the number of years spent in formal education.

v. **Farming experience:** This was measured in years.

vi. **Household size:** Household size here refers to the number of people in a household i.e. man (husband) with his wife or wives, their children, grand-children, and other dependents living with them. This was measured in number

vii. **Annual income from rice production:** referred to the total earnings of a respondent from agricultural during the previous year. This was measured in Naira

viii. **Access to extension:** This is the numbers of time the farmers had access to extension agent during the farming season which can be on weekly, for thnightly, monthly, and quarterly or annually. This was measured by number of visits

ix. **Cooperative membership:** This was measured by number of cooperatives the respondents belong (number)

x. **Distance to treatment centre:** (kilometer)

xi. **Access to credit**: This the amount received by the respondents over a period of one year. This was measured as amount received in Naira

xii. **Malaria infections:** Training attended. This is measured in number of times

xiii. **Amount spent on treatment of malaria per annum:** This was measured in naira

xiv. **Output:** This was measured in kilogram (rice)

(B) Perceived causes of malaria

Perception such as cold and rain, dirty food, contact with sick fellow, mosquito parasites, changes in weather was measured using 5 point Likert scale, and were allotted as follows: Strongly Agreed(5), Agreed(4), Undecided (3), Disagreed(2), and Strongly Disagreed(1). A mid point scale of 3.0 was obtained by adding 1+ 2+ 3+ 4+ 5=15 and dividing by 5. The decision rule was any mid point ($\overline{X}$) scale equal 3.0, indicates agree, while scores less 3.0 were termed disagree.

(C)Perceived effects of malaria disease on well-being status

Malaria disease has direct effect on the well-being status of rural farming households in Nigeria. The likely seen effects may include inability of farmers to acquire productive

and household assets, inadequate assess to farm inputs and incentives, loss of productive time, decrease in household farm income and food security among others. This was measured using 5-points Likert rating scale of Strongly Agreed (SA)=5, Agreed (A) =4, Undecided (UND) =3, Disagreed (D) = 2 and Strongly Disagree (SD) = 1. These were added together to get 5+4+3+2+1= 15 and will be divided by 5 to get a mid point scale of 3.0 which served as the mid point. Mid point scale value that is less than 3.0 were regarded as Disagreed, while any mean score value that is equal or above 3.0 was regarded as Agreed.

(D) Preventive and control measures of malaria disease

This was measured by using Adoption index that gave an absolute measurement of adoption rate. The obtained final scores was categorized into three groups, low adopters, medium adopters and high adopters. A mean value of 8 was obtained by dividing the 16 measurements by 2. The decision rule was any score that is less than 8 was regarded as low Adopters, any scores that is between 8-12 was regarded as moderate Adopters while any scores that is above 12 was regarded as high Adopters.

(E) Constraints faced in treating malaria disease

This was measured using 3 point Likert type rating scale of Very severe (3),Severe (2) and Not Severe (1). A mean score value of 2.0 was obtained by adding 1 + 2+ 3 = 6 and divide by 3. The decision rule is any mid point ($\overline{X}$) scale equal or greater than 2.0 indicates Severe, while mid point scale less than 2.0 were termed not severe.

3.5 Method of Data Analysis

Both descriptive and inferential statistics used to analyses data collected. Objective i, ii, iii, v and vi were achieved using descriptive statistics (such as frequency counts,

percentage and mean), while Objective iv which is the determinants of well- being status was achieved using inferential.

3.6 Model Specification

3.6.1 Ordinary Least Squares

Ordinary least squares (OLS) was used to achieve the determinants of well-being status of the farming households (objective IV).

The model is expressed in implicit form as shown in equation (1):

$$Y = f(X_1, X_2, X_3, X_4, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}U) \quad (1)$$

The explicit form of the model is expressed below:

$$Y = a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5\beta_6X_6\ \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11+} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + U \quad (2)$$

Where;

Y=well-being status of the rural farmers (measure using well-being score)

X_1= Amount spent on malaria treatment (naira)

X_2 =Household size (number of people)

X_3 = Farm size (hectare)

X_4 = Age (years)

X_5 = Sex (male-1 or female-0)

X_6 = Education (years)

X_7 = Extension contact (number of contact per year)

X_8 = Credit access (naira)

X_9= Malaria infection (number of infection per year)

X_{10}= Distance to treatment centre (km)

X_{11} = Farming experience (measured in years)

X_{12} = Output (kg)

X_{13} = Membership of association (number)

X_{14} = Annual income (naira)

a = intercept

b_1 - b_{14}= coefficient of the value

x_1 - x_{14}= independent variables

3.6.2 Pearson`s Product Moment Correlation (PPMC)

The Pearson product moment correlation is a statistic that measures linear correlation between two variables X and Y. It has value between +1 and -1.Hypothesis ii of the study was tested using correlation analysis. The formula is given below:

$$r_{xy} = \frac{n\Sigma XY - \Sigma X \Sigma Y}{\sqrt{[n(\Sigma X^2) - (\Sigma X)^2][n(\Sigma Y^2) - (\Sigma Y)^2]}} \quad (3)$$

Where:

r = correlation coefficient

Y = well-being status

X = perceived effect of malaria disease

N = total number of observations

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristic of Rural Households in the Study Area

The socio-economic characteristics of the farmers under consideration include sex, age, marital status, household size, years of farming experience, educational level, primary and secondary occupation of the rural households.

4.1.1 Sex of the respondents

Table 4.1 indicated that majority (79.9%) of the rural farming households in the study area were male, while 20.1% were female. This implies that majority of rural farming households in the study area were male. Male dominance could have negative effect on the wellbeing status and productivity of the households once the household head is incapacitated as a result of malaria infection that causes partial separation from farming activities for days. Rice farming is more prone to harboring malaria parasite and male are more expose to farming activities. This finding agrees with that of Oyibo *et al*. (2020) who reported that men were more affected by malaria incidence in Kogi State, Nigeria.

4.1.2 Age of the respondents

Table 4.1 showed that 62.3% of the respondents were between the age range of 31-50 years. The mean age of the respondents was 42 years, implying active and productive age in which new innovation and improved practices are often adopted in order to enhance their wellbeing status. On the other hand, households at this age are expected to witness increase in production, given a healthy living condition devoid of malaria and other productivity diminishing problems. This finding is in agreement with Ajani and Ashagidigbi (2015) who reported that the mean age of farming households affected by malaria in Oyo State was 41 years

Table 4.1: Distribution of respondents according to socio-economic characteristics (n=199)

Variables	Frequency	Percentage	Mean
Sex			
Male	159	79.9	
Female	40	20.1	
Age (years)			

<30	34	17.1	**42**
31-50	124	62.3	
>50	41	20.6	
Marital status			
Married	166	83.4	
Single	31	15.6	
Separated	1	0.5	
Widow	1	0.5	
Household size			
1-10	136	68.4	**8.0**
11-15	35	17.6	
16-20	22	11.1	
>20	6	3.0	
Size of farm land			
≤1.0	75	37.7	**2.0**
1.1-2.0	70	35.2	
2.1-3.0	32	16.1	
>3.0	22	11.1	
Farming experience (years)			
1-10	47	23.6	**22**
11-30	104	52.3	
>30	48	24.1	
Level of education			
Non-formal	68	34.2	
Primary	11	5.5	
Junior	9	4.5	
Secondary	56	28.1	
Diploma/NCE	39	19.6	
HND/Degree	15	7.5	
Others	1	0.5	
Years spent in school			
1-6	9	4.5	**9**
7-12	65	32.7	
>12	56	28.1	
None	69	34.7	
Farming status			
Full time	125	62.8	
Part time	74	37.2	

Source: Field Survey (2021)

4.1.3 Marital status of the respondents

Table 4.1 indicated that 83.4% of the respondents were married while 15.6% were single. This denotes that majority of rural households in the study area were married which could be an additional family responsibilities, thus could negatively affect their wellbeing status. Also, married households are likely to be prone to malaria infection than unmarried ones due to presence of children and older ones with compromise immune system. This finding is in consonance with that of Oyibo *et al.* (2020), who reported that larger proportions of farming households affected by malaria in Kogi State were married.

4.1.4 Household size of the respondents

Table 4.1 showed that majority (68.4%) of the respondents had between household members range of 1- 10. The mean household of the respondents was 8 persons. This signifies large household size. Large household size could be advantageous in the provision of unpaid family labour that will go a long way in improving the wellbeing status. This finding is in consonance with that of Onuche *et al.* (2014) who reported that large household size had implication for labour availability that would reduce amount of income spends in hiring of paid. However, this could negatively affect income and wellbeing status of households with high incidence of malaria infection.

4.1.5 Years of farming experience of the respondents

Table 4.1 revealed that the mean farming experience of households in the study area was 22 years, signifying many years in farming in which proper preventive measures would have been adopted that will reduce persistence malaria infection that is expected to have negative effect on the well-being status of the households. Also, high years of farming experience could imply acquisition of practical experience, farming skills and techniques

expected to be gained over many years that would improve the productivity and wellbeing status of farming households (Oyibo *et al.,* 2020).

4.1.6 Level of education of the respondents

Table 4.1 showed that 34.2% of the respondents had non-formal education while 65.2% had formal education. The mean years spent in formal education in the study area was 8.7 years, which is considered as low literacy level. Low literacy can negatively affect households in taking proactive measures that will prevent malaria infection thereby making them to spend more on malaria treatments which in turns have negative effects on their well-being status. This agrees with Ibitoye *et al.* (2016) who reported that educational status of an individual plays a significant role in their health status of farming households. It is expected that educated farmers are well equipped with both preventive and curative strategies.

4.1.7 Farming status of the respondents

Table 4.1 revealed that 62.8% of the respondents were full-time farmers while 37.2% were part-time farmers. This finding implies that majority of the respondents were full-time farmers. However, recurrent malaria infection will have negative effect on the productivity and wellbeing status of farming households that do not have other means of livelihood apart from farming.

4.1.8 Primary occupation of the respondents

Table 4.2 showed that 62.3% of the households were crop farmers while 12.1%, 8%, 7%, 2.0% and 1.5% were agro-processors, traders, civil servants, livestock farmers, students and artisan respectively. This implies that most of the respondents are crop farmers. This scenario is peculiar to most rural area where majority engaged in crop farming. This

finding agrees with that of Ayantoye *et al.* (2017) who reported that crop farming is high among farmers in Kwara State, Nigeria.

4.1.9 Secondary occupation of the respondents

Table 4.2 revealed that 30.7% of the households were crop farmers while 25.1% were livestock farming. Also, 13.1%, 7.5%, 6.5%, 4.5% and 3.0% were traders, civil servant, artisan and agro-processing respectively. This finding implies that larger proportion of the rural households engaged in other farming enterprises. This will assist their wellbeing status during peak period of food scarcity. This finding concurs with that of Baiphethi and Jacobs (2015) who stressed that secondary occupation enable rural households to diversify their sources of income in order to manage risk and uncertainties in farming business.

4.1.10 Size of farm land of the respondents

Table 4.1 indicated that the mean farm size of respondents in the study area was 2 hectares, implying that households produced on small scale mainly for family consumption and little for sales. Small farm size households may not likely susceptible to malaria illness because of less drudgery nature of crop farming, and less emotional stress unlike households that cultivate on large hectares (Ochi *et al*., 2015). Small farm holding could negatively affect households' productivity and wellbeing status, when the productive household members are down with malaria infection.

4.1.11 Method of land acquisition by the respondents

Table 4.2 showed that 59.8% of the respondents acquired land through inheritance while 20.6% rented their land. Also, 11.1%, 5.5% and 3.0% acquired land through gift, leasehold and purchase respectively. This implies that most of the respondents inherited

their farm land. This result is also in agreement with Zalkuwi (2019) who reported that larger proportion of farmers inherited their farm land.

4.1.12 Annual farming income of the respondents

Table 4.2 revealed that the mean annual income of households in the study area was ₦503,394.5, indicating improved income among the rural farming household. This could be advantageous in the purchasing of drugs and prevention of malaria infection in order to improve rural household wellbeing status. This agrees with Munongo and Chitungo (2013), who stated that households with low income might find it difficult to cope with effect of malaria infection unlike their counterparts with higher income and this is expected to affect their wellbeing status.

4.1.13 Annual non-farm income of the respondents

Table 4.2 showed that the mean non-farm farm income of rural household in the study area was ₦330,889.4, indicating that rural farming household diversified into other income generating activities aside from farming and could probably afford the cost of malaria treatment in the study area for sustainable wellbeing status. This finding is in agreement Batool *et al.* (2017) who reported that farmers engaged in off-farm activities as a means of shielding themselves from risk and the uncertainties associated with agricultural production.

Table 4.2: Distribution of respondents according to their socio-characteristics continued

Variables	Frequency	Percentage	Mean
Primary occupation			
Crop farming	124	62.3	
Livestock farming	4	2.0	
Fish farming	0	0	
Trading	16	8.0	
Civil servant	14	7.0	
Artisan	3	1.5	
Agro-processing	24	12.1	
Student	4	2.0	
Secondary occupation			
Crop farming	61	30.7	
Livestock farming	50	25.1	
Fish farming	15	7.5	
Trading	26	13.1	
Civil servant	13	6.5	
Artisan	9	4.5	
Agro-processing	6	3.0	
Tailoring	1	0.5	
Transportation	5	2.5	
Teaching Quran	1	0.5	
Method of land acquisition			
Purchase	6	3.0	
Rent	41	20.6	
Leasehold	11	5.5	
Gift	22	11.1	
Inheritance	119	59.8	
Annual farming income (₦)			
≤100000	33	16.6	**503,394.5**
101000-200000	41	20.6	
201000-300000	38	19.1	
301000-400000	30	15.1	
>400000	57	28.6	
Annual non-farm income(₦)			
≤100000	34	17.1	
101000-200000	66	33.2	**330,889.4**
201000-300000	21	10.6	
301000-400000	13	6.5	
>400000	56	28.1	
None	9	4.5	

Source: Field survey (2021)

4.1.14 Institutional variables

4.1.15 Extension access by the respondents

Table 4.3 indicated that 77.4% of the households have access to extension services while 22.6% did not receive extension services. This implies that access to extension services can assist rural households to combat malaria infection and also improved their wellbeing. On the frequency of contact, 42.2% and 19.6% of the respondents were visited monthly and biweekly respectively. The mean numbers of extension contact was 8.0 times, implying adequate access to extension services delivery among rural households in the study area. This findings is in consonance with that of Abiodun and Abayomi (2013) who stated that access to extension service as at when due will not only enhance wellbeing but also expose farmers to preventive measures needed to combat malaria infection.

4.1.16 Access to credit by the respondents

Table 4.3 revealed that 20.1% of the respondents had access to credit while majority (79.9%) did not access credit. This implies that majority of rural households do not have access to credit. Indicate credit access could negatively affect prevention and treatment of malaria among farming households that will go a long way in determining their level of productivity and wellbeing status. Also, 7.5%, 5.5% and 3.5% accessed credit from cooperative society, family and friend and microfinance respectively. This result concur with that of Obinaju and Asa (2014), who through their findings reported that majority of the respondent in AkwaIbom State of Nigeria had no access to credit.

4.1.17 Cooperative membership by the respondents

Table 4.3 revealed that 68.3% of the respondents belong to cooperative while 31.7% did not belong to any cooperative society. This implies that most of the respondents belong to one cooperative society or the other. Membership of cooperative grant rural households' access to information and incentives needed for prevention, treatment and

control of malaria for better productivity and wellbeing status of farming households. Also, 52.3%, 13.5% and 2.5% of the respondents belong to one, two and three cooperatives respectively. The mean years spent in cooperative by rural farming households was 10 years, implying better experience in cooperative that is expected to influence farming households' willingness to prevent malaria infection for better productivity and wellbeing status. This result is in line with that of Yebisi (2014), who opined that membership of cooperative increase households' access to vital information that will increase their wellbeing status.

4.1.18 Distance to health centers

Table 4.3 showed that the mean distance to healthcare centers by the respondents was 5.0 kilometers, signifying that rural households tend to embark on long distance before accessing improved medical assistance. This could probably result to death and negative implication on well-being status. This finding agreed with Oyibo *et al.* (2020), who reported that majority of rural households in Nigeria lack adequate access to improved health centers. Long distance also discourages health expert visit thereby reducing rural households' access to effective treatment on malaria infection (Onuche *et al.*, 2014).

Table 4.3: Distribution of respondents according to institutional variables (n= 199)

Variables	Frequency	Percentage	Mean
Extension access			
Yes	154	77.4	
No	45	22.6	
Frequency of extension visit			
Weekly	15	7.5	
Biweekly	39	19.6	
Monthly	84	42.2	
Quarterly	13	6.5	
Annually	3	1.5	
None	45	22.6	
Numbers of extension visit			
1-5	45	22.6	**8**
6-10	59	29.7	
11-15	30	15.1	
>15	18	9.1	
None	47	23.6	
Access to credit			
Access	40	20.1	
Not access	159	79.9	
Amount of credit (₦)			
50000	11	5.5	**25,276**
51000-100000	14	7.0	
>100000	15	7.5	
None		80.0	
Sources of credit			
BOA	1	0.5	
Commercial	1	0.5	
Family and friend	11	5.5	
Cooperative	15	7.5	
Microfinance	7	3.5	
Money lender	5	2.5	
Cooperative membership			
Yes	136	68.3	
No	63	31.7	
Number of cooperative			
One	104	52.3	
Two	27	13.6	
Three	5	2.5	
None	63	31.7	
Years of cooperative membership			
1-5	25	12.6	**10**
6-10	30	15.1	
11-15	32	16.1	
15-20	34	17.1	
>20	15	7.5	
None	63	31.7	
Distance to healthcare center (km)			
1-2	107	53.8	**5**
3-4	62	31.2	
>4	30	15.1	

Source: Field Survey (2021)

4.2 Perceived Causes of Malaria Disease

Table 4.4 showed that respondents in the study area agreed with the following causes of malaria infection; mosquito parasite ($\bar{X}$ =4.52) ranked 1st, this was followed by poor sanitation ($\bar{X}$ =4.17) which ranked 2nd. This could be associated to with fact that dirty environment serve as hide out for malaria vector thereby increases famers' exposure to mosquito bite. Farming household members could also be exposed to malaria as a result of frequent farming activities and its related stress. This finding concur with that of Ibrahim *et al.* (2017), who reported that agricultural activities increases exposure of individuals to mosquito bites which could lead to malaria transmission. Also, change of weather ($\bar{X}$ =3.55) ranked 3rd. It is expected change in weather is always accompanied by fever that could negatively affect farming households productivity and wellbeing status. This finding agrees with that of Praise *et al.* (2015) who reported that change in weather was one of the major causes of malaria.

Other causes of malaria include nature ($\bar{X}$ =3.17) which ranked 4th, implying that some individuals are allergic to malaria probably as a result of their compromised immune system. Water pollution ($\bar{X}$ =3.15) ranked 5th, signifying contact with unhygienic water that aid malaria infection. This is mostly common in the rural areas where dirty and harmful substances are always deposited in the river. Rain ($\bar{X}$ =3.14) ranked 6th. Raining season is always associated with change in weather that triggers breeding of mosquitoes that carry malaria vector. Dirty food ($\bar{X}$ =3.09) and cold ($\bar{X}$ =3.01) were ranked 7th and 8th respectively. This implies that conterminated food and cold will result to malaria infection. This finding is in agreement with that of Ibitoye *et al*. (2016), who reported that water pollution cold and unhygienic food contribute to malaria infection in Ondo State, Nigeria. However, respondents disagreed that air pollution ($\bar{X}$ =2.89) and contact with sick fellow ($\bar{X}$ =2.46) were among the major causes of malaria.

Table 4.4: Distribution of respondents according to perceived causes of malaria (n=199)

Variables	SA	A	UN	D	SD	WS	WM	D	R
Mosquito parasites	146(73.4)	24 (12.1)	18 (9.1)	9 (4.5)	2 (1.1)	900	4.52	A	1st
Poor sanitation	102(51.3)	61 (30.6)	11 (5.5)	18 (9.1)	7 (3.5)	830	4.17	A	2nd
Change of weather	42 (21.1)	77 (38.7)	42 (21.1)	24 (12.1)	14 (7.0)	706	3.55	A	3rd
Nature	19 (9.6)	45 (22.6)	95 (47.7)	30 (15.1)	10 (5.0)	630	3.17	A	4th
Water pollution	46 (23.1)	40 (20.1)	38 (19.1)	47 (23.6)	28 (14.1)	626	3.15	A	5th
Rain	38 (19.1)	56 (28.1)	29 (14.8)	48 (24.1)	28 (14.1)	625	3.14	A	6th
Dirty food	38 (19.1)	42 (21.1)	43 (21.6)	51 (25.6)	25 (12.6)	614	3.09	A	7th
Cold	48 (24.1)	29 (14.6)	31 (15.6)	59 (29.7)	32 (16.1)	599	3.01	A	8th
Air pollution	28 (14.1)	32 (16.1)	54 (27.1)	62 (31.2)	23 (11.6)	577	2.89	D	9th
Contact with sick fellow	14 (7.0)	27 (13.6)	35 (17.6)	83 (41.7)	40 (20.1)	489	2.46	D	10th

Sources: Field Survey (2021)

Keys: SA=Strongly Agreed, A=Agreed, UN=Undecided, D=Disagreed, SD=Strongly Disagreed, D=Decision, R=Ranking, WM =Weighted Mean Score = 3.00, WS=Weighted Sum

4.2.1 Farming activities affected by malaria

Table 4.5 indicated that 74.9% of the households believed that malaria affected their farming activities while 25.1% did not agree with the statement. This implies that most of the households believed that malaria affected their farming activities. It is expected that frequent malaria infection will affect land preparation, ridging, weeding and harvesting activities in the farm and also have negative implications on the productivity and wellbeing status of rural households. This finding is in agreement with that of Oluwatayo (2014), who stated that malaria's effect on smallholder farmers can be worrisome as it could reduce the ability to plant, weed and harvesting.

4.2.2 Days off from work due to malaria infection

Table 4.5 revealed that 42.7% of the respondents had between 1-5 days off from farm activities as result of malaria infection. This implies that for every infection, an individual

stay off duty from farming activities between 1-5 days. Also, 23.6 % and 13.1% stay off from farm work due to malaria infection for 6-10 days and > 10 days respectively. It is expected that having more days due to malaria infection suffered by farmers, their immediate family and relative could have negative effect on general farm activities, thereby affecting the wellbeing status and low productivity among farming households. This finding is in line with Adumanaya *et al.* (2012), who reported that rural households in Imo State, Nigeria always stay off farm works for many days because of malaria.

4.2.3 Experience symptoms of malaria

Table 4.5 showed that majority (97.5%) of the households experience symptoms while 2.5% do not experience any symptoms. This implies that majority of the respondents experience malaria symptoms. Having malaria symptoms is an indication of infection of malaria parasite on the health status of farmers.

Table 4.5: Distribution of respondents according to various malaria indicators (n=199)

Variables	Frequency (x)	Percentage	Mean
Farming activities affected by malaria			
Yes	149	74.9	
No	50	25.1	
Day off from work due to malaria infection			
1-5	85	42.7	**4**
6-10	47	23.6	
>10	26	13.1	
None	41	20.6	
Experience symptoms			
Yes	194	97.5	
No	5	2.5	
Symptoms experienced			
High temperature	190	95.5	
Cold	189	94.9	
Headache	189	94.9	
Loss of appetite	182	91.5	
Vomiting	167	83.9	
Dizziness	137	68.8	
Chill	94	47.2	
Convulsion	31	15.6	
Blister mouth	2	1.0	
Amount spent on malaria treatment (₦)			
≤10000	145	72.9	**7,902.5**
10001-20000	15	7.5	
>20000	19	9.6	
None	20	10.1	
Loss of household members due to malaria infection			
Yes	32	16.1	
No	167	83.9	
Number of household loss			
One	21	10.6	**1**
Two	9	4.5	
Three	2	1.0	
Numbers of times suffered from malaria/year			
1-3	154	77.4	**2**
4-6	25	12.6	
None	20	10.1	
Treatment on malaria			
Treated	186	93.5	
Not treated	13	6.5	

Source: Field Survey, 2021

Keys: x = Multiple Response

4.2.4 Symptoms experienced

Table 4.5 indicates that majority (95.5%) of the respondents experienced high temperature while 94.9% and 94.9% of the respondents experienced cold and headache respectively. This implies that increase in body temperature, cold and headache were the

main symptoms of malaria in the study area. Other findings showed that 83.9% experienced vomiting, 68.8% experienced dizziness, and 47.2% experienced chill. This result concur with that of Oyibo *et al.* (2020), who stated that working under intensive sun increases farmer's body temperature and can lead to malaria infection and also have negative effect on rural household wellbeing status. This is because continuous working without taking necessary rest could negatively affect the health status of farming household and also result to compromise immune system that pave ways for malaria infection.

4.2.5 Cost of malaria treatment

Table 4.5 revealed that 72.9% of the respondents spent <=₦10000 on malaria while 9.6% and 7.5% of the respondents spent between ₦10001-₦20000 and >₦20000 on malaria treatment, respectively. The mean amount spent on malaria treatment was ₦7902.5,this implies that respondents spent much money on treatment of malaria infection in the study area. This could thereby affect the wellbeing status of the households. This result is in contradicts that of Kughur *el al. (*2015), who reported that less money was spent on the treatment of selected diseases in Benue State, of Nigeria.

4.2.6 Loss of household member due to malaria infection

Table 4.5 indicated that 16.1% of the respondents lost members of their household while 83.9% did not lose any members of their households. This implies that only small fraction of the respondents lost members of their households as result of malaria infection.

4.2.7 Numbers of times suffered from malaria in farming season.

Table 4.5 indicated that 77.4% of the respondents suffered between 1-3 times from malaria in the last farming season while 12.6% suffered between 4-6 times from malaria

in the last farming season. This implies that rural households did not suffer much from malaria in the last farming season.

4.2.8 Treatment of malaria infection

Table 4.5 revealed that majority (93.5%) were treated on malaria infection while 6.5% do not received treatment on malaria infection. This implies that majority of the respondents were treated extensively on malaria. This might be due to availability of primary health care, medicinal shops, clinics/hospital in the rural areas that grant farming households easy access to treatment centers. It is expected that treatment of malaria will make farmers always available in the farm which would have positive implication on productivity and their wellbeing status. The few that do not received treatment might be due to self-medication which involves buying of drugs and use of herbs by some rural households.

4.2.9 Sources of training on malaria

Table 4.6 showed that NGOs ranked 1st as the major sources of training on malaria treatment, followed by Roll Back Malaria programme which ranked 2nd. The NGOs in Nigeria together with roll back malaria have been instrumental in the training on malaria prevention and control due to havoc it has caused in Sub-Sahara African countries. Some of the training offered by NGOs and Roll Back Malaria include training on good sanitation, self-medication and use of treated mosquito nets. Other sources of training are extension agents, research institute, ADP and ministry of agriculture ranked 3rd, 4th, 5th and 6th respectively. This finding is in agreement with Tsado *et al.* (2018), who reported that extension agents is one of the major sources of agricultural innovation in Nigeria.

Table 4.6: Distribution of respondents according to sources of training on malaria (n=199)

Variables	Frequency	Percentage	Rank
NGOs	73	36.7	1st

Roll back malaria	60	30.2	2nd
Extension agent	57	28.6	3rd
Research institute	9	4.5	4th
ADP	7	3.5	5th
Ministry of agriculture	4	2.0	6th

Source: Field Survey (2021)

4.2.10 Sources of information on malaria treatment

Table 4.7 revealed that family and friends ranked 1st as the major source of information on malaria treatment. Family and friends that once suffered from malaria and mass media have played important roles in providing awareness on the various means of treating malaria infection in the study area. This might be attributed to previous infection by household members in which more awareness were created for others not to fall victim. Mass media ranked 2nd. More awareness and programmes have been created in recent years on radio and television by rollback malaria, NGOs and others sources. Also, parents and extension officers were ranked 3rd and 4th respectively. respectively. This finding is in consonance with Oladapo *et al.* (2014) who reported that programmes on various mass media have been proactive in the treatment of malaria in Nigeria.

Table 4.7: Distribution of respondents according to source of information on malaria treatment (n= 199)

Variables	Frequency	Percentage	Rank
Sources of information on malaria treatment			
Family and friend	186	93.5	1st
Mass media	178	89.5	2nd
Parents	112	56.3	3rd
Extension officers	100	50.3	4th
Other farmers	84	42.2	5th
Community meeting	74	37.2	6th
Written information	53	26.6	7th
Field days	46	23.1	8th
Farm forum	31	15.7	9th
Ministry of agriculture	17	13.8	10th
Research institute	23	11.6	11th
ADP	22	11.1	12th

Source: Field Survey (2021)

4.3 Perceived effects of malaria on well-being status

Table 4.8 showed the level of perception on the malaria on well-being status of rural households on the perceived statements on effect of malaria. Malaria infection lead to loss of productive time ($\bar{X}$ =4.46) ranked 1st, implying that suffering from malaria will result to loss of time in the farm. This finding is in agreement with Andrew (2015) who reported that majority of rural households in Nigeria lost their sensitive productive time as a result of malaria infection. Malaria infections lead to decrease in households' income and food security as household income that would have been diverted into payment of malaria treatment of the infected family members ($\bar{X}$ =4.03) ranked 2nd, signifying prolong and persistence malaria infection will lead to reduction in household income and food security. Malaria infection caused reduction in living standard of farmers ($\bar{X}$ =3.88) ranked 3rd, implying that malaria reduce farmer standard of living. Standard of living of farmers is expected to be affected when substantial part of their saving is used on malaria treatment and control in the study area. Malaria infection deteriorate farmers health status ($\bar{X}$ =3.82) ranked 4th. This denotes that malaria hamper farmer's health. It is expected that

frequent occurrence of malaria will weaken farmers' immune system thereby expose them to more life threatening sicknesses. This is in agreement with Ajani and Ashagidigbi (2015), who reported that malaria at the household level contribute to ill health and negative influence farmers standard of living. This finding concurs with Onwujekwe *et al.* (2015), who stated that ill health directly affect quality of labour supplied by the households.

Also, rural households agreed with the following statements; malaria infection reduce farmers income ($\bar{X}$ =3.81), malaria infection reduce labour usage on farms ($\bar{X}$ =3.79), malaria infection expose farmers to other life threatening diseases ($\bar{X}$ =3.77), malaria infection reduce farmers recognition and participation in community activities (3.62), malaria infection causes farmers inability to save for future ($\bar{X}$ =3.60), malaria infection expose farmers to discrimination and separation ($\bar{X}$ =3.49), malaria infection affect assets acquisition among farmers ($\bar{X}$ =3.50), malaria infection disrupt economic and social prosperity of farmers ($\bar{X}$ =3.28). However, rural households disagreed that malaria infection negative affect the quality and quantity of food (2.97). This implies that rural households believed that malaria infection did not have effect on the quantity and quality of agricultural produce in the study area.

Table 4.8: Distribution of respondents according to perceived effect of malaria on rural households well-being status (n=199)

Perceived statements	SA	A	UN	D	SD	WS	WM	D	R
Malaria infection lead to loss of productive time	116 (58.3)	68 (34.2)	8 (4.0)	5 (2.5)	2 (1.0)	888	4.46	A	1st
Malaria infection lead to decrease in households income and food security	71 (35.7)	84 (42.2)	27 (13.6)	14 (7.0)	3 (1.5)	803	4.03	A	2nd
Malaria infection caused reduction in living standard of farmers	76 (38.2)	70 (35.2)	17 (8.5)	26 (13.1)	10 (5.0)	773	3.88	A	3rd
Malaria infection deteriorate farmers health status	55 (27.6)	93 (46.7)	24 (12.1)	15 (7.5)	12 (6.0)	761	3.82	A	4th
Malaria infection reduce farmers income	55 (27.6)	85 (42.7)	35 (17.6)	14 (7.0)	10 (5.0)	758	3.81	A	5th
Malaria infection reduce labour usage on farms	55 (27.5)	92 (46.2)	23 (11.6)	14 (7.0)	15 (7.5)	755	3.79	A	6th
Malaria infection expose farmers to other life threatening diseases	66 (33.2)	70 (35.2)	29 (14.6)	20 (10.1)	14 (7.0)	751	3.77	A	7th
Malaria infection reduce farmers recognition and participation in community activities	42 (21.1)	92 (46.2)	28 (14.1)	22 (11.1)	15 (7.5)	721	3.62	A	8th
Malaria infection causes farmers inability to save for future	49 (24.6)	78 (39.2)	34 (17.1)	20 (10.1)	18 (9.1)	717	3.60	A	9th
Malaria infection expose farmers to discrimination and separation	51 (25.6)	71 (35.7)	22 (11.1)	36 (18.1)	19 (9.6)	696	3.49	A	10th
Malaria infection affect assets acquisition among farmers	50 (25.1)	71 (35.7)	30 (15.1)	25 (12.6)	23 (11.6)	697	3.50	A	11th
Malaria infection disrupt economic and social prosperity of farmers	48 (24.1)	52 (26.1)	36 (18.1)	34 (17.1)	29 (14.6)	653	3.28	A	12th
Malaria infection lower farmers self confidence	39 (19.6)	45 (22.6)	41 (20.6)	35 (17.6)	39 (19.6)	607	3.05	A	13th
Malaria infection hamper life achievement	37 (18.6)	55 (27.6)	26 (13.1)	45 (22.6)	36 (18.1)	609	3.06	A	14th
Malaria infection lead to partial separation of farmers from love ones	42 (21.1)	46 (23.1)	25 (12.6)	44 (22.1)	42 (21.1)	599	3.01	A	15th
Malaria infection negative affect the quality and quantity of food	41 (20.6)	44 (22.1)	27 (13.6)	43 (21.6)	44 (22.1)	592	2.97	D	16th

Source: Field Survey, 2021

Keys: (%) Figure in Parentheses are Percentages, SA=Strongly Agreed, A=Agreed, UN=Undecided, D=Disagreed, SD=Strongly Disagreed, WS= Weight Sum, WM= Weight Mean

4.4 Wellbeing Status of Rural Households

Table 4.9 revealed that the respondents were satisfied with all the well-being indicators despite their different levels of malaria infection in the study area. The wellbeing indicators were ranked as followed; community connectedness ($\bar{X}$ =6.89) ranked 1st, personal relationship ($\bar{X}$ =6.75) ranked 2nd. This implies that rural households in the study area interact and enjoy good relationship with one another. This is a strong indication of better wellbeing status. More so, spiritual or religious activities ($\bar{X}$ =6.43) ranked 3rd, indicating that respondents in the study area participate in religious activities. Life achievement ($\bar{X}$ =6.41) ranked 4th, This could be reflected in the aspect of assets acquisition and prestige that arise from non-exposure to malaria disease. This finding agrees with that of Oladepo *et al.* (2014), who stated that non-exposure to malaria is a plus to life achievement, improved living standard and future accomplishment.

Also, future security ($\bar{X}$ =6.28) ranked 5th, personal safety ($\bar{X}$ =6.15) ranked 6th, standard of living ranked 7thand personal health ($\bar{X}$ =5.81) ranked 8th. This implies that farming households have put proper measures in place that would prevent malaria infection and also promote personal safety and improved standard of living. This implies that rural households in the study area had improved wellbeing status. This finding agreed with Fatoki and Ajibola (2020), who reported rice farmers in Nasarawa State, Nigeria were satisfied with their life achievement, personal relationship, standard of living and community connectedness.

Table 4.9: Distribution of respondents according to their wellbeing status (n=199)

Indicators	Mean	Decision	Rank
Community connectedness despite malaria infection	6.89	Satisfy	1st
Personal relationship despite malaria infection	6.81	Satisfy	2nd
Spiritual or religious activities despite Malaria infection	6.43	Satisfy	3rd
Life achievement despite malaria infection	6.41	Satisfy	4th
Future security despite malaria infection	6.28	Satisfy	5th
Personal safety despite malaria infection	6.15	Satisfy	6th
Standard of living despite malaria infection	6.06	Satisfy	7th
Personal health despite malaria infection	5.81	Satisfy	8th

Source: Field Survey, 2021

4.4.1 Determinant of wellbeing status of farming households

Table 4.10 shows result of the linear regression analysis with R^2 value of 0.4184, which implies that 41.8% variation in wellbeing status of the respondents in the study area was explained by the independent variables included in the model. The coefficient of amount spent on malaria treatment (0.0003) was positively significant at 1% level of probability, implying that increase in amount spent in treatment of malaria will increase wellbeing status of farming households. This was contrary to priori expectation which stated that increase in amount spent on treatment of malaria will reduce their wellbeing status.

The coefficient of farm size (2.4792) was positively significant at 1% level of probability, indicating that every being equal, increase in size of farmland will lead to increase in wellbeing status of rural households in the study area. This is because larger farm size translates to increase output and improved standard of living. This result concurs with that of Rasaki *et al.* (2020), who stated that that additional farm size will increase standard of living of farmers in Oyo State, Nigeria. The coefficient of age (-0.5061) was negatively significant at 1% level of probability, indicating that older farmers are likely expected to

have low wellbeing status due to less-productive and non-zealous to engage in profitable enterprises that will improved their wellbeing status. This agrees with Abdullahi and Tashikalma (2016), who reported that as farmers' advances in age, their efficiency and productivity decreases. The coefficient of years spent in school (0.2288) was positively significant at 1% level of probability, implying that increase in literacy level of farming households will result to more skills; knowledge and practices in farming that is expected to improve the wellbeing status of rural households in the study area. This agreed with Oyewole and Ojeleye (2015) who posited that knowledge of farmers on improved farming practices increased with attainment of higher level of education among farmers in Kano State, Nigeria.

The coefficient of access to credit (-4.2312) was negatively significant at 5% level of probability, implying that access to credit will reduce the wellbeing status of rural households this might be due to spending more of the credit on malaria treatment. The coefficient of incapacitation (-0.0366) was negatively significant at 10% level of probability, implying that as incapacitation increases, the well-being status of households reduces. The coefficient of output (-3.3900) was negatively significant at 1% level of probability, indicating increase in malaria infection among farmers could probably lead to decreased in farmers output.

Table 4.10: Determinant of well-being status of farming households (n=199)

Variables	Coefficient	t-value
Amount spent on malaria treatment	0.0003	3.78***
Distance to health care centers	0.0033	1.23
Size of farm land	2.4792	4.43***
Age	-0.5061	-4.70***
Annual income from farming	-1.1300	-2.09**
Years spent in school	.2288	2.77***
Access to extension	.0299006	0.31
Access to credit	-4.2312	-2.36**
Incapacitation	-.0.0366	-1.52
Output	-3.3900	-3.30***
Land ownership	-0.0482	-0.09
Constant	34.4434	5.49***
F-value	11.15***	
R-square	0.4184	
Adjusted R-square	0.3809	

Sources: **Field Survey, 2021**

Keys:***=significant at 1%, **=significant at 5%, *= significant at 10%, *=multiple response

4.5 Preventive and Control Measures to Mitigate Malaria Disease infection

Table 4.11 revealed that use of mosquito net ranked 1st, implying that mosquito net played active roles in the prevention of malaria in the study area. This finding is in agreement with Oyibo *et al.* (2020), who reported that use of treated mosquito net is the best preventive measures against malaria infection. Immunization ranked 2nd, this is mostly applicable to children at infancy stage in order to immune them from deadly vector that claim more live in Sub-Sahara Africa annually (Oyibo *et al.,* 2020). Environmental/ personal cleanliness and frequent usage of anti-malaria were ranked 3rd and 4th respectively. Cleanliness involves practice of good hygiene and usage of anti-malaria drugs will prevent the spread of the virus.

Also, sewage disposal and local herbs were ranked 5th and 6th respectively. This involves disposing and getting rid of dirty water and use of local herbs in the study area. This finding is related with that of Abiodun and Abayomi (2013), who reported that cleanliness

and sewage disposal are some of the preventive measures used by rural households against malaria infection in Oyo State, Nigeria.

Furthermore, chemoprophylaxis and draining of stagnant water were ranked 7th and 8th respectively. Chemoprophylaxis is define as a way of administering drugs made of chemicals to prevent diseases or sickness. Antibiotics are drugs made of chemicals used to prevent diseases caused by bacteria. The use of chemoprophylaxis has been proven effective in the fight against malaria infection. The finding agreed with that of Oyibo *et al.* (2020) who reported the effectiveness of chemoprophylaxis in fighting against malaria infection among rural households in Kogi State. The same author reported one of the common factor that thrive the spread of malaria among rural households in Nigeria is stagnant water and this could be controlled by proper draining in order to reduce the enabling environment for the factor to thrive.

Table 4.11: Distribution of respondents based on preventive and control measures adopted (n=199)

Variables	Frequency*	Percentage	Rank
Use of mosquito net	188	94.5	1st
Immunization	184	92.5	2nd
Cleanliness	166	83.4	3rd
Frequent use of anti-malaria	161	80.9	4th
Sewage disposal	148	74.4	5th
Local herbs	146	73.4	6th
Chemoprophylaxis	140	70.4	7th
Draining of stagnant water	136	68.3	8th
Destruction of breeding places	109	55.1	9th
Prayers	88	44.2	10th
Use of screen and opening	75	37.7	11th
Burning of scent leaf	66	33.2	12th
Giving clean food	66	33.2	13th
Avoid contact with cold/warm	60	30.2	14th
Use of mosquito coil	58	29.2	15th
Avoiding contact with infected person	40	20.1	16th

Source: Field Survey, 2021

Key: * = Multiple responses

4.5.1 Adoption of preventive and control measures of malaria infection

Table 4.12 revealed that 64.3% of the respondents have between 6-10 scores while 21% of the respondents had between 11-15 scores. The mean score of the respondents in the study area was 9.2, implying a moderate score that could prevent and control malaria infection for better wellbeing status among farming households.

Table 4.12: Level of preventive measures adopted for controlling malaria infection (n=199)

Score	Frequency	Percentage	Mean
1-5	20	10.1	**9.2**
6-10	128	64.3	
11-15	42	21.1	
>15	9	4.5	

Source: Field Survey (2021)

4.5.1.1 Adoption index

Table 4.13 showed that 64.3% of the respondents medium adopter preventive and control measures of malaria infection while 25.6% highly adopted preventive and control measures of malaria. This finding implies that most of the respondents moderately adopted preventives malaria control measures. The implication is malaria infection might likely be prevalent in the study area. This scenario is not the best as it could result to more damage to wellbeing status of the respondents and increase the days farmer stay off from farm. This finding is in agreement with that of Adeneye *et al.* (2016), who stated that lack of access to the right preventive measures could expose farmers to malaria and reduce the number of productive days.

Table 4.13 Adoption index for preventive measures for controlling of malaria (n=199)

Variables	Frequency	Percentage	Mean
Low adopter ≤5	20	10.1	9.2
Medium adopter 6-10	128	64.3	
High adopter >10	51	25.6	

Sources: Field survey (2021)

4.6 Constraints Faced by Rural Farming Households in Treating Malaria Disease

Table 4.14 indicates the seriousness of the constraints faced by rural households in treating malaria disease. The following constraints were perceived to be a serious constraint by the respondents in the study area; high cost paid by farmers ($\bar{X}$ =2.75) which ranked 1st. High cost of malaria treatment has been a major concern in the treatment of malaria in Niger State. This often forced rural populace to take shelter with herb sellers not minding the negative implication on their immune system. Favourable climatic condition for vector ($\bar{X}$ =2.47) ranked 2nd, poor hygienic condition of larger proportions of rural households in Nigeria increase the spread of tropical diseases. Inadequate capital

($\bar{X}$ =2.43) ranked 3rd, implying majority of rural households do not have enough capital to access quality health care in the treatment of malaria This finding is in agreement with that of Abiodun and Abayomi (2013), who reported that inadequate capital and high cost of malaria treatment are major problem faced by rural household in Nigeria. Also, Kughur *et al*. (2016) reported that inadequate finance are the major constraints faced by rural households in the treatment of tropical diseases in Benue State, Nigeria.

Also, inadequate human resources ranked 4th, Inadequate human personnel in the remote areas contributed to persistence recurrent of malaria infection in Niger State. This finding agreed with that of Onah *et al.* (2017) who reported that lack of adequately trained personnels is common in Nigeria. Donor dependency (2.33) ranked 5th, over-dependency of Bill and Melinda Gate foundation in collaboration with world health organization (WHO) in the treatment of malaria by government have reduce activities of government in tackling the menace (Njau *et al.,* 2013).

Other serious constraints perceived by the respondents were; time wasted in taking care of the sick person ($\bar{X}$ =2.27), poor health facilities ($\bar{X}$ =2.19), inadequate local budget ($\bar{X}$ =2.18), inadequate knowledge about the causes and control malaria ($\bar{X}$ =2.16). The following constraints were however not perceived as serious; less effectiveness of anti-malaria drugs ($\bar{X}$ =1.96), non-availability of drugs ($\bar{X}$ =1.91), non-availability of mosquito nets ($\bar{X}$ =1.80) and long distance to health centers ($\bar{X}$ =1.75).

Table 4.14: Constraints faced by rural farming households in treating malaria disease (n=199)

Variables	Very Serious	Serious	Not serious	WS	WM	Ranking	Decision
High cost paid by farmers	155 (77.9)	39 (19.6)	5 (2.5)	548	2.75	1st	S
Favourable climatic condition for vector	116 (58.3)	60 (30.2)	23 (11.6)	491	2.47	2nd	S
Inadequate capital	102(51.3)	79(39.7)	18(9.1)	484	2.43	3rd	S
Inadequate human resource	7 (43.7)	96 (48.2)	16(8.0)	469	2.36	4th	S
Donor dependency	97 (48.7)	70 (35.2)	32 (16.1)	463	2.33	5th	S
Time waste in taking care of the sick person	91 (45.3)	71 (35.7)	37 (18.6)	452	2.27	6th	S
Poor health facilities	74 (37.2)	87(43.7)	37 (18.6)	436	2.19	7th	S
Inadequate local budget	116 (58.3)	60 (30.2)	38 (19.1)	434	2.18	8th	S
Inadequate knowledge about the causes and Control of malaria	102 (51.3)	79 (39.7)	18 (9.1)	431	2.16	9th	S
Malaria surveillance	62 (31.2)	96 (48.2)	41(20.6)	419	2.11	10th	S
Non availability of standard healthcare and delivery system	68 (34.2)	85 (42.7)	46 (23.1)	420	2.11	10th	S
Displacement of population due to communal Clashes	76 (38.2)	53 (26.6)	70 (35.2)	404	2.03	12th	S
Less effectiveness of anti-malaria	54 (27.6)	79 (39.7)	65(32.7)	390	1.96	13th	NS
Non availability of drugs	50 (25.1)	81(40.7)	68 (34.1)	380	1.91	14th	NS
Non availability of mosquito nets	52 (26.1)	56(28.1)	91 (45.7)	359	1.80	15th	NS
Long distance to health centers	44 (22.1)	61 (30.7)	94 (47.2)	348	1.75	16th	NS

Sources: Field survey (2021)

Keys: (%) Figure in parenthesis are percentages, S=Serious, NS=Not Serious, WS=weight sum, WM=weight mean

4.7 Hypotheses Testing

4.7.1 Hypothesis I

The null hypothesis I that there is no significant relationship between the selected socio-economic characteristics (size of farm land, age, annual income, years spent in school, access to extension and access to credit) and their wellbeing status in the study area was tested using the z – value from the linear regression analysis as presented in Table 4.15.The result of hypothesis I in Table 4.15 revealed that the coefficient farm size (2.4792), age (-0.5061), years spent in formal education (0.2288) had significant relationship with well-being status and were significant at 1% level of probability while annual income (-1.1300) and access to credit (-4.2312) had significant relationship with well-being status and significant at 5% level of probability. However, the null hypothesis is thereby rejected because the p-value is less than the level of significance.

Table 4.15: Regression estimates of the null Hypothesis I (n=199)

Variables	Coefficient	t-value
Size of farm land	2.4792	4.43***
Age	-0.5061	-4.70***
Annual income from farming	-1.1300	-2.09**
Years spent in school	0.2288	2.77***
Access to extension	.02990	0.31
Access to credit	-4.2312	-2.36**

Source: Field Survey (2021)

Keys: *** = significant at 1%, **= significant at 5%

4.7.2 Hypothesis II

Table 4.16 showed result of Hypothesis II that there is a significant relationship between perceived effect of malaria disease and wellbeing status significant at 1% level of probability. This implying that malaria infection have strong effect on the wellbeing status of farming households in the study area. This finding is in consonance with that of Onuche *et al.* (2020)

who reported that the negative effect of ill health of farmers livelihood and well-being status in Nigeria can never be over emphasis. Oluwatayo (2014) on the other hand reported that malaria infection is a major setback for improved well-being among rural households in Nigeria.

Table 4.16: Relationship between perceived effect of malaria disease and wellbeing status (n=199)

Variable	Well-being Status	P-value
Perceived effect	0.1916	0.0067***

Source: Field Survey (2021)

Keys: ***=Significant at 1% level of probability

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the findings, it can be concluded that majority (79.9%) of the respondents in the study area were male and mostly in the active age and married. Also, majority (68.4%)of the respondents had large family size and one forms of formal education. More so, most of the respondents engaged in crop farming and significant annual income. Majority of the respondents did not access credit. Mosquito parasite, poor sanitation and change in weather were the most perceived causes of malaria disease. Also, high temperature, cold and headache were the most symptoms' of malaria experienced by the respondents. Malaria infection led to loss of productive time, malaria infections lead to decrease in households income and food security and malaria infection caused reduction in living standard of farmers were the most perceived effect of malaria on rural households wellbeing status.

Also, most of the respondents have medium adoption score in the preventive measures for controlling of malaria. Further findings showed that households were satisfied with community connectedness despite malaria infection, personal relationship despite malaria infection and spiritual or religious activities despite malaria infection. The coefficients of farm size (2.4792), age (- 0.5061), years spent in formal education (0.2288), access to credit (- 4.2312) and incapacitation (- 0.0366) determined the wellbeing status of rural households in the study area. The most preventive measures to malaria disease are; mosquito net, immunization and cleanliness and frequent usage of anti-malaria. The most constraints faced by rural farming households in treating malaria disease were high cost paid by farmers for treatment, favourable climatic condition for vector and inadequate capital.

5.2 Recommendations

i. Majority (79.9%) of farming households do not have access to credit in the study area. It is recommended that farming households should create credit co-operatives that concern in getting credits facilities to its members with minimum interest to improved their production and wellbeing status.

ii. Poor sanitation is one of the causes of malaria in the study area. It is recommended that farmers should always maintain good hygienic environment in order to combat malaria vector.

iii. Farming households in the study area reported that malaria infection lead to lose of productive time and reduction in households` income. It is recommended that farming households should take preventive measures such as use of mosquito nets, cleanliness, frequent use of anti-malaria drugs, draining of stagnant water, that will reduce the spread of malaria in the study area.

iv. Personal health despite malaria infection was the least satisfied well-being indicator as reported by the respondents. It is recommended that households in the study area should devote more time for personal hygiene for improved well-being status.

v. Age negatively determined wellbeing status of farming household in the study area. It is recommended that older farmers should be trained by extension agents on how to engage in both on-farm and off farm activities in order to improve their livelihood status.

vi. Most of the respondents had medium adoption score on the preventive measures on the treatment of malaria. Efforts should be made by stake holders through extension agents and Roll Back Malaria to create sound awareness on the preventive measures of malaria disease.

vii. Cost of malaria treatment was high in the study area. Government should subsidize the cost of malaria treatment that negatively affect farmers livelihood in the study area.

5.3 Contribution to Knowledge

The study revealed that mosquito parasites, poor sanitation and change of weather are the major causes of malaria infection. As such there is need for farmers to be well trained on malaria treatment, prevention and control through Roll Back Malaria programmes.

The study revealed that mosquito net, immunization and Chemoprophylaxis drug play active roles in preventing malaria infection. As such the study will be of great intellectual and practical value to stake holders, academia and scholars that have strong passion for malaria disease prevention.

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APPENDIX

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT,
SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
NIGER STATE, NIGERIA
RESEARCH QUESTIONNAIRE

Dear respondent,

This questionnaire aims at gathering relevant information that would assist the researcher in "PERCIEVED EFFECT OF MALARIA DISEASE ON WELL-BEING STATUS OF RURAL FARMING HOUSEHOLDS IN NIGER STATE, NIGERIA". All the information supplied here shall be solely for research purposes and will be treated as confidential. You are therefore required to fill in the answer for the following questions and mark or tick as appropriate.

Section A: Socio-economic characteristics of the respondents

1. Name of the town/village……..
2. Local government areas……..
3. What is your sex? (a) Male [ ] (b) Female [ ]
4. What is your age?.....
5. Indicate your marital status:
   (a) Single [ ] (b) Married [ ](c) separated [ ] (d) Widow [ ] (e) Divorced [ ]
6. What is your dependency ratio……..
7. If male indicate number of wife (s) .....
8 Indicate your household size:.....
9. How long have you been in farming in years?.....
10. Indicate your education highest level….....
    (a) non-formal education [ ] (c) Primary school [ ]
    (b) secondary/modern school [ ] (d) tertiary institution [ ]
11. If formal how many years did you spend in school.....
12. Are you a full-time farmer? Yes / No……..
13. Name other occupation(s) you do apart from farming……...
14. What is your total rice farm size in (ha)?.....
15. Do you have access to agricultural extension service? (a) Yes [ ] (b) No [ ]
16. If yes how many times were you visited in the last farming season?.....
17. If no why?.....
18. What is your average annual income from farming activities?.....
19. What are your annual income from non-farming activities? .....
20. What is the distance to market.....
21. Are you a member of cooperative? (a) Yes [ ] (b) No [ ]
22. If yes how many cooperatives do you belong?.....
23. How many years are you in the cooperative?.....

24. Do you have access to credit? (a) Yes [ ] (b) No [ ]

25. How much do you received?.....Interest rate,.....sources of your credit? (a) Friends [] (b) Commercial bank [ ] (c) Cooperative [ ] (d) Contributions [ ] (e) Others [ ]

26. What is mode of payment of your credit? (a) Cash [ ] (b) In Kind [ ]

SECTION B: PERCEIVEDCAUSES OF MALARIA DISEASE AMONG RURAL FARMERS

27. What do you know as malaria causes? Tick from the list below

Causes of malaria	**Strongly Agreed**	**Agreed**	**Undecided**	**Disagreed**	**Strongly Disagreed**
Cold and rain					
Contact with sick fellow					
Dirty food					
Mosquito parasites					
change of weather					
No idea					
Comes on its own					
Poor sanitation					
Air pollution					
Others (Specify)					

28. Has malaria infection affected your farming activities? (a) Yes [ ] (b) No [ ]

29. How many days did you stay off of work as a result of malaria in the last farming season…….

30. Did you experience any symptoms as a result of malaria? (a) Yes [ ] (b) No [ ]

31. If yes indicate from the list of symptoms below

Symptoms	Tick
Fever	
Chill	
Headache	
Loss of appetite	
Dizziness	
Vomiting	
High temperature	
Convulsion	

Others (specify)	

32. What is the estimated amount spent on malaria treatment over the last six months----

33. What is average distance to treatment center----------km

34. How many times did you suffer from malaria infection last farming season----------

35. Do you receive any training on malaria prevention and control? Yes [ ] No [ ]

36. If yes who organize the training?

a. Extension agents [ ]

b Roll back malaria [ ]

c, Ministry of agriculture [ ]

d. ADP [ ]

e. Research institutes [ ]

f. NGOs [ ]

37. How many members of your household infected……what is the cost implication…… ..

38. How many size of your rice farm land did you lost as a result of malaria----------

39. Did you lost any members of your household due to malaria? A. Yes [ ] B. No [ ]

40. If yes how many members of your household did you lost as a result of malaria ------

41. What are your sources of information on malaria treatment? Tick from the table below

No	**Sources of information on malaria treatment**	Tick
1.	Family Friends	
2.	Field days	
3.	Parents	
4	Mass media	
5	Extension officers	
6	Ministry of agriculture	
7	ADP	
8	Farm forum	
9	Other farmers	
10	Research institutes	
11	Community meeting	
12	Written information	

SECTION C: PERCEIVED EFFECTS OF MALARIA DISEASE ON WELL-BEING STATUS

42. What is your output from rice production in the last farming season----------

43. How much did you spend on the following inputs in the last cropping season

Inputs	**Qtty**	**Unit Prize**	**Total Cost**
Land			
Seeds			
Chemical			
Fertilizer			

44. What is your average amount spent on labour in the last farming season

Labour	**Man day**	**Days**	**Amount**
Family labour			
Hired labour			

45. What is your perceived effects of malaria disease on crop production

Perceived effect	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
Malaria attack reduces my ability to clear the land for cultivation					
Malaria attack adversely affected my capacity to transplant seedlings from nursery to the farm					
Malaria attack reduces my ability to weed the farm					
Malaria attack adversely affected my threshing ability					
Winnowing is not carried out when attacked with malaria					
Parboiling is usually slowed down when attacked by malaria					
Malaria attacks strongly affect harvesting					
Packaging is usually slow down by malaria infection					
Drying of crop is always affected by malaria infection					

Malaria infection reduce farmers area of cultivation					
Malaria infection lead to reduction in the farm inputs					

46. What are your perceived effects of malaria disease on the farmers well-being status

Perception	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
Malariadisease lead to loss of productive time					
Malariadisease lead to decrease in household income and food security					
Malaria disease caused reduction in living standard of rice farmers					
Malariadisease deteriorate farmers health status					
Malariadisease hamper life achievement					
Malaria disease lead to partial separation of farmers from love ones					
Malaria disease expose farmers to other life threatening diseases					
Malaria disease expose farmers to discrimination and separation					
Malaria disease causes farmers inability to save for future					
Malaria disease lower farmers self confidence					
Malaria disease negative affect the quality and quantity of food					
Malaria disease affect assets acquisition among farmers					
Malaria disease reduce farmers recognition and participation in community activities					
Malaria disease reduce farmers income					
Malaria disease reduce labour usage on farms					
Malaria disease disrupt economic and social prosperity of farmers					

SECTION E: FARMERS' WELL-BEING STATUS

47. Indicate from the list well-being indicator accessed on the scale of 0-10

Indicators	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Standard of living											
Personal health											
Life achievement											
Personal relationship											
Personal safety											
Community connectedness											
Future security											
Spiritual/ religion											

SECTION F: PREVENTIVE AND CONTROL MEASURES TO MITIGATE MALARIA DISEASE

48. Please tick from the table below on the preventions and control measures adopted to mitigate malaria disease

Preventive and control measure	**Tick**
Immunization	
Avoiding contact with Cold/keeping warm	
Use of mosquito net (ITBNs)	
Use of mosquito coil	
Chemoprophylaxis	
Destruction of breeding places for mosquito	
Frequent usage of anti-malaria	
Local herbs	
Cleanliness	
Sewage disposal	
Draining of stagnant water	
Use of screen and opening	
Burning of scent leaf	
Prayers	
Giving clean food	
Avoiding contact with infected person	

Section G: Constrained faced by farmers on malaria treatment

49. What are the constraints faced on malaria treatment

Constraints	**Very severe**	**Severe**	**Not severe**
High cost paid by farmers			
Inadequate human resources			
Malaria surveillance			
Inadequate local budget			
Donor dependence			
Less effectiveness of anti-malaria			
Displacement of population due to communal clashes			
Favourable climatic condition for vector breeding			
Inadequate capital			
Inadequate knowledge about the causes and control of malaria			
Non availability of standard health care and delivery system			
Non availability of drugs			
Non availability of mosquito nets			
Long distance to health centers			
Poor health facilities			
Time waste in taking care of the sick person			

Thank you