DETERMINANTS OF THE USE OF INORGANIC FERTILIZER AMONG VEGETABLE FARMERS IN ILORIN EAST LOCAL GOVERNMENT AREA OF KWARA STATE, NIGERIA.

BY

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CERTIFICATION

This is to certify that this project work was carried out by ADAMS, Tijani Buhari with matriculation number HND/23/AGT/FT/0145. In the Department of Agricultural Technology (AGT), Institute of Applied Sciences (IAS), and has been read and approved as meeting the requirement for the award of Higher National Diploma (HND).

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DEDICATION

I dedicated this project work to my Lord, my Creator, the Almighty Allah who gave me the privilege to finish this project successfully, and to my family whose unwavering support, acknowledgment, financial support and their prayers made this project possible

ACKNOWLEDGEMENT

In the first premise, I give gratitude to Almighty Allah, the most beneficent the most merciful for seeing me through from the beginning of this project work to the end. I adore Him for His favour and kindness.

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Finally my appreciation also goes to other person whose names were not mentioned here but whom in one way or the other has been of help to us, we pray that Almighty Allah will perfect everything that concerning your life.

Jazakumullahu kaira jazal Amin.

ABSTRACT

The study investigated the determinants of fertilizer use by vegetable farmers. Data were drawn from 207vegetable farmers, experts, and respective office heads using structured and semi-structured interview schedules, Key informant interviews and focus group discussions. Data were analysed using percentage, mean and standard deviation and linear regression model. About 94% of the farmers had the willingness to apply inorganic fertilizer on their farmland. An increasing price of inorganic fertilizer (96%), poor demand estimation (82%), and delay in distribution (78%), are the top-ranked challenges affecting inorganic fertilizer use. The result of hypothesis I which stated that there was no significant relationship between the selected socio-economic characteristics of rural households (age, gender, education, experience etc.) and extent of utilization of inorganic fertilizer in the study area is presented in Table 4. It revealed that marital status (2.05), household size (2.04), education (2.83) farming experience (1.82) and access to credit (3.23) were all statistically significant at 1%, 5% and 10% level of probability were found significantly promoting the amount of fertilizer use by vegetable farmers. Actions such as real demand estimation, arranging agricultural implements, and fertilizer subsidy for resource-poor farmers should be implemented to ensure more vegetable production.

Key words: *Determinants, vegetable farmers, inorganic fertilizer, utilization.*

TABLE O CONTENT

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Inorganic fertilizer is a crop yield-enhancing technology for improving smallholder farmers' income and food security by enhancing land productivity (Andani *et al.* 2020). Fertilizers, if well used, are ones of the most important inputs in enhancing agricultural output. Among the major difficulties the agricultural sector is facing; are achieving food security, mitigating climate change and reducing natural resource deterioration towards achieving Sustainable Development Goals (SDGs) (Prakash Aryal et al., 2021).

Soil infertility is the major cause of food insecurity and poverty in developing countries and it invites to the use of chemical fertilizer (Martey *et al.*, 2019). In sub-Saharan African countries, low fertility and inefficient management of soil is the main challenge facing productivity among smallholder farmers (Raimi *et al*., 2017).

With the rapid population growth, food production hinges largely upon access to fertilizer (Powers et al., 2017). The effective use of inorganic fertilizer becomes very essential to boost land productivity and achieve food security with the growing world population which is expected to reach 9.7 billion by 2050, within arable land scarcity which will increase the current demand for food by 70% (Randive et al., 2021). There is an increased demand for agricultural products since the world population is doubled in the past decades and the situation is more severe in sub-Saharan African Countries (Shanka, 2020). Similarly, the imbalance between the population growth rate and the agricultural production growth rate is one of the prominent national problems in Ethiopia (Abebe & Debebe, 2020). Increasing inorganic fertilizer application allows farmers to gain better welfare (Legesse et al., 2019). Even the non-farming communities can enjoy a lower cost of food items as being a net consumer in today's inflated market. Recent studies indicated a strong relationship between yield and fertilizer use among smallholder farmers (Pandey and Diwan, 2021). Similarly, enhancing agricultural production to feed the ever-growing population requires the rational use of inorganic fertilizer (Noor et al., 2020; Nyamangara et al., 2020). Inorganic fertilizer use, particularly nitrogen (N), is an important management practice to increase crop production and improve soil fertility. Thus, the use of soil fertility enhancing amendments to supply essential nutrients in crop production is of clear importance. Along with the nutrient supply from soil organic matter, crop residues, wet and dry deposition, and biological nitrogen fixation, synthetic (inorganic) fertilizer is a primary source of essential nutrients in crop production.

Vegetable plant parts are either eaten fresh or prepared in a number of ways. It tend to have short production cycles, receive intensive labour but few purchased inputs and produce high yields with strong nutritional value (Obalola and Tanko, 2016). They support rural and urban populations both in terms of subsistence and income generation without requiring large capital investments. It is estimated that there are at least ten thousand plant species used as vegetables worldwide but only about fifty of them are of great commercial value. The vegetables generally cultivated in Africa, most especially the tropics are of the genera: Amaranthus, Celosia, Cucumis, Hibiscus, Talinum, Solanum and Corchorus with onion, tomato, okra, pepper, amaranthus, carrot, melon, and Jute

1.2 Statement of the Problem

In Nigeria, vegetable growing is one of the major enterprises of agriculture and is becoming increasingly popular owing to greater appreciation of their food value. Vegetables, in no small measures, offer people with limited access to meat and fish, rich sources of protein and some vital micro nutrients needed for healthy living (Ajewole and Folayan, 2008). Vegetables are not only important as protective food and highly beneficial for the maintenance of health and prevention of diseases, but they are also a source of livelihood for small holder farmers (Ogunniyi and Oladejo, 2011)**.**

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The above factors underline the need for this study to provide answer to the following research questions:

i. What are the socio-economic characteristics of the vegetable farmers in the study area?
ii. What are the extents of utilization of inorganic Fertilizers by the respondents?
iii. What are the factors influencing extent of utilization of inorganic Fertilizers?
iv. What are the constraints associated with utilization of inorganic Fertilizers in the study area?

1.3 Aim and Objectives of the Study

The aim of the study was to examine the determinants factors of inorganic fertilizers among vegetable farmers of Ilorin East Local Government, Kwara State, Nigeria.

The specific objectives were to:

i. Describes the socio-economic characteristics of the inorganic vegetable farmers in the study area;
ii. Determine the extent of utilization of inorganic fertilizers by the respondents;

iii. Determine the factors influencing the utilization of inorganic fertilizers in the study area.

iv. Examine the constraints associated with inorganic fertilizers utilization in the study area.

1.4 Hypotheses of the Study

The following null hypotheses was tested in this study:

HO1: There is no significant relationship between some selected socio-economic characteristics of rural households (age, gender, education, experience etc.) and extent of utilization of inorganic Fertilizers by vegetable farmers in the study area.

HO2: There is no significant relationship between the agricultural and economic benefits and extent of utilization of inorganic Fertilizers by vegetable farmers in the study area.

1.5 Justification of the Study

Almost all household in Nigeria include vegetable in their diets. Vegetables are generally associated with a number of problems particularly from the production aspect. Farmers are still applying inorganic fertilizer lower than the recommended rate and some of the farmers do not apply at all in the study area as the use of inorganic fertilizer is generally low in developing countries because of smallholder farmers' low purchasing power and access to the inorganic fertilizer (Nyamangara et al., 2020). Several studies have identified factors affecting fertilizer adoption, but the factors vary from place to place and time to time (Ketema and Kebede, 2017). Thus, an area specific study is required to explain the determinants of inorganic fertilizer use. This study analysed the willingness, challenges and determinants of fertilizer use by vegetable farmers.

The use of fertilizers, particularly chemical fertilizers use, is an important method for increasing farm income by boosting soil fertility. The use of fertile soil improves amendments to supply needed macro and micronutrients in crop productivity. The achievement of the Green Revolution (GR) in the 1960s to improve food production and alleviate global hunger was made possible by the increased usage of inorganic fertilizers (Erisman et al., 2010). The increased of using inorganic fertilizers combined with irrigation schemes and improved varieties were core to the

Government of Nigeria philosophy that targeted to increase crop yields. Many farmers in Nigeria are unaware of application rate of inorganic fertilizers, they just apply when and where they believe it is necessary. Heavy subsidy related to inorganic fertilizers and the inadequate fertilizers application knowledge has resulted to inadequate application,

CHAPTER TWO

LITERATURE REVIEW

2.1 Economic and Health benefits of Vegetable Production

In Nigeria, vegetable growing is one of the major enterprises of agriculture and is becoming increasingly popular owing to greater appreciation of their food value. Vegetables, in no small measures, offer people with limited access to meat and fish, rich sources of protein and some vital micro nutrients needed for healthy living (Ajewole and Folayan, 2008). Vegetables are not only important as protective food and highly beneficial for the maintenance of health and prevention of diseases, but they are also a source of livelihood for small holder farmers (Ogunniyi and Oladejo, 2011)**.**

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2.2 Inorganic Fertilizers

The success of the Green Revolution (GR) in 1960s to increase food production and to reduce hunger worldwide was made possible, partly due to the increasing use of inorganic fertilizer (Erisman et al. 2008). However, excessive inorganic fertilizer use during and post GR caused a number of environmental and ecological problems such as soil acidification, degradation, and water eutrophication, severely undermining the sustainability of agriculture (Lu and Tian 2017). The loss of applied nutrients into the environment resulted in the fertilizer-induced emission of nitrous oxide (N2O) from agricultural production, a major source of anthropogenic greenhouse gas emissions (Sutton et al. 2013). Around 60% of nitrogen pollution is estimated to originate from crop production alone, particularly through nitrogen (N) fertilizer application (Sapkota et al. 2018b). Hence, agricultural development pathways need to address these concerns, in addition to climate change adaptation and mitigation (Aryal et al. 2020a; Aryal et al. 2020b; van Beek et al. 2010).

In South Asia (SA), the use of N fertilizer has been increasing over three decades (FAO 2021). Increased use of inorganic fertilizer together with irrigation and improved genetics were core to the GR philosophy that aimed to increase crop productivity in SA (Benbi

2017; Firdousi 1997; Pingali 2012; Roy 2017). Food-grain production in India increased from 82

million tons in 1960 to 284 million tons in 2018/19, rendering the country largely self-sufficient in cereals (GoI 2020). Yet to achieve this, rates of inorganic fertilizer application have increased

dramatically (Benbi 2017; Roy 2017). For instance, in Indian states of Punjab and Haryana, fertilizer-N use increased from a meager 2–8 kgNha−1 in 1960s to more than 160–180 kg N ha−1 in 2017 (Benbi 2017).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

This study was carried out at Ilorin East Local government, Ilorin Kwara State, is a state in Western Nigeria, bordered to the East by Kogi State, to the North by Niger state, and to the South by Ekiti, Osun, and Oyo states, while its Western border makes up part of the international border with Benin Republic. It is located at 4.3874051^o E longitude and 8.9668961^o N latitude respectively (Kwara State Geographical Information System (KWGIS), 2018). Kwara State is bounded in the guinea savannah (also known as savannah woodland or wooded savannah) which is the most extensive vegetation in Nigeria's middle belt, with a combination of trees and grass. It receives yearly rainfall in the range of 1000–1500 mm, with 6–8 months of rain. Ilorin East is a Local Government Area in Kwara State, Nigeria. Its headquarters are in the town of Oke Oyi. It has an area of 486 km^2 and a population of 204,310 at the 2006 census. It comprises of thirteen (13) district (wards) which are : Magaji Are, Iponrin, Ibagun, Agbeyangi, Gbadamu, Gambari, Marafa, Maya, Ile-Apa, Oke-Ose, Alalubosa, Zango..

The State has a climate typical of the tropical zone, because of its location. Its climate is quite pleasant with a minimum temperature of 60o F and Maximum temperature of 80o

F, recorded while rainfall varies from 313.73cm in some places to 145cm in other areas. The month of December, January and February are cold period (sometimes quite cold) due to the very dry Harmattan winds blowing across the state from the North-East. The State is characterized by two distinct seasons: dry and wet. The dry season start from November to February, while the rainy season is from March to October. Average daily sunshine in the state is 6.2 hours and daily vapour pressure is 26hpg.

3.2 Method of Data Collection

Data for this study was obtained from primary sources with the use of structured questionnaire. The questionnaire was administered on the vegetable inorganic farmers respondents to collect information on their socio-economic characteristics, the extent of utilization of inorganic fertilizers by the respondents; the factors influencing the extent of utilizing inorganic fertilizers and the constraints associated with the inorganic fertilizers.

3.3 Measurement of Variables

3.3.1 Dependent variables

Dependent variable for this study is the extent of utilizing inorganic fertilizers. This was measured using 3-point Likert type of scale involving High utilization (3), Moderate Utilization (2) and Low utilization (1). The mean score for the scale calculated as 3+2+1=6, divided by 3 to give 2.0 was considered as bench mean score for the scale.

Thus, mean Score ≥ 2 was adjudged = High utilization, while mean Score < 2 was adjudged = Low utilization

3.3.2 Independent variables

1. Socio-economic characteristic of rural households:

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

Household size: - This was determined as the number of people living in a family.

Farm size: - This was measured in hectare (ha)

Income: - This was measured as total amount of money realized by the respondents from the sale of vegetable products. It was measured in Naira.

Credit access: - It was measured in Naira over a period of one year.

Cooperative membership: - It was measured by the number of Cooperatives the respondents belong (number)

Extension contact: This was the numbers of times the respondents received extension agent per annum.

Farming experience using inorganic fertilizers in vegetable production:- Measured in number of years the respondents have been Farming .

Experience in inorganic fertilizers utilization in vegetable production: measured in number of years the respondents have been utilizing inorganic fertilizers for vegetable production.

Types of inorganic fertilizers utilized: Was measured in number by asking the respondents to indicate the type of inorganic fertilizers utilized in the study area

Purposes of utilizing inorganic fertilizers in vegetable production: This was measured based on the purposes of utilizing inorganic fertilizers

2. The constraints faced by inorganic fertilizers farmers was determined using a 3-point Likert type of scale involving Very Severe (VS) = 3, Severe (S) = 2 and Not Severe (NS) = 1. Thus, mean scores of ≥ 2 implies Severe constraint, while mean scores of < 2 = Not Severe constraint.

3.4 Method of Data Analysis

Objective i, ii, iii and iv.

Objectives i, ii, iii and iv was achieved using descriptive statistics such as frequency distribution, percentage, mean and standard deviation.

Objectives i, ii, iii and iv

Objectives i, ii and iv was achieved using descriptive statistics (Three point likert scale was used to measured the extent of inorganic fertilizers utilization among the vegetable farmers as HU = Highly Utilization (3), MU = Moderate Utilization (2) and LU = Low Utilization (1)

Objective iii

The factors that influence the extent of inorganic fertilizers utilization objective (iii) was achieved using inferential statistics of Logit regression; The implicit form of the model is given as:

$Y = f(X1, X2, X3, X4, X5 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots X12)$

The Logit regression model in its explicit form is expressed as below:

$Y=b+b1X1 +b2X2 +b3X3 +b4X4 +b5X5 +\ldots\ldots+b12X12 +U$

Where;

Y = Extent of utilizing inorganic fertilizers (1 = high utilization, 0 = otherwise)

X1 = Age (years)

X2 = Gender (male=1, female=0)

X3 = Education level (years)

X4 = Household size (number)

X5 = Farm size (hectares)

X6 = Farming experience (years)

X7 = Extension contact (number)

X8 = Cooperative membership (number)

X9 = Credit access (yes =1, otherwise =0)

X10 = Type of inorganic fertilizers utilized (number)

3.5 Testing of Hypothesis

The Pearson Product Moment Correlation (PPMC) analysis was used to test hypothesis ii, while hypothesis i was tested using the z-value from the Logit regression. The PPMC formula is given as:

$$r = \sum \frac{n\sum xy - \sum x \sum y}{\sqrt{[n(\sum X2) - (\sum X)2\}[n(\sum Y2) - (\sum Y)2]}}$$

here;

: correlation coefficient

= Health benefits

here;

: correlation coefficient

= Health benefits

Where;

r = correlation coefficient

Y = Health benefits

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

This chapter discussed the results of analysis from information provided by the respondents on their socio-economic characteristics, determinants of utilization of inorganic fertilizer, factors influencing extent of utilization of inorganic fertilizer and challenges associated with inorganic fertilizer in the study area.

4.1 **Socio-economic characteristics of the vegetable farmer's rural households**

The Socio-economic characteristics of the respondents includes age, sex, marital status, household size, educational status, access to farmland and farmland acquisition.

4.1.1 Age of the respondents

The result in Table 1 revealed that most (60.7%) of the respondents were within the age range of 31 – 60 years with a mean age of 40 years implying that the rural households were in their mid-age and most productive stage of life where they could utilize inorganic fertilizers. Young people are reported to be active in every economic activities and quick in decision making process as it affect their livelihood.

Thus, they are inclined towards utilizing inorganic fertilizers based on its benefit. This result is in agreement with Etonihu *et al.* (2013) who posited that active farming age was between 41 – 60 years with a mean age of 43 years.

Table 1: Distribution of respondents based on their socio-economic characteristics (n =207)

Variable	Frequency	Percentage	Mean
Age (years)			
< 31	70	28.7	40
31 – 40	89	36.5	
41 – 50	38	15.6	
51 – 60	21	8.6	
< 60	26	10. **7**	
Sex			
Male	158	64.8	
Female	86	35.2	
Marital Status			
Single	74	30.3	
Married	134	54.9	
Divorced	12	4.9	
Separated	4	1.6	
Widowed	20	8.2	
Household size (No)			
< 6	138	56.6	
6 – 10	63	25.8	
11 – 15	17	7.0	
16 – 20	9	3.7	
> 20	17	7.0	
Educational status			
No formal	39	16.0	**13**
Primary	42	17.2	
Secondary	72	29.5	

Diploma/NCE	55	22.5
Degree/HND	36	14.8

Source: Field Survey 2025

4.1.2 Sex of the respondents

The distribution of the respondents based on their sex is presented in Table 1 as most (64.8%) of the respondents were males, while 35.2% were females implying that males were the dominant household heads in the area. Males are the major decision makers and breadwinner in most rural household settings because of the role they play in the society. They provide the basic needs of the family like food, clothing and shelter as well as provide healthcare which could be achieved through utilization of inorganic fertilizers. This finding is in line with the work of Thamaga and Chitja (2014) who reported that most of the respondents utilizing inorganic fertilizers in their study area were males.

4.1.3 Marital status of the respondents

As shown in Table 1, more than half (54.9%) of the respondents were married, while 30.3% were single and others were either widowed (8.2%), divorced (4.9%) or separated (1.6%), implying that the respondents are responsible individual with sense of responsibility to provide the basic needs of their families. Married individual are responsible for pro-creation of next generation that will assist in farming operations. This result agrees with the work of Onyebu (2016) who reported that majority of the respondents in his study area were married and more involved in income generating activities than those that is single.

4.1.4 Household size of the respondents

Table 1 revealed that more than half (56.6%) of the respondents had household size of less than 6 people with a mean household size of 7 people implying a relatively large households. A rural household comprises of all the people living under the same roof and eat from the same pot. It plays an important role in determining what occurs on the farm through supply of family labour. An increased family member increases the consumption expenditure of the households which could enhance the utilization of inorganic fertilizers.

4.1.5 Educational status of the respondents

In terms of the educational status of the respondents, majority (84.0%) of the respondents acquired one form of formal education or the other (primary, secondary and tertiary) with a mean of 13 years of formal schooling. This implies that most of the respondents are educated (i.e. could read and write), with at least acquiring secondary education. Education is a major pathway for improved health, productivity and socio-economic status. Hence, high literacy level in the study area could be associated with enhance utilization of inorganic fertilizers. This agrees with Ayanwale and Amusan (2012) who reported that high level of education improves an individual's ability to understand and process information about farming benefits of inorganic fertilizers.

4.2 Extent of Utilization of Inorganic fertilizer by the vegetable farmers

4.2.1 Utilization of Inorganic fertilizer by the vegetable farmers

As revealed in Table 2, almost all (99.0%) of the respondents utilized the inorganic fertilizers, while very small (1.0%) of the respondents did not utilized the inorganic fertilizers. This implies that the rural households in the study area have the knowledge of inorganic fertilizers and utilized it. inorganic fertilizers could be utilized in several other ways as source of income, nutritional supplement, food security, immune booster, livestock feeding, water purification and energy booster.

Table 2: Respondents' extent of utilizing Inorganic fertilizer by vegetable farmers (n = 207)

Inorganic Fertilizers	HU (3)	MU (2)	NU (1)	Sum	Mean	Remark
NPK 15:15:15	215 (88.1)	20 (8.2)	9 (3.7)	694	2.84	High Utilization
NPK 20:10:10	43 (17.6)	175 (71.7)	26 (10.7)	505	2.0	High Utilization
Urea	55 (22.5)	145 (59.4)	44 (18.0)	499	2.05	High Utilization
NPK 20:15:15	35 (14.3)	114 (46.7)	95 (38.9)	428	1.75	Low Utilization
SSP	30 (12.3)	86 (35.2)	128 (52.5)	390	1.60	Low Utilization
	34 (13.9)	77 (31.6)	133 (54.5)	389	1.59	Low Utilization
TSP	23 (9.4)	68 (27.9)	153 (62.7)	358	1.47	Low Utilization

Sources: Field Survey 2025

Note: HU = Highly Utilization (3), MU = Moderate Utilization (2) and LU = Low

Utilization (1)

Bench mean score = 2.0

4.3 Willingness of Vegetable Farmers to Apply Inorganic Fertilizer

About 94 % of the respondents are willing to apply inorganic fertilizer on their farm land. This implies that the use of inorganic fertilizer can boost plot level productivity with the small plot of land and fast-growing population. The current study revealed that there is an increasing pattern of using inorganic fertilizer among small holder farmers to boost farm productivity (Tesfay, 2021). However, there are many challenges in the supply and distribution system which farmers faced to use of inorganic fertilizer. The main challenges farmers face in access to inorganic fertilizers are high price of fertilizers, infrastructure problem like road facility, late delivery, unavailability of credit facility, and no appropriate storage facility in farmers' association offices which make fertilizers liable for theft and spoilage. The current distribution system of inorganic fertilizer is linked with a local credit institution, but not with the issue of access to credit service for vegetable farmers. The low consumption of inorganic fertilizer was explained by limited access to credit in the study area as it has been explained by the focus group discussants. The other main challenge in fertilizer consumption is the activities of illegal private fertilizer providers. A significant number of farmers buy inorganic fertilizer from local markets and neighboring farmers. These in turn lead farmers to use low-quality fertilizer. Farmers explained the reason that there was no affordable quantity to be supplied by the cooperatives below 50 Kg as per the demand of farmers. As a result, farmers prefer the local market since they can buy the amount they need. The respondents identified and ranked the major challenges of vegetable farmers' access to inorganic fertilizer inorganic fertilizer price increment was the most felt challenge in the study area, followed by poor demand estimation and delay in distribution of inorganic fertilizer. This implies that smallholder farmers are more sensitive to price fluctuation in the market, and it influences the use of inorganic fertilizer (Shee *et al*., 2020)

Table 3: Major challenges to access inorganic fertilizer

Challenges to access inorganic fertilizer	Percentage (n=207)
High price of inorganic fertilizer	96
Poor demand estimation of inorganic fertilizer	82
Delay in distribution of inorganic fertilizer	78
Difficult to access in the right mix at the same time	69
	65
	61
Low performance of the supply and distribution system	58
Difficult to access right quantity of inorganic fertilizer	57
Difficult to access right quality of inorganic fertilizer	49
No legal private agro-dealers	44
Lack of appropriate fertilizer storage facility	34

Source: Field Survey 2025

Determinants of Inorganic Fertilizer Use

Active labour forces in the family: Higher number of active family labour force leads to decisions to take the risk of participation in technology packages, and hence the family labour force contributes to use of inorganic fertilizer. The rate of inorganic fertilizer consumption is positively influenced by the number of man equivalent present in the household. The result shows that as the number of active labour force of the family increases by 1 unit, fertilizer utilization of the family would increase by 20.4 Kg. This implies that fertilizer utilization needs a high labour force, and this idea was raised during the focus group discussion. Moreover, whenever the number of active labour force of the family increases, taking the risk of using production enhancing inputs would increase. This result coincides with the findings of Tamirat, (2020).

Farm Size: Farm size influenced positively inorganic fertilizer consumption. The marginal effect indicates that if other things remaining constant, the amount of fertilizer utilization increases by 14.53% as an additional unit (Timad) of land increases by one unit. Therefore, farm size is an important variable in the input-output marketing participation and fertilizer consumption. The result is in line with the findings of Bai *et al.,* (2019), Ambaw (2019), Martey *et al.,* (2019), and Pandey and Diwan, (2021).

Income of the household: Its coefficient came out to be positive and statistically significant. The marginal effect indicates that other things remaining constant, the amount of fertilizer utilization increases by 0.025% as the income of the household increases by one percent. This implies that households who have access to better income opportunities are likely to use more fertilizer than those households who had no or little access. The possible reason might be that income of the household determines the purchasing power of households since fertilizer is distributed on a cash basis. Moreover, households that have low income suffer more from an increasing fertilizer price. The result is in line with the findings of prior studies Ambaw, (2019).

Use of credit: The result of the model depicted that the use of credit service has a positive relationship with the consumption of inorganic fertilizer by smallholder vegetable farming. Other things being unchanged, the probability of using more amounts of inorganic fertilizer increases by 31.11%for households who use credit services compared to vegetable farming households who do not use credit services. This implies that credit can buffer the financial constraints of farmers to buy inorganic fertilizer. This finding is similar to others' findings with the explanation that farmers' financial condition and purchasing capacity are crucial in deciding about the amount of fertilizer to be consumed (Pandey and Diwan, 2021).

Extension contact: Frequency of extension workers' contact with farmers observed to have a positive influence on the use of inorganic fertilizer. It was shown that an increase in one contact increases the amount of fertilizer consumption by 24.60 Kg. Farmers who get more contact with frontline extension workers are able to receive better information and advice for agricultural technology information including fertilizer (Gebreegziabher and Mezgebo, 2020). Access to extension service is the main determinant factor to apply agricultural technologies (Usman *et al*., 2020). This implies that farmers who have a high frequency of contact can take the advantage of taking information and use more fertilizer. The finding is congruent with the result of Ambaw (2019).

4.4 Hypotheses testing

4.4.1 Hypothesis I:

The result of hypothesis I which stated that there was no significant relationship between the selected socio-economic characteristics of rural households (age, gender, education, experience etc.) and extent of utilization of inorganic fertilizer in the study area is presented in Table 4. It revealed that marital status (2.05), household size (2.04), education (2.83) farming experience (1.82) and access to credit (3.23) were all statistically significant at 1%, 5% and 10% level of probability. Therefore, the null hypothesis that says there is no significant relationship was rejected and the alternative hypothesis was accepted. This implies that the selected socio-economic variables influence the extent of inorganic fertilizer utilization.

Table 4. Regression estimate of hypothesis I

Variable	Coefficient	Standard error	z–value
Age	0.0083	0.0263	0.32
Sex	-0.1781	0.4049	-0.44
Marital status	0.8726	0.4247	2.05**
Household size	0.0939	0.0461	2.04**
Education	0.1293	0.0457	2.83***

Table 5: Correlation estimate of hypothesis II

	r	sf
Extent of Inorganic fertilizer utilization	1.0000	
Perceived benefits of Inorganic fertilizer	0.1537*	1.0000

Source: Field survey, 2025 *signifies relationship

4.4.2 Hypothesis II

The result of hypothesis II which stated that there was no significant relationship between the perceived benefits and extent of utilization of *Moringa oleifera* in the study area was tested using Pearson's Product Moment Correlation (PPMC) and the result is presented in Table 5. The correlation (r) value of 0.1537 showed that there was a weak relationship between the extent of utilization and the perceived benefits of different inorganic fertilizers. Thus, the null hypothesis was rejected, while the alternative hypothesis accepted.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

There is increasing inorganic fertilizer consumption by vegetable smallholder farmers. Vegetable smallholder farmers' access to inorganic fertilizer is challenged by increasing price of inorganic fertilizer, poor demand estimation, delayed in distribution of inorganic fertilizer, difficulty in getting the types and amount of inorganic fertilizer at the right time, and lack of attention for Irrigation production system are the top-ranked challenges. On the other hand, the existence of more active labour forces in the family, farm size, total income, use of credit service and frequency of extension contact were found to significantly promote the consumption of inorganic fertilizer by vegetable farmers.

Government and other development partners should focus on the supply and distribution side of inorganic fertilizer through enhancing real demand estimation, finding a financial solution for resource-poor farmers and motivating frontline extension workers for better contact. The introduction of labour-saving farm tools is very critical to enhance inorganic fertilizer application to support vegetable farmers with low active labour force.

DEPARTMENT OF AGRICULTURAL TECHNOLOGY, INSTITUTE OF APPLIED SCIENCE, KWARA STATE POLYTECHNIC ILORIN, NIGERIA.

RESEARCH QUESTIONNAIRE

Dear Respondent,

We are Higher National Diploma (HND) student of the above named institution currently undergoing research work titled "DETERMINANTS OF INORGANIC AGRICULTURE PRACTICES AMONG VEGETABLE FARMERS IN ILORIN EAST LOCAL GOVERNMENT AREA OF KWARA STATE, NIGERIA.

This act is in partial fulfillment of the requirement for the award of HND AGRIC TECH of higher diploma in Agricultural Extension. Please, kindly supply the necessary information required to execute the study by answering the questions provided here. We assure you that all the information supplied will be keep as confidential and use strictly for academic purpose only.

Thank you for your anticipated cooperation and understanding.

By:

HND/22/AGT/FT/066 AZEEZ, Taiwo Bashir

HND/22/AGT/FT/075 AJIBOYE, Mustapha Olohunlogbon

HND/22/AGT/FT/145 ADAM, Tijani Buhari

HND/22/AGT/FT/190 ABDULRASHEED, Mardiyah Adenike

HND/22/AGT/FT/218 ADIO, Christian

SECCTION A: RESPONDENTS BACKGROUND INFORMATION

1. Name of Community / Village			
2. Age of Respondent			
3. Sex of Respondent	Male	Female	
4. Marital status	arried	ngle	'idow/Widower
5. Size of household	umber of wives	Jumber of children	
6. Educational status *ease tick the highest level of education you attained*)	Primary Education		
	condary Education		
	rtiary Education		
	lult Education		
	hers specify		

SECCTION B: RESPONDENTS' LEVEL ON USAGES OF INORG NIC FERTILIZERS FOR VEGETABLE PRODUCTION

1. Do you use inorganic fertilizer in your vegetable farming ?

2. If yes, what type of inorganic fertilizer do you use (e.g., NPK, Urea, SSP) ?

3. How often do you apply inorganic fertilizer to your vegetables?

………………………………………………..

4. What is the average amount of inorganic fertilizer you apply per hectare?

5. Where are the main sources of your inorganic your fertilizer? (e.g fertilizer depot, ministry of agriculture, research institute, individuals)

SECTION C: RESPONDENTS LEVEL ADDITIONAL INFORMATION ON UTILIZATION OF INORGANIC FERTILIZER

1. Are there any other farming practices you use in conjunction with organic fertilizer?

2. Have you received any training or

3. Support on organic fertilizer use

4. Are there any plan to expand or change your vegetable farming practices in the future ?

SECTION D: RESPONDENTS LEVEL OF VEGETABLE PRODUCTION USING INORGANIC FERTILIZER

1. What is the average yield of your vegetables per hectare ?
2. Have you noticed any changes in vegetable yield since using inorganic fertilizer ?
3. What is the average price you sell your vegetables for per kilogram
4. Have you noticed any changes in vegetable quality (e.g taste, texture) since using inorganic fertilizer ?

SECTION E: RESPONDENTS LEVEL OF VEGETABLE PRODUCTION USING INORGANIC FERTILIZER CHALLENGES AND BENEFITS

1. What are the main challenges you face in using inorganic fertilizer in your vegetable farming ?

2. What are the benefits you have experienced from using inorganic fertilizer in your vegetable farming?

3. Would you recommend inorganic fertilizer to other vegetable farmers ? When or Why not

THANK YOU VERY MUCH FOR YOUR KIND RESPOND

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