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AN EVALUATION OF FERTILIZER USE INTENSITY AMONG ARABLE FARMERS IN YOLA SOUTH LGA, ADAMAWA STATE, NIGERIA

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ABSTRACT: *Fertilizer use intensity per unit area is receiving a gross decrease in Africa most especially in Nigeria where farmers are faced with different factors limiting the intensive use of fertilizers particularly in Yola South LGA, of Adamawa State. Therefore, there is need to evaluate determinants factors affecting fertilizer use intensity is timely and essential. Thus, this paper aimed to evaluation of fertilizer use intensity among arable farmers in Yola south LGA, Adamawa state, Nigeria. Four (4) farm locations were selected (Bole, Yolde Pate, Mbamab and Wuro-chekks) in the area with intensive cultivation were well structured questions were administered to 40 sampled farmers were selected from each location culminated to 160 total sampled farmers. The primary data obtained were analyzed using simple descriptive statistics where percentages, frequencies and charts were presented. The results revealed that most farmers in the area were in the middle- active age with an average literacy level having low monthly income. In all the farm location in the area the cost of fertilizers as very expensive and the cost of stable will not compensate the fertilizer cost per 100 Kg. Similarly, it was found that inorganic fertilizers are readily available in all the farm location, but due to its high cost, lack of capital, unavailability of credit and untimely released of fertilizers to the target farmers limit the affordability and availability among farmers. To realized effective fertilizer use intensity among farmers for profitable farming, it is therefore recommends that government at all levels should reduce the high cost of fertilizers at affordable rate, farmers should have access to loans and credit as startup capital and timely distribution of farmers by the government should geared towards target farmers respectively.*

KEYWORDS: Arable, Evaluation, Farmers, Fertilizer, Intensity, Yola South, Nigeria

INTRODUCTION

Despite the global demand of food for the growing population the food production still remains inadequate in African countries which associated with natural disasters such as flood, drought sedimentation and fertility degradation. (Sadiq *et al.*,2019a). Due to decades of soil nutrient mining, Africa's soils have become the poorest in the world. It is estimated that the continent loses the equivalent of over $4 billion worth of soil nutrients per year, severely eroding its ability to feed itself. Yet farmers have neither access to nor can they afford the fertilizers needed to add life to their soils. (Ajiboye and Osundare, 2015). Similarly, A contributing factor to insufficient food production is the low soil organic matter content, and consequently, the inherent infertility of soils in Nigeria and in sub-Saharan Africa (Shiyam and Binang, 2013) As a result, small scale farmers, who produce the bulk of food in Nigeria, have to embrace fertilizer application – organic and inorganic – in order to increase yield

(IFPRI, 2011; FAO, 2013). African soils have inherent difficulties for agriculture in terms of fertility, acidity, or drainage, and land use practices during the past several decades have exacerbated the situation through nutrient mining by crops, leaching, and inadequate erosion control (Buresh *et al.* 1997; Pol 1992; Sanchez *et al.* 1997; Scherr 1999; Smaling et al. 1997; Stoorvogel and Smaling 1990; UNEP 1997; Weight and Kelly1999). In consequence, the draw conclusions about the rate of nutrient depletion in Africa by the researchers were the impacts of soil degradation on future productivity trends, and the quantities of fertilizer (organic and inorganic) needed to develop sustainable agricultural systems (e.g., Barbier 1999; Dalton 1996; Mazzucato and Niemeijer 2000; Snapp 1998). In West Africa, soil erosion gulps about 10-21 tons of top soils per ha on nearly gentle slopes of 0.4 -0.8% and up to 30 -35 tons on 1-2% slopes (Serageldin, 1987). In Nigeria, it has been reported that over 25 million tons of valuable top soils are lost annually to erosion (Ezidinma, 1982). Similarly, agricultural land in Nigeria is often results in the degradation of natural soil fertility and reduced productivity (Sadiq *et al.,* 2019b). In Adamawa state, soil degradation is quite glaring and felt through on field observation caused by various factors. (Sadiq *et al.*,2019c).

REVIEWED LITERATURE

Determinants of Fertilizer Use Intensity

There is general agreement that the improvements in soil fertility needed to stimulate agricultural productivity growth, improved food security, and increases in rural incomes will require substantial increases in fertilizer use (both organic and inorganic) in combination with improved land husbandry practices. *(*Eric *et al.,* 2006) The average intensity of fertilizer use throughout Sub-Saharan Africa (SSA) remains much lower than elsewhere (roughly 9 kilograms per hectare versus 86 kg/ha in Latin America, 104 kg/ha in South Asia, and 142 kg/ha in Southeast Asia) and has been virtually stagnant during the past decade (Eric *et al.,* 2006)**.** This–might be affiliated ot the high level of poverty among the small-scale farmers coupled with high cost of fertilizers beyond farmer's affordability level as well as diversion of the fertilizers from the target beneficiaries. Using somewhat different terminology, fertilizer consumption can be viewed as the outcome of both the conversion of fertilizer's economic potential into farmers' effective demand and the fulfillment of the demand through fertilizer supply and distribution system (Desai, 1988). In developing countries, fertilizers economic potential – determined by the prevailing fertilizer responses and prices – is almost always much larger than actual use. (Desai, 2002). This fertilizer economic potential can be viewed as the amount of fertilizer that can be used profitably, based on an analysis of prevailing prices and response functions. In addition, Druilhe and Barreiro-Hurlé (2012) asserted that among the problems hampering arable crop yield is availability and affordability of inorganic fertilizers. However, Shiyam and Binang (2013) argued that inorganic fertilizer may increase yield in the short term but may be both uneconomical and environmentally unsound. Thus, this situation is a function of the type, method and amount of fertilizer applied on the farm. Similarly**,** the utilization of fertilizer and the productivity of arable crop farmers is influenced by a multitude of factors including ecological zone, farmers' age, education, access to credit, purpose of crop production, distance to market, price, club membership, and extension contact (Fawole and Fasina, 2005; Adesoji and Farinde, 2006; Akpan-Idiok, 2012). The availability and the cost of fertilizers to resource-poor farmers constrain the use of fertilizers to a large extent (Fasina, 2013).

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Fertilizer Use Intensity in Sub-Saharan Africa

Ajiboye and Osundare, (2015) explained that it is the concern to trigger the improvement of soil fertility in Africa as a whole that made some African leaders gathered together for a fertilizer summit in Abuja in 2009 which led to effective discussion on reducing hunger in the continent through addressing critical issues related to fertilizer availability potential use, irrigation and improving severely depleted soils respectively. Farmers in Sub-Saharan Africa (SSA) still lag far behind other developing areas in fertilizer use. The average intensity of fertilizer use throughout SSA (roughly 9 kilograms per hectare see table 1 below) remains much lower than elsewhere.

Table 1: Fertilizer Use in Sub-Saharan Africa Compared to Other Regions

Region	**2000-2001**	**2002-2003**
	(Kg of fertilizer nutrients per ha of arable land)	
Sub-Saharan Africa	9	9
South Asia	109	100
East and Southeast Asia	149	135
Latin America	99	73

Source: FAO (2004).

Table .2 shows fertilizer use trends for the 30 Sub-Saharan Africa for which data is available on the FAOStat website. The countries are subdivided by row into those with low and high fertilizer use intensity (i.e., using less than or more than 25 kg/ha of fertilizer during the 1996–2002 period), and subdivided by column into those with low and high rates of growth in fertilizer use intensity (i.e., less than or more than 30% growth in mean levels of fertilizer use per hectare) between the 1990–95 and 1996–2002 periods. From table 2, Nigeria is among the with low rates of growth in fertilizer use intensity utilized less than < 25 kg/ha with only 5.6 mean growth considered as negative growth of – 73 % dropped from 1996-2002 respectively. Of the four countries using over 25 kg per hectare during the 1990s, three of them displayed moderate or negative growth between the 1990–1995 and 1996– 2002 periods, while only one country, Kenya, has achieved more than a 30% increase in fertilizer use intensity over this period. The pivotal question here is that why fertilizer use is rates so low in Africa? Kherallah *et al.* (2002) give the following reasons:

- Fertilizer costs in Africa are higher than in Latin America and Asia;
- Africa has a much lower proportion of irrigated land than in other continents;
- African farmers rely more on traditional crop varieties that are less responsive to fertilizers than in Asia and Latin America where modern varieties of wheat and rice are highly responsive to fertilizer;
- Most areas of Africa have relatively low population density, providing less incentive to invest in land-saving technology.

Table 2: Fertilizer Use Intensity and Growth in Fertilizer Use Intensity by Country

Intensity of Fertilizer Use, 1996–2002	Percent Growth in Fertilizer Use Intensity (kg/ha cultivated) (mean 1996–2002 / mean 1990–95)	
< 25 kg/ha	Angola (0.7, -69%)	Benin (17.6, +76%)
	Burkina Faso (5.9, -28%)	Botswana (11.8, +294%)
	Burundi (2.3, -6%)	Ethiopia (14.4, +71%)
	DRC (0.5, -47%)	Cameroon (5.9, +77%)
	Gambia (5.2, +15%)	Chad (4.3, +93%)
	Guinea (2.0, -4%)	Cote d'Ivoire (11.8, +53%)
	Madagascar (2.9, -8%)	Ghana (3.6, +68%
	Mali (9.0, +7%)	Lesotho (23.2, +35%)
	Mauritania (4.0, -64%)	Mozambique (3.2, +142%)
	Niger (0.9, +5%)	Rwanda (1.8, +89%)
	Nigeria (5.6, -73%)	Senegal (13.2, +67%)
	Tanzania (4.8, -47%)	Togo (7.0, +30%)
	Zambia (8.4, -34%)	Uganda (0.6, +237%)
> 25 kg/ha	Malawi (30.8, +9%)	Kenya (31.8, +33%)
	Swaziland (30.5, -40%)	
	Zimbabwe (48.3, +9%)	

Source: FAOStat website: http://faostat.fao.org/faostat/collections?subset=agriculture.

Notes: Fertilizer use intensity is defined as kg of fertilizer applied per hectare cultivated to annual and permanent crops. Growth in fertilizer use intensity is defined as the percentage increase in mean fertilizer use intensity between the 1996–2002 period and the 1990–1995 period. Numbers in parentheses are mean fertilizer use intensity for 1996–2002, and the percentage increase in fertilizer use intensity as defined above.

Moreover, current trends of intensive cultivation (compounding soil infertility due to faster depletion of soil nutrients), low capital base of farmers, scarcity of inorganic fertilizers, and the increasing demand for food, necessitate the identification of type and factors affecting the quantity of fertilizer being used to achieve optimum yields for small scale farmers, who bear the burden of providing food for over 150 million Nigerians. (Oluwatosin, 2016). According to IFPRI (2011), the production efficiency of farmers for most crops is low. IFPRI (2012) reported that the intensity of inorganic fertilizer use among Nigerian farmers is low and has dropped due to the prevailing level of poverty. Thus, no region of the world has been able to expand agricultural growth rates, and thus tackle hunger, without increasing fertilizer use. (African Fertilizer summit, 2009). Conversely, an increase in fertilizer use is directly proportional to the determinant's factors affecting it application.

Similarly, in Yola South LGA, of Adamawa State food production per unit area still appears to be very low among small scale arable farmers which might be connected to the depletion of inherent soils nutrients due to continuous trends of intensive cultivation making their production less or not profitable. However, some of the farmers in the area precariously involved in restoring the nutrients statuses of the soils through adoption of agronomic conservation techniques which appeared less effective due to difficulties and low benefits attached. Even though, most of the farmers accepted the use of inorganic fertilizers due to its glaring timely effects on yield improvement but very few of them were able to employ the

use of the fertilizers which might be attributed to different factors determining its utilization. Therefore, it is timely and essential to assess the determinants factors limiting the effective use of fertilizers by the farmers for profitable production in the area. Thus, it is against this backdrop, this paper saddled to evaluate the fertilizer use intensity among arable farmers in Yola South LGA, Adamawa State, Nigeria.

Study Area

The study area is Yola South Local Government Area of Adamawa State. Yola is the state capital and it lies between latitudes 9013' North and 9o12' North of the equator and between longitudes 12028' East and 12o30' East of the Greenwich Meridian within an area of about 1139.1 square kilometers. The state is bordered in the north by Borno state, in the south by Taraba state, in the west by Gombe state and in the east by the Cameroon Republic. The Yola South Local Government Area are bordered in the east by Fufore LGA, in the west by Demsa LGA and in the south by Mayo-Belwa and Fufore LGAs. Yola South Local Government Area has a tropical type of climate marked by distinct dry and raining seasons. The dry season commences in November and ends in April; while the wet season is from May to September. The annual rainfall in the state ranges from 700mm in the North-west to 1,600mm in the extreme southern part of Adamawa state (Adebayo, 1999).

Research Methodology

The research work was based on primary data obtained from four (4) selected farm locations in the study area where agricultural activities are very intense. Well-structured questionnaires were administered to forty (40) sampled farmers culminated to 160 sampled farmers respectively. The data obtained were analyzed using simple descriptive statistics where frequencies, percentages and charts were presented. Other relevant information was sourced from journals, textbooks, proceedings and libraries which formed the secondary data accordingly.

RESULTS AND DISCUSSIONS

Table 3: Demographic Profile and Socio-Economic Status of the Respondents (n = 160)

Variables	Category	Frequency (N=160)	Percent % (P=100)
Age	≤ 20	3	2.0
	21-30	19	12.0
	31-40	29	18.0
	41-50	50	31.0
	51-60	35	22.0
	61-70	16	10.0
	≥70	8	5.0
Level of Education	Never been in school	24	15.0
	Religion school	34	21.0
	Primary school	40	25.0
	Secondary school	37	23.5
	Tertiary school	25	15.5

Occupational status	Civil servant	29	18.0
	Private servant	16	10.0
	Business	39	24.0
	Pensioner	14	9.0
	Farmer	62	39.0
Monthly Income level (Naira)	≤ 5,000	37	23.0
	6,000-10,000	45	28.0
	11,000-15,000	34	21.0
	16,000-20,000	25	16.0
	≥21,000	19	12.0

Source: field survey, (2019)

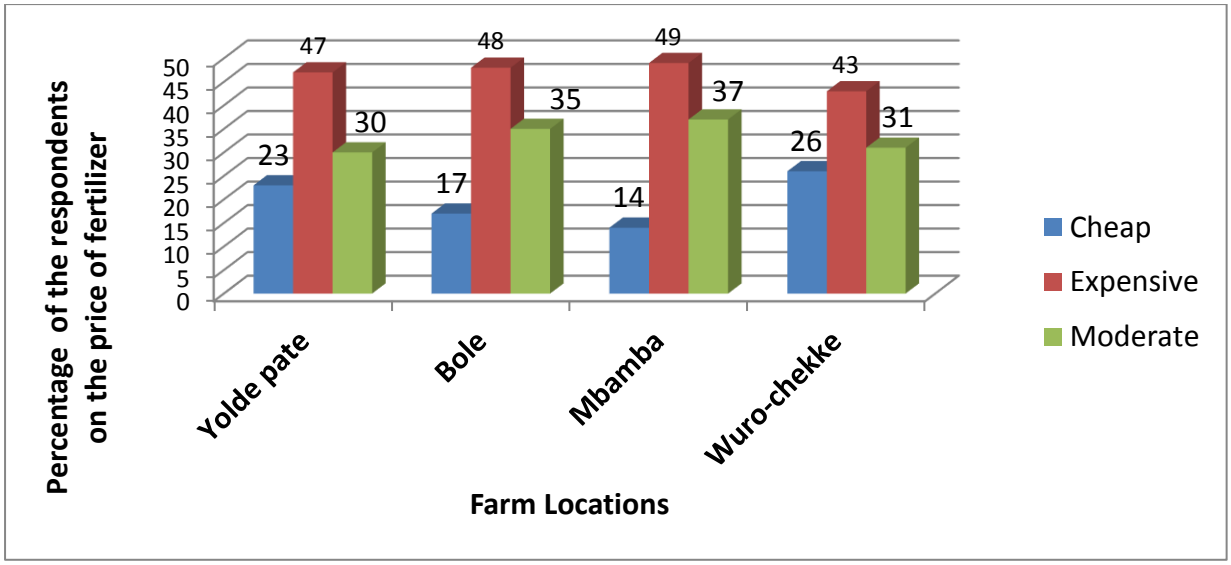

Fig 1. Perception of Farmers on Price of Fertilizer per bags

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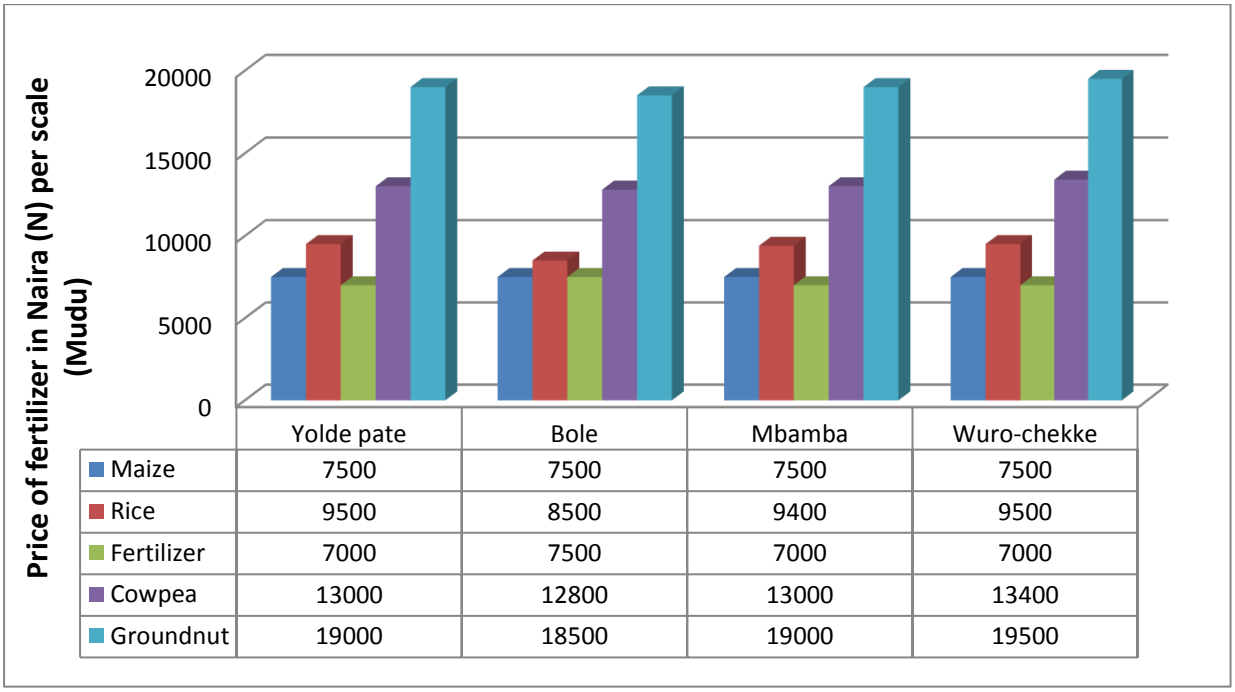
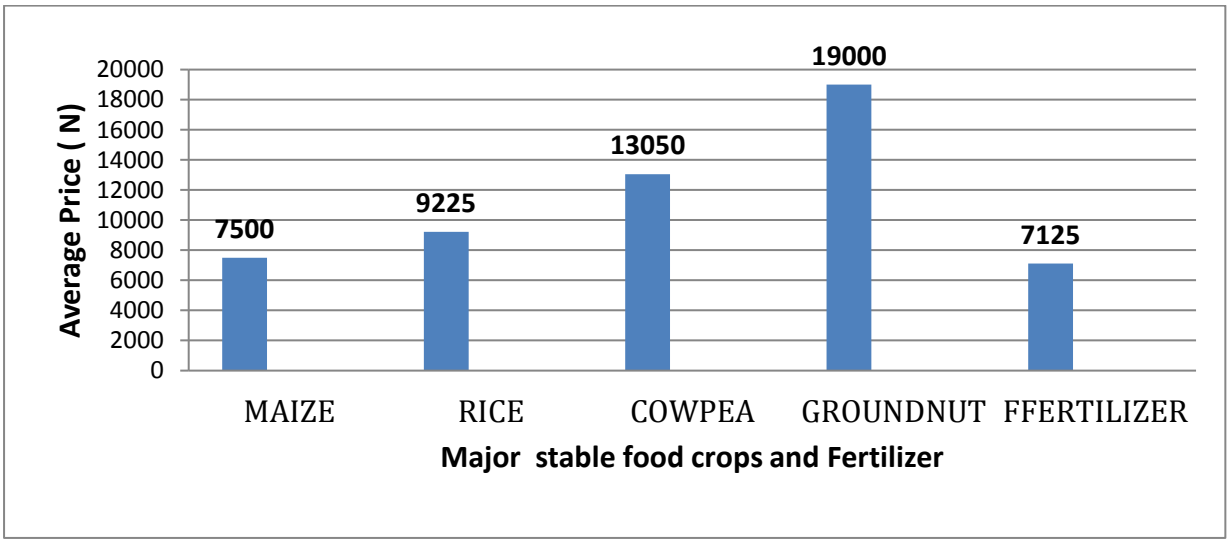


	Yolde pate	Bole	Mbamba	Wuro-chekke
Maize	7500	7500	7500	7500
Rice	9500	8500	9400	9500
Fertilizer	7000	7500	7000	7000
Cowpea	13000	12800	13000	13400
Groundnut	19000	18500	19000	19500

Fig 2: Comparative Analysis on the Price of Major Stable Food Crops per bag (100 Kg) and Fertilizer per bag (25 Kg).



Average fertilizer price was given in 25 Kg/bag × 4 = 100kg equivalent to other food crops. Therefore, the equivalent average price of fertilizer in 100kg was calculated as* ***7125× 4= 28,500

Fig 3: Average Price (₦) of Major Stable Food Crops per bag (100 Kg) and Fertilizer per bag (25 Kg)

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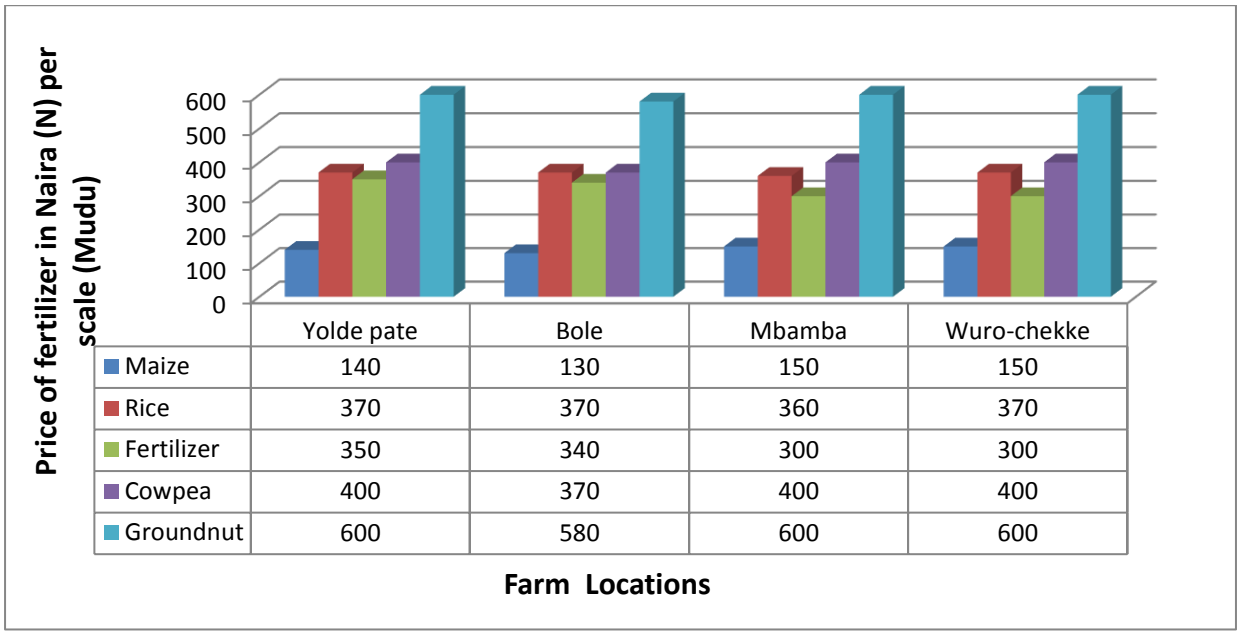

	Yolde pate	Bole	Mbamba	Wuro-chekke
Maize	140	130	150	150
Rice	370	370	360	370
Fertilizer	350	340	300	300
Cowpea	400	370	400	400
Groundnut	600	580	600	600

Fig 4: Comparative Analysis on the Price of Major Food Crops and Fertilizer per unit scale (Mudu)

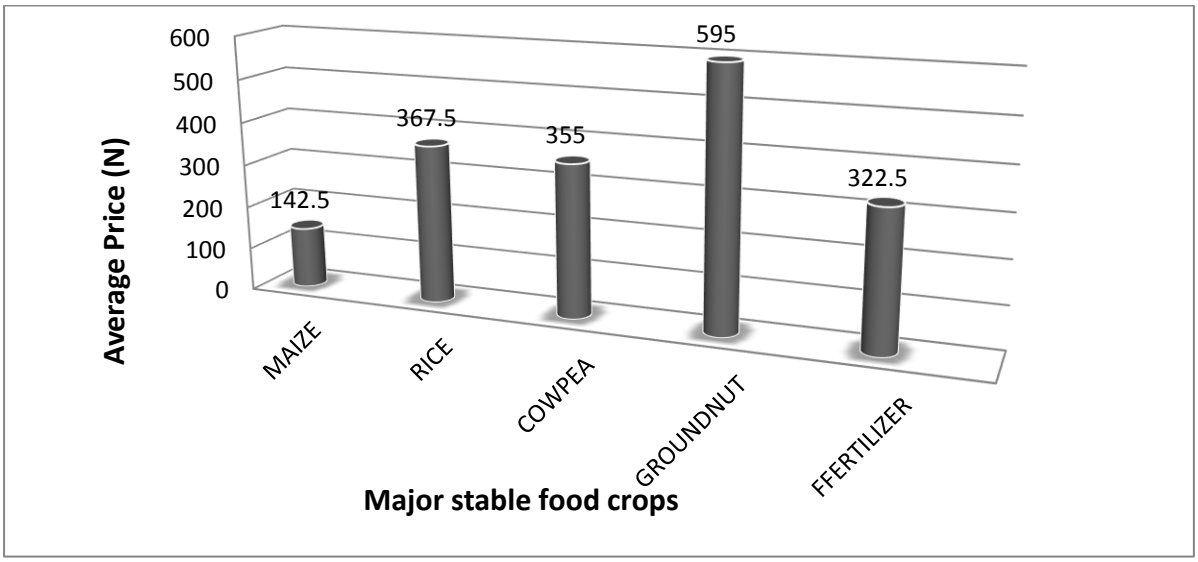

Fig 5: Average Price of Major Stable Food Crops and Fertilizer per unit scale (Mudu) in the Study Area.

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Table 4: Source of Credit for Fertilizer Purchase by the Arable Farmers (n = 40 for each location and p =100 %)

Farm Location	Corporative society	Commercial	Friends & Relatives	Private money lenders	No credit
Yolde pate	5 (12%)	9 (23%)	10 (25%)	8 (19 %)	8 (21%)
Bole	4 (10%)	11 (27 %)	9 (23%)	7 (18)	9 (22)
Mbamba	6 (15%)	8 (20%)	10 (25%)	5 (13%)	11 (27%)
Wuro-chekke	4 (10%)	9 (23%)	11 (27%)	6 (15%)	10 (25%)

Source: Field Survey, (2019).

Table 5: Distribution of Respondents by Availability of Fertilizer Among the Arable Farmers. (n=40 for each location and p = 100 %)

	Organic		Inorganic	
Farm Location	**Readily available**	**Not readily available**	**Readily available**	**Not readily available**
Yolde pate	18 (44%)	22 (56%)	31 (78%)	9 (22%)
Bole	10 (24%)	30 (76%)	27 (67%)	13 (33%)
Mbamba	26 (65%)	14 (35%)	25 (63%)	15 (37%)
Wuro-chekke	8 (20%)	32 (80%)	32 (81%)	8 (19%)

Source: Field Survey, (2019).

Table 6: Factors Affecting the Availability of Fertilizers and Utilizations Among Arable Farmers in the Study Area (n=40 for each location and p = 100 %).

Farm Location	Unavailability of credit	High cost	Cost of transportation	Ineffectiveness of fertilizers	Lack of knowledge on the application techniques	Untimely release	Lack of capital
Yolde pate	6 (15%)	9 (23%)	4 (10%)	2 (5%)	3 (7%)	8 (19 %)	8 (21%)
Bole	6 (15%)	8(19 %)	5 (13%)	2 (5%)	4 (10%)	7 (18)	8(20%)
Mbamba	7 (17%)	10 (24%)	5 (12%)	3 (7%)	2 (6%)	4 (11%)	9(23%)
Wuro-chekke	8 (19%)	10 (25%)	2(6%)	1 (3%)	3 (7%)	6 (15%)	10(25%)

Source: Field Survey, (2019).

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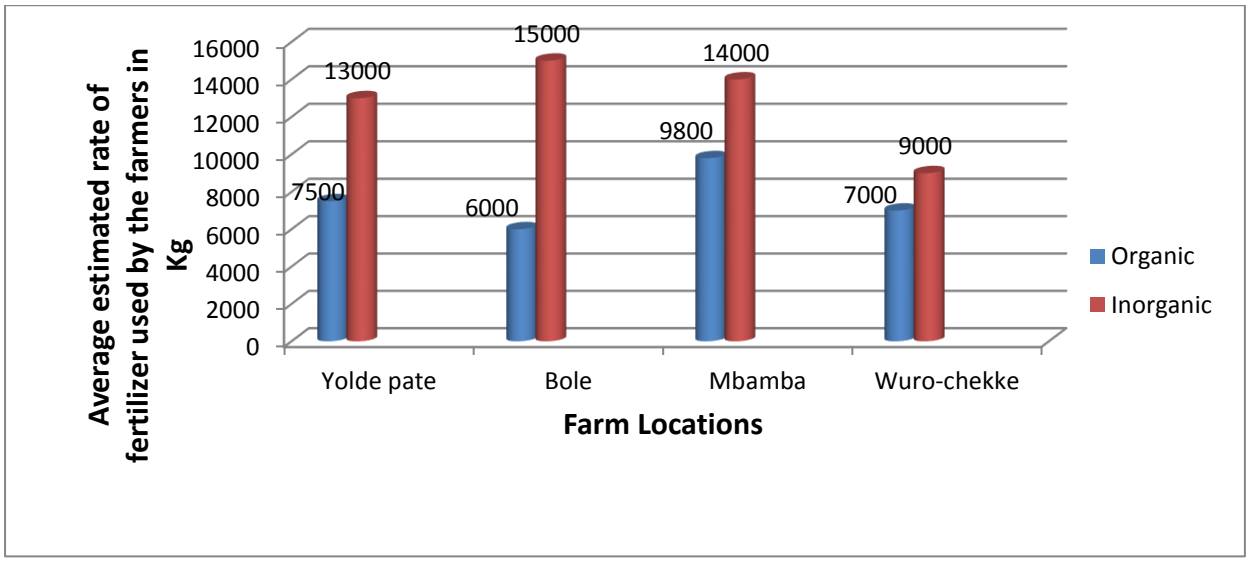

Fig 7: Comparative Analysis on the Average Estimated Quantity of Fertilizers used by the Farmers in Kilogram (Kg)

DISCUSSIONS

Demographic Profile and Socio-Economic Status of the Respondents

The result obtained from table 3 shows that majority of the farmers (31 %) falls within the middle active age of 41-50 years, then followed by 22 % which falls between 51-60 years and 18 % of them were in the range of 31-40 years respectively. This signified that the farmers are energetically enough to take active part in adoption of new farming innovations. About 25% of the respondents obtained primary school certificate, while 23.5% possessed secondary certificate and those with tertiary certificate constituted 15.5% of the total farmers in the study area. Thus, extension of modern techniques may be easy and easily acceptable among the farmers considering the baseline possessed by the farmers. Majority of the farmers (39 %) were engaged in both rainy and irrigation farming as their primary function, where 24 % of them involved in small scale business, civil servant constituted about 18 % and only 9 % were recorded to be pensioners of the total respondent respectively. This has indicated that their utmost livelihood income and economic status are basically depended on farming throughout the season. Most of the respondents (28 %) earned about 6000-10,000 naira as monthly income, 23 % earned ≤ 5,000, where those received monthly income of 11,000-15,000 naira recorded about 21 % and only 12 % of the farmers earned ≥21,000 monthly. The result further explained that income level of the most farmers is very low generated form intensive farm labour and sells of farm produce.

Perception of Farmers on Price of Fertilizer per Bag

Results on perception of farmers on price of fertilizer per bag were depicted on figure 1. At Yolde Pate farm location of the study area the results show that most of the farmers (47 %) conceived that the cost of fertilizer was expensive, while 30 % considered the price as moderate and the remaining 23 % perceived it as cheap and affordable. Similarly, the trends remained the same at Bole farm location where 48 % of the farmers agreed on the

expensiveness of fertilizer price in the area, 35 % of them recognized it as moderate and only 17 % perceived the prices as cheap. Likewise, at Mbamba farm location about 49 % of the respondents conceived the fertilizer to be expensive, 37 % recognized it as moderate and 14 % defined the price as cheap at their own disposal. Correspondingly, at Wuro-chekke farm location the price of fertilizer appeared to be expensive among most (43 %) of the farmers and those recognized it as moderate accounted of about 31 % while 26 % perceived the cheapness of the fertilizer compared with the other farm locations respectively. Generally, in all the farm location in the study area, farmers conceived that the price of inorganic fertilizer per bag is very expensive which might be unaffordable to them due to low income earnings thereby serve as factor limiting the use of in organic fertilizer in the area? Thus, this finding is in conformity with the report of Fasina, (2013) who explained that the cost of fertilizers to resource-poor farmers constrain the use of fertilizers to a large extent. Similarly, IFPRI (2012) reported that the intensity of inorganic fertilizer use among Nigerian farmers is low and has dropped due to the prevailing level of poverty. Thus, no region of the world has been able to expand agricultural growth rates, and thus tackle hunger, without increasing fertilizer use. (African Fertilizer summit, 2009).

Comparative Analysis on the Price of Major Stable Food Crops per bag (100 Kg) and Fertilizer per bag (25 Kg)

Results on comparative analysis on the price of major stable food crops per bag (100 Kg) and fertilizer per bag (25 Kg) were portrayed on figure 2. From the results, it was revealed that in all the four (4) farm locations (Yolde pate, Bole, Mbamba and Wuro-chekke) the price of maize was ranged from 7,000-8,000 naira, rice 8,000-9,500 naira, fertilizer 6,300-7, 500 naira, cowpea ranges from 12,500-13,000 naira and groundnut 18,000-19,000 naira respectively. In addition, results on the average price (₦)of major stable food crops per bag (100 Kg) and fertilizer per bag (25 Kg were depicted in figure 3. The results shows that the average price of maize in the farm locations was found to be 7500 naira per bag (100 Kg), rice 9, 225 naira per bag (100 Kg), cowpea 13,050 naira per bag (100kg), groundnut 19,000 naira per bag (100kg) and fertilizer 7125 naira per bag (25Kg). Therefore, to obtained 100 Kg (25 kg × 4) = 100 Kg. Thus, an average price per Kg was obtained as 7125 naira × 4 =28, 500 naira which is more than the average stable food crops in all the farm location. This is to say that for a farmer to obtained 100 kg of fertilizer he must sell about four bags of maize equivalent to 400 kg. The ratio of stable food to fertilizer is given as follows; 400 kg maize: 100 kg fertilizer, 350 kg rice: 100 kg, 150 kg cowpea: 100 kg and 150 kg Groundnut: 100 kg respectively. This is clearly explained why fertilizer use rate is low among small scale farmer in the area. The finding is connected to the reason of Kherallah *et al.* (2002) on low use of fertilizer by the small scale in Africa is due to high cost than in Latin America and Asia.

Comparative Analysis on the Price of Major Food Crops and Fertilizer per unit scale (Mudu)

Results on comparative analysis on the price of major food crops and fertilizer per unit scale (Mudu) of the four selected farm locations in the study area were depicted on figure 4. From the result obtained in all the four (4) farm locations expressed that the price of maize per unit scale (Mudu) ranged from 120-150-naira, rice 340-380, fertilizer price ranges from 280-350-naira, cowpea 350-380 naira and groundnut 550-590. However, the result on the price index of all the stable food crops and fertilizers are subject to fluctuation over time due to various factors (climatic, government policies, economic and agronomic) in the study area. The

current average price index on the price of major food crops and fertilizer per unit scale (Mudu) of all the selected farm locations were depicted in figure 5, which shows that the average price of all the major stable food crops per unit scale (Mudu) is higher than that of fertilizer (315 naira) per unit scale (Mudu) except that of maize with 135 naira per unit scale (Mudu).Hence, it might be an attributed determinant factor of low utilization of inorganic fertilizers among the small scale farmers in the area as maize appeared as a major stable food crops produced with high yielding potentials compared with the other food crops and most farmers rely on local traditional crop varieties that are less expensive to fertilizer. Therefore, the farmers prefer to purchase inorganic fertilizer in small quantity (Mudu) in trying to improve crop growth which might be insufficient. Kherallah *et al.* (2002) reported that, African farmers rely more on traditional crop varieties that are less responsive to fertilizers than in Asia and Latin America where modern varieties of wheat and rice are highly responsive to fertilizer as a limiting factor of fertilizer use.

Sources of Credit for the Purchase of Fertilizer by the Arable Farmers in the Study Area

Results on the sources of credit for fertilizer purchase by the arable farmers in the study area were depicted in table 4. The results shows that at Yolde pate farm location most of the farmers (25 %) obtained credit from their friends and relatives to purchase the fertilizer, 23 % as commercial credit, while 21 % of them recorded to have no credit and only 12 % of the total respondents received credit to obtained the fertilizer from corporative societies. Conversely, at Bole farm location 27 % of the small-scale farmers acquired loans from commercial centers, while those obtained from friends and relatives were recorded about 23 %, 22 % agreed to have no credit and 10 % sourced it from available corporative societies around the study area. Most of the farmers (27 %) in Mbamba farm location have no credit for them to purchase fertilizers, 25 % of them from friends and relatives, 20 % from commercial, those from corporative societies account about 15 % and 13 % of them were assessed from private money lenders respectively. At Wuro-chekke farm location majority of the farmers (27%) sourced money from their friends and relatives as loan to purchased fertilizer, followed by no credit or loan with about 25 %, while 23 % were obtained from commercial and 15 % from private money lenders accordingly. This result expressed that farmers in the area are generally faced with unavailability of credit sources or receiving assistant from government and non-governmental organizations they therefore depend on friends and relatives except at Bole farm location where they obtained credit from commercial and corporative societies because of the formation of farmers' societies among them. Availability of funds to purchase the input can also influence the quantity demanded particularly for resource poor farmers in Sub-Sahara Africa, as can risk consideration. (Ajiboye and Osundare, 2015)

Distribution of Respondents by the Availability of Fertilizer Among the Arable Farmers (n=40 for each location)

Results on the distribution of respondents on the availability of fertilizers among the arable farmers in the four (4) selected farm locations were presented in table 5. At Yolde pate farm location the organic fertilizer among the arable farmers was not readily available with about 56 % and 44 % conceived to be available while for the inorganic fertilizers it was revealed that 78 % of them agreed to be readily available and 22 % conceived not readily available. Similarly, at Bole farm location, organic fertilizers were not readily available perceived by 76

% of the farmers and 24 % as readily available, while for the inorganic fertilizers 67 % perceived by farmers and 33 % recorded as not readily available. Conversely, at Mbamba farm location 65 % of the respondent agreed that the organic fertilizers were readily available and 35 % as not readily available, while for inorganic fertilizer 63 % considered it as readily available and 37 % as not readily available respectively. Majority of the farmers (80%) at Wuro-chekke farm location perceived organic fertilizers not readily available and only 20 % of them as readily available and 81 % of the farmers recognized the readily availability of fertilizers and 19 % not readily available correspondingly. Despite the availability of inorganic fertilizers in the area still remain unaffordable to the small-scale farmers that are considered as target beneficiaries. The released fertilizers by the government were targeted to government officials, businessmen and traditional leaders than the small-scale farmers. Eric *et al.,* (2006) the beneficiaries are supposed to be poor farmers but some fertilizer leaks out to others and elites may capture much of the benefit. In addition, Druilhe and Barreiro-Hurlé (2012) asserted that among the problems hampering arable crop yield is availability and affordability of inorganic fertilizers. The results revealed that high cost of fertilizers and lack of capital to afford the inorganic fertilizers.

Factors Affecting the Availability of Inorganic Fertilizers and Utilizations Among Arable Farmers in the Study Area

Results on the factors affecting the availability of fertilizers and utilizations among arable farmers in the study area were portrayed in table 7. The result shows that at Yolde Pate high cost of fertilizers in the area was perceived to be 23 % of the respondents, 21 % as lack of capital and untimely release of fertilizers by the government agencies accounted as 19 % of the farmers respectively. At Bole farm location 20 % of the arable farmers considered as lack of capital, 19 % as high cost while untimely release was assessed as 18 % and 13 % of them as cost of transportation. Majority of the farmers (24 %) attributed it to high cost, lack of capital conceived as 23 % of them and unavailability of credit was assessed as 17 % at Mbamba farm location accordingly. Similarly, at Wuro-chekke farm location most farmers (25 %) conceived that high cost of fertilizers and lack of capital were the utmost factors affecting the availability and utilization of inorganic fertilizers in the area, then followed by unavailability of credit (19 %) while 15 % of them attributed it to untimely release of fertilizers by the agencies concern and only 3 % of the arable farmers considered ineffectiveness of fertilizers as a factor.

Comparative Analysis on the Average Estimated Quantity of Fertilizers used by the Farmers in Kilogram (kg)

Results on comparative analysis on the average estimatedquantity of fertilizers used by the farmers in Kilogram (Kg) were depicted on figure 7. From the result obtained Yolde pate farm location farmers utilized an estimated of 7, 500 Kg of organic fertilizers and 13, 000 Kg of inorganic fertilizers, at Bole farm location farmers used 6, 000 Kg organic fertilizers and 15,000 Kg inorganic fertilizers, while at Mbamba farm location an estimated of 9, 800 Kg of organic fertilizers are utilized by the farmers and 14,000 Kg used inorganic fertilizers and at Wuro-chekke farm location about 7,000 Kg of organic fertilizers were used on arable lands annually and 9,000 Kg used inorganic fertilizers respectively. For increased food production in the area it requires a complementary use of both organic and in organic fertilizers and making them avilable and timely to theenitre small scale farmers. Pertinently, there is general agreement that the improvements in soil fertility needed to stimulate agricultural productivity

growth, improved food security, and increases in rural incomes will require substantial increases in fertilizer use (both organic and inorganic) in combination with improved land husbandry practices. *(*Eric *et al.*, 2006)

CONCLUSION

Sustainable food production in the area requires appropriate use of fertilizers by the small-scale arable farmers who produced bulk of food for the growing population. However, it was revealed that fertilizer use intensity in Yola South LGA, is among the arable farmers with low source of income is very low due to the different factors which include high cost of fertilizers, lack of capital, untimely released of fertilizers, and unavailability of credit to the farmers make it unaffordable thereby making their production less economical. Therefore, fertilizer use intensity will be improving among the arable farming through significant reduction on the cost of fertilizers, provision of capital and timely release of fertilizers to target farmers at a subsidize price. To this end, dream of increased in food production will be released for the growing population in the area.

RECOMMENDATION

Based on the findings obtained from this research the following approaches have been suggested for effective fertilizer use intensity in the study area for profitable food production;

- ✓ Government should consider the reduction of fertilizer cost per bag so that it can be affordable by the small-scale farmers;
- ✓ Timely releases of inorganic fertilizer to the target beneficiaries should be ensured by the government and organizations involved;
- ✓ Provision of loans, credit and subsidies on farm inputs should be made available to the farmers;
- ✓ Investing in agricultural research, extension, and rural education should also be intensified and
- ✓ Communication of fertilizer recommendations to farmers should be improved

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