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PRODUCTIVITY AND RESOURCE USE EFFICIENCY AMONG BENEFICIARIES OF E - WALLET INPUT DISTRIBUTION SYSTEM COMPONENT OF GROWTH ENHANCEMENT SUPPORT SCHEME (GESS) IN ADAMAWA STATE, NIGERIA

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Abstract

Nigeria is fundamentally an agricultural country, at least 71% of Nigerian workforce is engaged in agriculture and over 90% of Nigerian agricultural output comes from small holder farmers most of whom dwell in remote rural and sometimes hard to reach areas. It is in these rural areas that over 60% of the over 180 million Nigerian population live and work. Despite all these abundant human and natural resources, Nigeria is still unable to feed her citizens due to low productivity which could be attributed to low fertilizer use, low improved seed utilization and low government expenditure on agriculture. The success of any agricultural revolution is not only on access of farmers to modern agricultural inputs, especially fertilizer and seeds but efficient allocation of resources. The study was conducted to examine Productivity and Resource Use Efficiency among Beneficiaries of E-Wallet Input Distribution System Component of Growth Enhancement Support Scheme (GESS) in Adamawa State Nigeria where data on 315 beneficiaries were collected and analyzed using descriptive and inferential statistics. Result of the socio-economic analysis revealed that respondents were small scale farmers who were young with mean family size of five people and with mean experience of 7 years. Production function analysis showed that the Cobb-Douglas functional form was selected as the lead equation and showed that the coefficient of multiple determination (R^2) of 0.7781 implied that about 77.81% of the variations in total output of respondents were explained by production factors included in the model. The overall model is significant at 1% level as shown by the magnitude of the F-statistics. Return to scale (RTS) was 1.45 showing increasing return to scale on the production surface (rational zone of production). The estimated coefficients for seeds, fertilizers, herbicides, farm size and hired labour were positive and statistically significant at 1% level. Marginal analysis of input utilization among respondents revealed that fertilizers, farm size and hired labour were over utilized while seeds and herbicides were underutilized. This shows that beneficiaries of the E wallet system are not efficient in their production. The study recommended the need for government to increase extension support services for farmers, consistent and sustainable policies to encourage production in the country.

Key words**:** *production function, resource use efficiency, electronic wallet, beneficiaries, Nigeria*

INTRODUCTION

The Growth Enhancement Support Scheme (GESS) is a Federal government initiation to actualize the Agricultural Transformation Agenda (ATA) which was aimed at subsidizing the costs of major agricultural inputs such as fertilizer, seeds, seedlings, and agro-chemicals for farmers [3]. One of the requirements of the GESS is the national farmers' registration exercise, where farmers' data are captured in to the ministry's central data bank. The GESS is hinged on the use of technology to enhance effective distribution of various farm inputs, especially fertilizers, to farmers. This is in line with government vision of making agriculture the cornerstone of Nigeria's economy. GESS started in May 2012, and has registered about 14 million farmers (4 million in 2012 and 10 million in 2013) throughout the federation for direct redemption of farm inputs through the Electronic wallet, E-wallet system. Under the scheme, registered farmers receive 50%

subsidy on their farm inputs from Federal Government with the support of the State government. With this system, farmers receive SMS alerts on their mobile phones and proceed to the nearest agro-dealers to redeem the inputs with 50% value of the inputs price putting an end to the age-long queue by farmers only to secure a bag of fertilizer for a group [6] .

E-wallet (Electronic wallet) refers to an electronic device that allows an individual to make electronic commerce transactions. This can include purchasing items on- line with the use of a computer or using a Smartphone to purchase items at a store or away from where one is. Digital wallets are made not just for basic financial transactions but also to authenticate the holders' credentials. For example, digital wallet could potentially verify the age of the customer who may want to purchase inputs such as fertilizer, seeds or agro-chemicals. A digital wallet has both software and an information component. The software provides security and encryption for the personal information and for the actual transaction.

The use of e-wallet for agricultural inputs distribution was adopted in Nigeria in 2012 as the first country in Africa to develop the e-wallet system for input delivery to farmers [3]. It was an initiative of the Federal Ministry of Agriculture to better the delivery of farm inputs such as fertilizer, seeds and agro-chemicals among other agricultural inputs delivered to farmers. The initiative was one of the most effective ways of reaching real farmers with government subsidies and other supports there by evading the hijacking influence of the fertilizer cartel in Nigeria. This is because in the past the cartel has made it impossible for such benefits to be tapped in to by the real farmers especially those at the grass roots. One direct way in which agricultural input subsidies can provide social protection to the poor is by targeting the poor with very high subsidies to ensure that they are able to access production inputs [5,9].

Federal Government of Nigeria has decided to reach farmers directly using the Global System of mobile telephones which allows the Federal Ministry of Agriculture to send electronic vouchers to farmers to buy seeds and fertilizers. The Government developed a system whereby no body signs fertilizer contract anymore. This therefore proves a fact that Information and Communication Technologies (ICTs) have brought to the fore new ways of doing things. This also brought to the fore the realization of the need to integrate ICTs to be effectively used in agriculture development as facilitating tools to boost its impact to the lives of farmers. ICTS have become an increasingly powerful tool for improving the delivery of basic services and enhancing local development opportunities [7].

Nigeria is fundamentally an agricultural country, at least 71% of Nigerian workforce is engaged in agriculture and over 90% of Nigerian agricultural output comes from small holder farmers most of whom dwell in remote rural and sometimes hard to reach areas. It is in these rural areas that over 60% of the over 180 million Nigerian population live and work [8]. Despite all these abundant human and natural resources, Nigeria is still unable to feed her citizens. The reasons for the low productivity in the country could be attributed to low fertilizer use, low improved seed utilization and low government expenditure on agriculture. International Fertilizer Development Centre (IFDC) revealed that average fertilizer use in Nigeria is just 13 kg/ha compared to a world average of 100 kg/ha and 150 kg/ha for Asia. Also, percentage of farmers who had access to improved seeds has been recorded to be very low in Nigeria as only five per cent of farmers accessed seeds compared to twenty five per cent in East Africa and sixty per cent in Asia [2].

"Efficiency is the optimal productivity of resources in production process. Production is the ratio between output and input. Also efficiency is a significant concept in production economics. When resources are constrained and prospects of adopting better technologies are competitive. Efficiency studies helps in understanding the existing performance and opportunities to improve the production performance of a particular enterprise under consideration. Earlier studies

on efficiency have revealed that it is possible to increase the productivity of farms without actually increasing the inputs" [11]. The role of efficiency in increasing agricultural output had been recognized by researchers.

The success of any agricultural revolution is not only on access of farmers to modern agricultural inputs, especially fertilizer and seeds but efficient allocation of resources. Six years after the introduction of the initiative, are beneficiaries efficient in the use of inputs leading to higher productivity prompting the need to conduct a study on Productivity and Resource Use Efficiency among Beneficiaries of E-Wallet Input Distribution System Component of Growth Enhancement Support Scheme (GESS) in Adamawa State Nigeria. The specific objectives are to describe the socio-economic characteristics of the beneficiaries and examine resource use efficiency among respondents.

MATERIALS AND METHODS

The Study Area

The study was carried out in the four Agricultural Development Zones of Adamawa State, namely Mubi, Gombi, Mayo-Belwa and Guyuk respectively. Adamawa State lies between latitude $7^0 28'$ N and $10^0 55'$ N of the Equator and longitude $11^0 30'$ E and $13^0 45'$ E of the Greenwich Meridian. The study area has a population of about 3,168,101 people National Population Commission [12] Adamawa State has a land mass of about 36,917 km^2. The mean annual rainfall ranges from 700 mm in the North West to 1,600 mm in the South East. The mean annual rainfall is less than 1,000 mm in the Central and North Western part of the State. The State is characterized with mean temperature of 26.7^0C to 27.8^0C. The area lies within the guinea savannah climatic zone of Nigeria with distinct dry and rainy seasons. The rainy season commences in April and ends in October, while the dry season starts in November and ends in April.

Major occupation in the State includes farming, cattle rearing, fishing, trading and civil service. Adamawa State is bordered to the East by Republic of Cameroon, to the North by Borno State, to the West by Gombe State and Taraba State to the South [1].

Source of Data and Sampling Procedure

Primary data was used for this study, which was collected using interview schedule to obtain data from the respondents. List of beneficiaries of E- wallet in all the redemption centres across the ADP zones was obtained and the sample size for this study was determined using Yamane (1976) formula:

$$n = N/1+N(e)^2$$

where n = sample size, N = total population e = margin of error disturbance.

Given that N = 52,476 and e is assumed to be 5%. Then sample size,

$$n = 52,476/1+52,476(0.05)^2$$

n = Sample Size = 399.

Random and proportionate sampling technique was then used in selecting respondents for the Study (Table 1).

Out of this number, 315 respondents provided the required information and were used for analysis.

Table 1. Selection of Respondents for the Study

ADP Zones	Number of Redemption Centres	Registered Farmers	Number of Farmers sampled
Gombi	6	8,199	62
Guyuk	12	14,148	108
Mayo Belwa	17	21,318	162
Mubi	10	8,811	67
Total	**45**	**52,476**	**399**

Source: ADADP (2017).

Methods of Data Analysis

Descriptive statistics and inferential statistics were used to achieve the objectives of the study. The descriptive statistics which employed the use of mean, frequencies, tables and percentages were used to achieve objective i.

Of the inferential statistics used was the production function analysis. This was used to actualize objective ii (resource use efficiency). Four functional forms (Linear, Semi log, Exponential and Double log) were tried to

select the best fit based on economic, econometric and statistical criteria.
The Double log functional form gave the best fit and is explicitly stated as follows:

$$LnY = \beta_0 + \beta_1 LnX_1 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \beta_6 LnX_6 + \mu$$

where:
Y = output of the ith respondent(grain equivalent)
X_1 = quantity of seed(grain equivalent)
X_2 = fertilizers (kg),
X_3 = herbicides (litres),
X_4 = farm size (hectares),
X_5 = hired labour(SMD),
X_6 = family labour (SMD) and
μ =error term. β_0, β_1..... β_6 coefficients that were determined.
The marginal analysis of input utilization was used to estimate the efficiency of resources used (objective iii) it will be determined by computing the ratio between the marginal value product and marginal factor cost of variable inputs. The ratio for determining the efficiency use was calculated as follows.

$$R = MVP/MFC$$

where: MVP = Marginal Value product of each input, MFC = Marginal factor cost of input r = Efficiency ratio. The MVP is defined as the product of the Marginal Physical Product (MPP) and the unit price of output (P). The MFC of input can either be taken as the market unit price or geometric mean value of the input costs, or depreciation of durable assets. When r =1 efficiency in resource use r >1 under-utilization of resources and r <1 over-utilization of resources.

RESULTS AND DISCUSSIONS

Socio-economic Characteristics of Respondents

Summary of socio-economic variables of respondents (Table 2) revealed that the mean age of the farmers was 32 years which showed that the farmers are relatively young. The preponderance of younger farmers in agriculture production is a positive signal with increasing productivity and likely increase in hectares of land under production. This result is in accord with the previous studies that food production in Adamawa State are by younger farmers as the result of lack of industries that could provide white collar jobs to young and active population [13].
Family sizes of farmers provide sources of labour for production especially in African agriculture that is not mechanized. As shown in Table 2, the minimum and maximum family sizes were 1 and 17. The mean family size of respondents was five people with a standard deviation of 2.501897 which is a reflection of the fact that many of the farmers were married. Large family size of respondents could be used as a vital source of labour for food production and other productive activities. Large family size can put pressures on family heads in devising means of obtaining income to meet family needs. The mean farm size was 1.7926 hectares with a standard deviation of 1.052991 (Table 2) and imply that farmers operated at different levels of farm sizes which tend to affect their production levels. This result indicates that majority of the farmers are small holders. The result is line with several studies conducted which showed that small scale farmers in Nigeria are major producers of food and cash crops [11]. Years of farming experience have been reported to provide a measure of managerial ability among farmers in Nigeria.

Table 2. Summary statistics of Socio-economic characteristics of Respondents (N=315)

Variable	Mean	Standard deviation	Minimum	Maximum
Age	31.5	5.16063	20	64
Family size	5.393333	2.501897	1	17
Experience	6.893333	2.937809	2	16
Farm size	1.7926	1.052991	1	5.5
Output	1557.21	1028.933	691.5	3,534.6

Source: Data Analysis, 2018.

The mean farming experience was 7 years with standard deviation of 2.937809.

This implies that the farming experience varied significantly among the farmers. The result showed that respondents were majorly new entrants to farming business.

Productivity and Resource Use Efficiency Analysis

Efficiency of Resource use among respondents was examined using the production function analysis. Out of the four functional forms tried, Cobb - Douglas functional form was selected as the lead equation based on statistical, economic and econometric criteria.

Table 3. Results of Diagnostic statistics

Diagnostic Variable	**Value**
Ramsey RESET test	0. 530 (Prob > F = 0.0014)NS
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	$Chi^2(1)$ = 0.82 (Prob > chi^2 = 0.3662)Ns
Variance inflation Factors	
Seeds(grain equivalent)	1.53
Fertilizers(kilogramme)	1.31
Herbicides (litres)	1.23
Farm size (hectare)	1.23
Hired labour (SMD)	1.17
Family labour(SMD)	1.11
Mean VIF	1.26

Source: Output from STATA 11, 2018 Ns = Not significant.

The result of diagnostic statistics is presented in Table 3 and revealed that there were no estimation error (Ramsey RESET test) and no heteroskedasticity (Breusch-Pagan / Cook-Weisberg test) were not statistically significant.

The variance inflation factors (VIF) showed no multicollinearity as all the variables were within the acceptable threshold levels of not more ten (10).

The Cobb-Douglas function (Table 4) showed that the coefficient of multiple determination (R^2) of 0.7781 implied that about 77.81% of the variations in total output of respondents were explained by production factors included in the model.

The overall model is significant at 1% level as shown by the magnitude of the F-statistics. Coefficients of the variables are their corresponding elasticities as is the case with Double log functional form. All the coefficients are positively signed and in conformity with apriori.

Return to scale (RTS) was 1.45 showing increasing return to scale on the production surface (rational zone of production).

The estimated coefficients for seeds (X_1), fertilizers (X_2), herbicide(X_3), farm size (X_4) and hired labour (X_5) were positive and statistically significant at 1% level.

The uses of fertilizers and agrochemicals have been found to increase output of crops in Nigeria. The significant relationship between output of respondents and seeds, fertilizers and herbicides agreed with the findings of Umaru [14] who reported that seeds, fertilizers and herbicides are critical inputs that increase farmers' productivity in Nigeria.

Table 4. Production function Result for Beneficiaries of E-Wallet

Variable	**Parameter**	**Coefficient**	**Standard error**	**t- values**
Constant	β_0	2.511101	0.1371436	18.31***
Ln seeds	X_1	0.4584587	0. 0536736	8.54***
Ln fertilizers	X_2	0. 1276967	0. 0416118	3.07***
Ln herbicide	X_3	0. 3031969	0. 0403722	7.51***
Ln farm size	X_4	0. 392205	0. 0596050	6.58***
Ln hired labour	X_5	0. 1444916	0. 0481384	3.00***
Ln family labour	X_6	0. 0241052	0. 0264539	0.91
RTS		1.45		
R^2		0.7781		
Adjusted R^2		0.7690		
F-value		6 2.87594621		
Error of the estimate		0.23468		

Source: Data Analysis, 2018, *** Significant at 1% level of probability.

Farm size is important in technology adoption and improved productivity among small scale farmers who are the bulk producers of food in Nigeria [4].

Respondents' Marginal Analysis of Input Utilization

Marginal analysis of input utilization among respondents (Table 5) revealed that fertilizers, farm size and hired labour were over utilized while seeds and herbicides were underutilized. This shows that beneficiaries of the E wallet system are not efficient in their production as regards the five important resources that were used in this analysis. The result is similar to the findings of Jongur [10] who reported inefficient utilization of resources among Masakwa (sorghum) farmers in Adamawa State.

Table 5. Result of Marginal analysis of input utilization of Respondents

Resources	MPP	MVP	MFC	MVP/MFC	Remarks
Seeds	41.70	34544.50	1250	2.84	Underutilization
Fertilizers	1.26	107.10	3500	0.041	Over utilization
Herbicide	34.05	2894.25	1850	1.56	Underutilization
Farm size	4.82	409.70	1500	0.27	Over utilization
Hired Labor	11.13	946.05	2570	0.38	Over utilization

Source: Data Analysis 2018.

CONCLUSIONS

Respondents were young with mean family size of five people with mean experienc years and mostly small scale farmers. S fertilizers, herbicides, farm size and hired labour were positive and statistically significant at 1% level and increased output of farmers. Marginal analysis of input utilization among respondents revealed that fertilizers, farm size and hired labour were over utilized while seeds and herbicides were underutilized. Beneficiaries of the E wallet system are not efficient in their production.

There is the need for the three tiers of government to increase extension support services for farmers, consistent and sustainable policies to encourage production in the country.

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