



The Impact of E-Wallet Fertilizer Subsidy Scheme and its Implication on Food Security in Nigeria

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Abstract

This study examined the impacts of the e-wallet fertilizer subsidy scheme on quantity of fertilizer use, crop output and yield in Nigeria. The study made use of the Nigeria General Household Survey (GHS)-Panel Datasets of 2010/2011 and 2012/2013 which contain 5000 farming households in each of the panel. We applied relevant evaluation techniques to analyse the data. The results of the impact analysis demonstrate that the scheme has generally increased the yield, crop output and quantity of fertilizer purchase of the participating farmers by 38%, 47%, and 16%, respectively. The study concludes that increased productivity, which the scheme engenders, can help to reduce food insecurity

in Nigeria. Provision of rural infrastructure, such as good road network, accessibility to mobile phones, radio, etc., will increase accessibility of the small-scale farmers to the scheme or any other similar agricultural schemes in Nigeria.

Introduction

To reduce poverty in rural areas and promote food security by developing agriculture, successive Nigerian Government put in place several programmes/schemes. These programmes/schemes include: Fertilizer Subsidy Scheme, Commodity Boards, National Accelerated Food Production, Nigerian Agricultural Cooperative Banks, and Agricultural Development Projects (FEWSNET, 2007). Others include: River Basin Development Authorities, Operation Feed the Nation, Green Revolution, Directorate of Food, Roads and Rural Infrastructure, and National Agricultural Land Development. Furthermore, Presidential Initiatives on cocoa, cassava, rice, livestock, fisheries and vegetables and National Special Programme on Food Security were also implemented. Most of these schemes and programmes have come and gone but the most persistent of them all is the fertilizer subsidy scheme. The fertilizer subsidy in Nigeria aims at making fertilizer price affordable by smallholder farmers to increase agricultural productivity and its efficiency, thereby increase the income of the farmers and reduce poverty and food insecurity in the country. Adesina (2013) pointed out that the old fertilizer scheme used in supplying agricultural inputs to the farmers was weak, inefficient, and fraudulent, hence a large proportion of the farmers could not benefit from it. He stressed that the inputs meant for the farmers were diverted by political elites for personal gains. He concluded that the gains of the old fertilizer subsidy schemes are also not widely spread among the targeted beneficiaries. An attempt to overcome these difficulties led to the introduction of the Growth Enhancement Support Scheme (GESS) and the use of Electronic Wallet (e-wallet) approach to distribute fertilizer to the farmers.

According to the Federal Ministry of Agriculture and Rural Development (FMARD), GESS represents a policy and pragmatic shift within the existing Fertilizer Market Stabilization Programme (FMSP), and it puts the resource constrained farmer at its centre through the provision of series of incentives to encourage the critical actors in the fertilizer value chain to work together to improve productivity, household food security and income of the farmer (FMARD, 2014). The goals of GESS are to target 5 million farmers in each year for 4 years that will receive fertilizer through mobile phone technology. The scheme intends to provide direct support to 20 million farmers at the end of 4 years to enable them to procure fertilizer and seeds at affordable prices, at the right time, and at the right place. Finally, the scheme intends to increase productivity of farmers across the length and breadth of the country through increased use of fertilizer. The aims of the GESS is to migrate smallholder farmers from sub-sistence

farming to commercialized systems over a 4-year period in order to facilitate trade and competitiveness.¹ The \$2.5 billion programme is projected to generate an overall benefit/cost ratio of 16 to 1, with an estimated annual cost per farmer of \$30, and an anticipated yearly individual benefit of five hundred US Dollars (\$500) (GrowAfrica, 2015).

The GESS guarantees registered farmer e-wallet vouchers with which they can redeem fertilizers and seeds from agro-dealers at below the cost prices, the other remaining costs are being borne by the federal and state governments in Nigeria in equal ratios (Atofarati, 2014). The interested farmers must register by filling a questionnaire at the registration centre.² The information on the questionnaire have to be later transferred to an electronic database. The registration exercise takes place across every ward in each of the 36 states of the federation including the Federal Capital Territory (FCT). The requirements for getting registered are that you must be an adult farmer, possess valid means of identification, have cell phone with a registered SIM card with at least sixty-naira credit in the cell phone. You must also possess passport size photograph and should also know the size or approximate size of your farm beforehand. After the registration, you will be issued with an identity card that contains your passport size photograph and right-hand thumb print. Although all adult farmers have rights to apply for the e-wallet fertilizer, the target farmers are small scale farmers that do not have enough resources to purchase two bags (100kg) of fertilizer on their own.³ The selection of beneficiaries is based on the fact that the individual must be proved to be a farmer with a landholding size of three hectares or less (GrowAfrica, 2015).⁴ Once the targeted farmers were determined, supply chain managers (selected private companies) were in charge of sending text messages (SMS) to farmers to let them know the

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- 1 The target farmers are small-scale farmers that do not have enough resources to purchase two bags of fertilizer on their own. The scheme is designed for 'core poor' farmers that are not able to purchase fertilizer and agro-inputs at the competitive prices in the market.
 - 2 The GESS uses an "on demand" registration process, whereby eligible individuals are invited to register for the programme at designated centres established at the ward level. Complementary outreach and information campaigns use radio and broad-based advertising and public notices to inform farmers about registration. Registration takes place over a period of 1-2 weeks in each location; there are no limits to the number of farmers who can register in each location.
 - 3 Since the registration is at individual level, there can be more than one member who applied to receive subsidized fertilizer per household.
 - 4 Farmers are self-declared and provide information on their land size at registration. It is challenging for farmers to declare accurately their land size because the land tenure system may not clearly delineate land owned or used. It is also not possible to verify whether a farmer is indeed a farmer.

location of redemption centre⁵, quantity and kinds of inputs, and the period of the redemption. This is called roll-out or activation of the e-wallet fertilizer voucher. An authentication code will be provided in the SMS for presentation in return for the inputs. The redemption supervisor helps in verifying farmer's identity as well as a farmer's code in the text message received by the farmer, and then compares it with the name and code listed in the farmers register which the supervisor received from the Cellulant Limited (The mobile commerce network operator that designs and delivers the e-wallet voucher to the farmers)⁶. Once the farmers pay the balance of 10% of the cost of seeds and 50% cost of fertilizers to the selected agro-dealer, the farmers will collect two bags (100kg) of fertilizer and one bag (50kg) of maize or rice seed.⁷ This is called redemption of the inputs (fertilizer and the seeds). This completes the transaction and the agro-dealer⁸, seeds and fertilizer companies will automatically get their accounts credited from the escrow account at the Central Bank of Nigeria (Fadairo et al., 2015). It is expected that this scheme will improve agricultural input distribution and marketing. In addition, it can provide incentives to encourage actors along the fertilizer value chain to work together towards the common purpose of improving agricultural productivity, household food security, and income (Olomola, 2015).

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- 5 Redemption centre is a warehouse where an agro-dealer stores its products for sale. The farmer must show the text message and one of their IDs (identity card issued by GESS, voter's card, or national identity card). When e-voucher is redeemed, voucher number and beneficiary's ID are recorded and reported electronically to GESS office.
 - 6 The scheme is managed by a technical facilitator, Cellulant Limited that oversees the GESS technology platform through which farmers are registered and the input subsidy delivered. Cellulant Limited also provides a set of standard operating procedures for checks, balances and penalties for non-compliance. The system also plays a key role in reconciliation and provides regular reports directly to the FMARD.
 - 7 However, a 3-hectare plot requires a higher quantity of inputs; for example, 500kg fertilizer is recommended for one hectare of rice (Yoko, 2016). The challenge for the e-wallet fertilizer scheme is to stimulate purchase of inputs by farmers beyond the quantity available under the subsidy programme. A possible way to increase sales could be to shift redemption from warehouses to agro-dealer retail outlets to provide farmers with greater exposure to a broader range of available products.
 - 8 Adebo (2014) further indicated that for an agro input dealer to participate in the programme, he/she must own a cell phone with a registered SIM card, understand the process of using e-wallets, and attend training programmes designed for the project. The agro dealers are expected to be honest and guide against fraud; choose and prepare a location for the business transaction; provide storage facilities and be available at the appropriate time to attend to farmers' needs. Other prominent agents in the scheme are the helpline personnel and redemption supervisors. Each state Agricultural Development Project (ADP) supplied the helpline staffs, and about 3-5 helpline staffs are assigned to each of the Local Government Area. The helpline staff and supervisors connect to the farmers on a daily basis to attend to their needs.

The research questions and objectives of the study

The few studies that evaluated newly introduced e-wallet fertilizer subsidy scheme used descriptive methodology and are therefore subject to serious problems arising from selection bias (Amurtiya et al., 2018; Ejiogu, 2017; Enemchukwu et al., 2017). One major weakness associated with these studies is the implicit assumption that all farmers that have access to e-wallet fertilizer scheme and those that did not are respectively identical with respect to their fertilizer subsidy demand or supply situation. In addition, there is also the problem of endogeneity which arises from the fact that access to e-wallet fertilizer subsidy scheme is either voluntary or some farmers are in better position than others to have access to the scheme. For example, wealthy, educated, or more productive farmers are more likely to have access to the scheme than others. Thus, self-selection into access to the scheme is the major source of endogeneity in these past studies (Obayelu, 2016). With the problem of selection bias which can arise as a result of endogenous programme placement, the past studies on the impact of e-wallet fertilizer subsidy scheme are likely not to give a consistent estimate of the impact of the scheme on agricultural productivity or output. This implies that the accurate impact of e-wallet fertilizer subsidy scheme on agricultural productivity in developing countries like Nigeria is still missing. It is very crucial to specifically evaluate the extent of the expected gains in productivity arising from the e-wallet fertilizer subsidy scheme using appropriate evaluation techniques. This is a vacuum this study intends to fill.

The measure of performance of e-wallet fertilizer scheme is based on how many registered farmers activated their e-wallets on the GESS platform-wallet. The registered farmers are the farmers whose names are on the farmer's register at redemption centre. The measure of service delivery is how many farmers received inputs? Therefore, it is expedient to ask questions on the scheme performance based on these objectives. Part of such questions includes: are the small-scale farmers able to register for and redeem the fertilizers using e-wallet system? Has the scheme benefited the small-scale farmers more than the large-scale farmers? Did non-poor farmers, urban farmer and male farmers benefit more proportionately than poor farmer, rural farmer, and female farmer? Has the scheme increased the fertilizer use and crop productivity among the participating farmers? These questions are relevant because they will have implication on the sustainability of the scheme and its ability to improve food security situation in Nigeria. Furthermore, the empirical answers to some of these questions and the salient lessons derived from this study will help in re-designing and implementation of the scheme and other similar agricultural schemes in Nigeria and other African countries. This study will provide the government with feedback required for adjusting in input subsidy policies and spending in Nigeria.

The broad objective of this study is to analyse the impact of the fertilizer subsidy scheme on fertilizer use, crop output and yield, and establish its implication on food security in Nigeria.

Methodology

This study was carried out in Nigeria. Nigeria lies between 40161 and 130531 North Latitude and between 20401 and 140411 East Longitude. It is in the West Africa bordered on the West by the Republic of Benin, on the North by the Republic of Niger and on the East by the Republic of Cameroon. To the South, Nigeria is bordered by approximately 800 kilometres of the Atlantic Ocean, stretching from Badagry in the west to the Rio del Rey in the east. The country also occupies a land area of 923,768 square kilometres, and the vegetation ranges from mangrove forest on the coast to desert in the far North. Administration-wise, Nigeria consists of 36 states and a Federal Capital Territory (FCT). Each state is further divided into Local Government Areas (LGAs). There are presently 774 LGAs in the country. The total population of Nigeria stood at 166.2 million in 2012 according to the estimate from Nigeria Bureau of Statistics (NBS).⁹

The study made use of the Nigeria General Household Survey (GHS)-Panel Datasets of 2010/2011 and 2012/2013. The Nigeria General Household Survey (GHS)-Panel was carried out by the National Bureau of Statistics (NBS).¹⁰ The panel component applies to 5,000 farming households with information on multiple agricultural activities and household consumption. The GHS-Panel drew heavily on the Harmonized National Living Standards Survey (HNLSS—a multi-topic household survey) and the National Agricultural Sample Survey (NASS—the key agricultural survey) to create a new survey instrument to shed light on the role of agriculture in households' economic wellbeing that can be monitored over time. The first wave of the GHS-Panel was carried out in two visits to the panel households (post-planting visit in August-October 2010 and post-harvest visit in February-April 2011). The second wave of the GHS-Panel was carried out also in two visits to the panel households (post-planting visit in September-November 2012 and post-harvest visit in February-April 2013). The panel data set are

9 Nigeria Population available on the internet at <http://www.tradingeconomics.com/nigeria/population>

10 The Nigeria (GHS)-Panel) was supported by the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) project undertaken by the Development Research Group at the World Bank. The LSMS-ISA project aims to support governments in seven sub-Saharan African countries to generate nationally representative household panel data with a strong focus on agriculture and rural development. The surveys under the LSMS-ISA project are modelled on the multi-topic integrated household survey design of the LSMS; Household, Agriculture, and Community questionnaires are an integral part of every survey effort.

downloadable at the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) website address.¹¹

The sample design was a two-stage probability sampling. The primary sampling units (PSU) were the Enumeration Areas (EA). These were selected based on probability proportional to size (PPS) of the total EAs in each state and FCT and the total household listed in those EAs. A total of 500 EAs were selected using this method. Households were selected randomly using the systematic selection of ten households per EA. This involved obtaining the total number of households listed in a particular EA, and then calculating a sampling interval (SI) by dividing the total households by ten. The next step was to generate a random start 'r' from the table of random numbers which stands as the 1st selection. Consecutive selection of households was obtained by adding the sampling interval to the random start. In all, 500 clusters/EAs and 5,000 households were interviewed. These samples were proportionally selected in the states such that different states had different sample sizes. However, the selection covers all the LGAs and all the states in Nigeria. The urban and rural areas were also included in the sample.

Conclusion and recommendations

If the e-wallet estimated yield impact of 66% on the participating small-scale farmers is compared with 38% estimated as the impact of the scheme on the yield of average farmers participating in the scheme, it suggests that the impact of the scheme could be higher if the scheme is well targeted at small scale poor farmers. Increased productivity, which the scheme engenders, can reduce food insecurity in Nigeria. Provision of rural infrastructure, such as good road network, accessibility to mobile phones, radio, etc., will increase accessibility of the small-scale farmers to the scheme or other similar agricultural schemes.

References

- Adebayo, O. and K. Olagunju. 2015. Impact of agricultural innovation on improved livelihood and productivity outcomes among smallholder farmers in rural Nigeria". The Maastricht School of Management Working Paper No. 2015/07.
- Adebo, G.M. 2014. "Effectiveness of e-wallet practice in grassroots agricultural services delivery in Nigeria - A case study of Kwara State growth enhancement support scheme". *Journal of Experimental Biology and Agricultural Sciences*, 2: 4-12.

11 <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:22949589~menuPK:4196952~pagePK:64168445~piPK:64168309~theSitePK:3358997~isCURL:Y~isCURL:Y~isCURL:Y,00.html>

- Adesina, A. 2013. "Agricultural Transformation Agenda: Mid-Term Report". Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.
- Ahmed, F.F., A.B. Yusuf and J. Dunnah. 2016. "Effect of growth enhancement support on food security status of rural farming households in Adamawa State, Nigeria". *International Journal of Economic and Business Review*, 4(5):14–24.
- Amurtiya, M., A.K. Tashikalma and D.C. Maurice. 2018. "Agricultural inputs subsidy in Nigeria: An overview of the growth enhancement support scheme (GESS)". *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 66(3): 781–89.
- Atofarati, Y. 2014. "Growth enhancement support scheme: Towards the transformation of Nigeria agricultural sector". At <http://www.ciuci.us/wp-content/uploads/2013/03/Growth-Enhancement-Support-Scheme.pdf>.
- Banful, A.B. 2010. "Old problems in the new solution? Politically motivated allocation of programme benefits and the 'new' fertilizer subsidies". International Food Policy Research Institute (IFPRI). At <http://www.ifpri.org/publication/old-problems-new-solutions>.
- Banful, A.B. and O. Olayide. 2010. "Perspectives of varied stakeholders in Nigeria on the federal and state fertilizer subsidy programs". Nigeria Strategy Support Program Working Paper Number 08. International Food Policy Research Institute, Washington, D.C.
- Becerril, J. and A. Abdulai. 2010. "The impact of improved maize varieties on poverty in Mexico: The propensity matching approach". *World Development*, 38(7): 1024–35.
- Becker, S.O. and A. Ichino. 2002. "Estimation of the average treatment effects based on propensity score matching". *The Stata Journal*, 2(4): 358–77.
- Bertrand, M., E. Duflo and S. Mullainathan. 2004. "How much should we trust differences-in-differences estimates?" *Quarterly Journal of Economics*, 119(1): 249–75.
- Blundell, R. and M. Costa-Dias. 2000. "Evaluation methods for non-experimental data". *Fiscal Studies*, 21: 427–68.
- Caliendo, M. and S. Kopeinig. 2008. "Some practical guidance for the implementation of propensity score matching". *Journal of Economic Surveys*, 22(1): 31–72.
- Chirwa, E.W., A. Dorward and M. Matita. 2011. "Conceptualizing graduation from agricultural inputs subsidies in Malawi". Future Agricultures Working Paper No. 029. U.K Department for International Development (DFID). Also available at www.future-agricultures.org.
- DellaVigna, S. 2009. "Psychology and economics: Evidence from the field". *Journal of Economic Literature*, 47(2): 315–72.
- Denning, G., P. Kabembe, P. Sanchez, A. Malik, R. Flor, R. Harawa and P. Nkhoma. 2009. "Input subsidies to improve smallholder maize productivity in Malawi: Toward an African green revolution". *PLoS Biology*, 7(1): 11–18.
- Diaz, J.J. and S. Handa. 2004. "Propensity score matching as a non-experimental impact estimator: Evidence from Mexico's PROGRESA". Mimeo. UNC-CH, Department of Public Policy.
- Dorward, A. and E. Chirwa. 2011. "The Malawi agricultural input subsidy programme: 2005/06 to 2008/09". *International Journal of Agricultural Sustainability*, 9(1): 232–47.
- Duflo, E., M. Kremer and J. Robinson. 2008. "How high are rates of return to fertilizer? Evidence from field experiments in Kenya". *American Economic Review*, 98(2): 482–88.
- Duflo, E., M. Kremer and J. Robinson. 2011. "Nudging farmers to use fertilizer: Theory and experimental evidence from Kenya". *American Economic Review*, 101(6): 2350–90.

- Ejiogu, A.O. 2017. "Growth enhancement support scheme of the Nigerian agricultural transformation agenda: Looking back and thinking ahead". *Nigerian Agricultural Policy Research Journal*, 3(1): 28–41.
- Enemchukwu, D.C., C.O.A. Ugwumba and U.O. Uche. 2017. "Performance of the growth enhancement support scheme among food crop farmers in Anambra State, Nigeria". *International Journal of Multidisciplinary Research and Analysis*, 1(1): 13–22.
- Fadairo, O.S., N.S. Olutegbe and A.M. Tijani. 2015. "Attitude of crop farmers towards e-wallet platform of the growth enhancement support scheme for input delivery in Oke-Ogun area of Oyo State". *Journal of Agricultural Informatics*, 6(2): 62–71.
- FAO. 2012. *Statistical Yearbook, 2012*. Italy, Rome. Food and Agriculture Organization Statistical Year Book
- FAOSTAT. 2011. "Fertilizer consumption in Nigeria". Italy, Rome. Food and Agriculture Organization Statistical Year Book
- FEWSNET. 2007. "Nigeria food security update". Famine Early Warning Systems Network. Washington, D.C.: U.S. Agency for International Development.
- FMARD. 2016. "The agriculture promotion policy (2016–2020)". Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.
- FMARD. 2014. "Ten million farmers captured in agric e-wallet scheme". Abuja, Nigeria. Federal Ministry of Agriculture and Rural Development.
- FMARD. 2012. "Growth enhancement support scheme". Abuja, Nigeria. Federal Ministry of Agriculture and Rural Development.
- FMARD. 2008. *National Fertilizer Policy for Nigeria*. Abuja, Nigeria. Federal Ministry of Agriculture and Rural Development, Federal Fertilizer Department
- Fuentes, P.A., B. Bumb and M. Johnson. 2012. "Improving fertilizer market in West Africa: The fertilizer supply chain in Nigeria". Washington, D.C. IFDC and IFPRI Report, GrowAfrica.
- GrowAfrica. 2015. "Accelerating agricultural transformation in Africa". At <https://www.growafrica.com/resources/all>
- Heckman, J., H. Ichimura and P. Todd. 1997. "Matching as an econometric evaluation estimator". *Review of Economic Studies*, 65(2): 261–94.
- Heckman, J.J., R. LaLonde and J. Smith. 1999. "The economics and econometrics of active labour market programmes". In O. Ashenfelter and D. Card, eds., *Handbook of Labor Economics*, vol. 3, pp. 1865–2097. Amsterdam: North-Holland.
- Hirano, K., G.W. Imbens and G. Ridder. 2003. "Efficient estimation of average treatment effects using the estimated propensity score". *Econometrica*, 71(4): 1161–89.
- Holden, S. and R. Lunduka. 2013a. "Who benefit from Malawi's input subsidy programme?" *Forum for Development Studies*, 40(1): 1–25.
- Holden, S. and R. Lunduka. 2013b. "Input subsidies, cash constraints and timing of inputs supply". *American Journal of Agricultural Economics*, 1–18.
- Holden, S.T., B. Shiferaw and M. Wik. 1998. "Poverty, market imperfections, and time preferences of relevance for environmental policy". *Environment and Development Economics*, 3: 105–130.
- IDEP. 2011. "Towards improved fertilizer subsidy programme in Nigeria. Drawing lessons from promising practices in SSA". At <http://www.npc.gov.ng/vault/files/IDEP%20Study%20doc.pdf>.

- IFDC/PROMIDIA. 2008. *An Assessment of the Nigeria Seed and Fertilizer Markets*. Abuja, Nigeria. IFDC
- Khandker, S.R., Z. Bakht and G.B. Koolwal. 2009. "The poverty impacts of rural roads: Evidence from Bangladesh". *Economic Development and Cultural Change*, 57(4): 685–722.
- Kwa, A.R. 2002. "Policy initiatives relating to fertilizer production and marketing and fertilizer regulations in Nigeria". Paper presented at the National Workshop for Fertilizer Blending Plants in Nigeria, organized by the IFDC/DAIMINA Project. Abuja, Nigeria, 25–26 June.
- Leslie, R.S and H. Ghomrawi. 2008. "The use of propensity scores and instrumental variable methods to adjust for treatment selection bias". USA, SAS Global Forum.
- Liverpool-Tasie, L.S.O., A.B. Banful and B. Olaniyan. 2010. "An assessment of the 2009 fertilizer voucher programme in Kano and Taraba, Nigeria". Policy Note No.30. International Food Policy Research Institute. At <http://www.ifpri.org/sites/default/files/publications/nssp30.pdf>.
- Minde, I., T.S. Jayne, J. Ariga and E. Crawford. 2008. "Fertilizer subsidies and sustainable agricultural growth in Africa: Current issues and empirical evidence from Malawi, Zambia and Kenya". Food Security Group, Michigan State University. Paper prepared for the Regional Strategic Agricultural Knowledge Support System (Re-SAKSS) for Southern Africa.
- Minot, N. and T. Benson. 2009. "Fertilizer subsidies in Africa: Are vouchers the answer?" International Food Policy Research Institute (IFPRI). Issue Brief 60, July 2009.
- Morris, M., V. Kelly, R.J. Kopicki and D. Byerlee. 2007. *Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guidelines*. Washington, D.C.: The World Bank.
- Nagy, J.G. and O. Edun. 2002. "Assessment of Nigerian Government fertilizer policy and suggested alternative market friendly policies". At http://pdf.usaid.gov/pdf_docs/PNADB846.pdf
- Nwaobiala, C.U. and V.U. Ubor. 2016. "Effectiveness of electronic wallet system of growth enhancement support scheme distribution among arable crop farmers in Imo State, South Eastern Nigeria". *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 16(1): 355–60.
- Obayelu, A.E. 2016. "Cross-country comparison of voucher-based input schemes in sub-Saharan Africa agricultural transformation: Lessons learned and policy implications". *Agriculturae Conspectus Scientificus*, 81(4): 251–67.
- Ogunfowora, O. 2000. "The travails of Nigerian agricultural inputs supply system: Which way forward?" 5th Tai Solarin Memorial Lecture, Mayflower School, Ikenne, Nigeria. ACS ABISE Consulting System (NIG) Ltd.
- Ogunfowora, O. and B. Odubola. 1994. "A conceptual framework for a phased subsidy withdrawal programme under a liberalized fertilizer sector". Draft, Lomé. IFDC/Africa.
- Olomola, A.S. 2015. "Understanding the framework for intergovernmental interactions in the implementation of Nigeria's agricultural transformation agenda". IFPRI Working Paper No. 27. International Food Policy Research Institute, Washington, D.C.
- Olomola, A., T. Mogue, T. Olofinbiyi, C. Nwoko, E. Udoh, R. Alabi and J. Onu. 2014. *Analysis of Agricultural Public Expenditures in Nigeria. Examination at the Federal, State and Local Government Levels*. IFPRI Discussion Paper No. 01395. International Food Policy Research Institute, Washington, D.C.

- Ravallion, M. 2008. "Evaluating anti-poverty programmes". In T.P. Schultz and J. Strauss, eds., *Handbook of Development Economics*, vol. 4. Amsterdam: North-Holland.
- Rosenbaum, P.R. and D.B. Rubin. 1983. "The central role of the propensity score in observational studies for causal effects". *Biometrika*, 70(1): 41–55.
- Salman. K.K. 2014. "Political economy of fertilizer subsidy process in Nigeria". A Final Research Report Submitted to African Economic Research Consortium, Nairobi, Kenya.
- Shahidur, R.K., G.B. Koolwal and H.A. Samad. 2010. *Handbook on Impact Evaluation: Quantitative Methods and Practices*. Washington, D.C.: The World Bank.
- Yoko, K. 2016. "Can electronic agricultural input voucher enhance fertilizer demand? Evidence from rice growing households in North Central Nigeria". Mimeo. University of Tsukuba, Japan.



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