Impact of SG 2000 Technologies Adoption on Smallholder Agricultural Productivity in Nigeria

Abdulhamid Gambo (Ph D) and Cornelius N. Kwanga
Coordinator, Monitoring, Evaluation, Learning and Sharing SG 2000-Nigeria Project
Email:
Department of Economics, Yobe State University, Damaturu – Nigeria
Email: corneliuskwanga@gmail.com

Abstract

The use of improved agricultural technologies determines increases in agricultural output. This implies that returns from agricultural technology development on agricultural could be very high and far reaching. This paper assesses the impact of Sasakawa Global (SG) 2000 technologies adoption on agricultural productivity in smallholder agriculture in the Nigeria. 280 farmers are selected from Adamawa, Kano, Jigawa and Gombe States, where Sasakawa Africa Association (SAA) operates in Nigeria. The paper finds encouraging level of adoption of SG 2000 technology by smallholder farmers through the use of improved seed variety, improved agronomy practices, better land and soil management practices. However, the success is limited by inaccessibility of the hybrid seed to the grass-root, villages and communities; low of awareness on sourcing and usage of the improved seed; higher prices of the improved seeds; and some farmers' resistance to change. The paper recommends that attempts should be made to understand the rationale behind traditional smallholder farmer resistance to the use of technology means of cultivation, as this will make future technological interventions in smallholder agriculture more effective.

Keywords: Technology adoption, agricultural productivity, Nigeria technology, smallholder,

i. Introduction

Food crises and low agricultural productivity in the LDCs is a major a concern. Nigeria with all its vast agricultural land has over the years been in a similar precarious situation. Public and private partnerships to improve productivity are being pursued as a means of improving small farm holders agricultural yields across the country. Sasakawa Africa Association (SAA)/Sasakawa Global (SG) 2000, is one of such partnerships. Sasakawa Africa Association (SAA)/Sasakawa Global (SG) 2000 has over 25 years worked with tens of thousands of

frontline extension workers and several million farmers in 14 sub-Sahara African countries to promote higher-yielding technologies for maize, wheat, rice, grain legumes, including roots and tubers at the same time playing a catalytic role with National Ministries of Agriculture to mount dynamic field demonstration programs. At present, it has visible presence in Nigeria, Uganda, Ethiopia and Mali. Since 1991, its focus in Nigeria has been on smallholder farmers.

Historically inspired by the success of SG 2000 in Sudan and Ghana, the Federal Government of Nigeria requested to partner/collaborate with SG 2000 which became effective in March 1992 with the signing of the memorandum of understanding (MoU) between the two. The purpose then was to raise agricultural productivity as well as improve output marketing efforts. With this roadmap, pioneer operational office was established in Kano (for wheat) and Kaduna (for maize). Implementation was fashioned to be through the Federal Ministry of Agriculture and Natural Resources assisted by the States' Agricultural Development Programs (ADPs). By 1997, SG 2000 operations escalated to other States like Adamawa and Gombe. Still, the collaboration mandate is focused on wheat and maize production.

Since 2009, SG 2000's operations escalated to also address issues to do with crop postharvest handling and access to markets by smallholder farmers. To date, SG 2000 operates in four States - Adamawa, Jigawa, Gombe and Kano; a collaborative arrangement with USAID-Market is also in operation and located in Kaduna State.

SG 2000 pays attention to the area of technology transfer to small farm holder scheme. This area of intervention is known as Agricultural Technology Adoption Initiative (ATAI). The approach taken by the Agricultural Technology Adoption Initiative (ATAI) assumes that beneficial technologies do exist and that successful strategies for addressing the constraints on their adoption will improve welfare. ATAI therefore target technologies that are profitable in a world with perfectly efficient markets, but that are currently under-adopted, which suggests some market failure.

Since 2009 SAA country programs implement Farmer Learning Platforms (FLPs) as the main training and technology transfer mechanisms. As centerpiece to farmers' capacity building, which are used to: stimulate farmer learning, initiate the process of adopting new technologies and knowledge, initiate a process of farmer experimentation, as well as develop mutual trust between farmers and the extension services. The approach also aims at sharing the costs among SAA, National Agricultural Extension Services (NAES) and farmers

as well as increasing the intensity of training and back-stopping in order to graduate farmers within a period of two (2) years. The idea behind cost effectiveness is to serve as a barometer to test the ability of the approach to upscale on a larger scale.

Farmer Learning Platforms (FLPs) consist of two elements - the field demonstrations of new and/or adapted and improved technologies as well as the training of farmers to acquire management skills, appreciate agronomic concepts and receive technical skills to help them improve farm productivity and reduce yield variability. FLPs consist of three types of demonstration plots: Technology Option Plots (TOPs), Production Test Plots (PTPs), as well as Women Voucher-assisted Developments (WADs). The TOPs and WADs are closely supervised by extension agents and operationally supervised by the Country programs until a new cost-sharing modality comes into play. Again, these two serve as the primary focal points for community-and group-based agronomic training and technology evaluation. TOPs are used to introduce technological innovations to the larger community and serve as sites for community-based field days. TOPs are normally 1,500M^2 in size and divided into three contiguous 500M^2 sub-plots. The first sub-plot is devoted to demonstrating the official national agricultural research centers' recommendations; the second is a lower-cost (intermediate) variation of the same, while the third is used to show the prevailing farmer practice in the area.

Communities in which TOPs are located are asked to select the farmers that host the TOPs - normally these are among the more accomplished farmers in each community who are already familiar with use of modern inputs. TOP farmers provide land and labour, while Country program provides inputs for the demonstration, and work with extension professionals to provide technical oversight.

WADs are simplified versions of the TOPs. They are intended specifically for resource-poor women farmers who have been excluded in the past from direct involvement in crop demonstrations and as a result, whose technical knowledge and agronomic performance in the field lags behind the average for the community. WADs comprise the lower cost, intermediate level of a particular crop technology and will generally range in size between 500M^2 and 1,000M^2. They are targeted for women farmer self-help groups, which provide the land and labour, with inputs coming from the Country programs in addition to technical backstopping (training) being provided by extension and program staff.

The Nigerian/SG 2000 partnership is making significant attempts to improve smallholder agricultural productivity in Nigeria through the promotion of improved seed; Agricultural practices; promotion of pest and disease control; and Land/Soil Management. There is therefore the need to assess how this impacts on smallholder agricultural productivity.

ii. Theoretical Framework and Role of technology in agricultural productivity

This paper is situated in the technological diffusion theory which highlights that technological innovation has an impact on economic growth only when it is widely adopted and diffused (Hanel and Niosi, 2007; Meinzen-Dick et al., 2002; Mazonde, 1993; and Kennedy and Bouis, 1993). It is concerned with the process by which innovations (be they new products, new processes or new management methods) spread within and across economies. This theory lays emphasis on the diffusion of innovations which leads to the realisation of benefits from technological advance, rather than on the generation of innovations (invention or R & D).

There is a large gap between what the smallholder farmer gets and what is feasible with the available technology in Nigeria. In looking at what has gone wrong, a fundamental issue of concern relates to the technologies and institutional arrangements that are being promoted by governments in the region to increase agricultural productivity. The use of agricultural technologies affects the rate of increase in agricultural output. It also determines how the increase in agricultural output impacts on poverty levels and environmental degradation. Therefore the focus of recent research has been to find better agricultural practices. New strains of crops have been discovered. The focus of research has also been on improvements of land, soil and water management practices (Meinzen-Dick et al., 2002). However, the only way for smallholder farmers to benefit from these research station technologies is if they perceive them to be appropriate and proceed to implement them on their farms (Meinzen-Dick et al., 2002). Increased agricultural productivity, technology adoption rates, and household food security and nutrition can be achieved through improved agricultural practices, expansion of rural financial markets, increased capital and equipment ownership by rural households, and development of research and extension linkages (von Braun et al., 1999). Increased technology development and adoption can raise agricultural output, hence improve household food intake. Improved food intake can also

improve the functioning of the human body and the performance of a healthy, normal life which will increase work output. However, increased technology adoption may result in high labour demands and less time available for other household activities by women (e.g. household chores like child care, and fuelwood and water collection), (Kennedy and Bouis, 1993). On the overall, the experience and evidence from countries within and around the Nigerian region indicates that returns to agricultural technology development could be very high and far reaching. This would transform not only the smallholder sector, but also in the entire national economies of countries in the region (Mazonde, 1993).

3. Methodology

The study focused on some 280 selected farmers at 70 per state from the 4 states where Sasakawa Africa Association (SAA) operates in Nigeria. These states are Adamawa, Kano, Jigawa and Gombe States. These farmers were selected across the states on the basis of typology as TOP, WAD and PTP trained and those who learnt through stepped down. Equally, Gender and location by geographical coverage was another strategy used in farmer selection.

The sample area for the study are the four States in which SG 2000 operates, which include Adamawa, Kano, Jigawa and Gombe. In the case of Adamawa State, Jambutu, Ganye, Fufore, Yola and Lafiyar Lamurde LGA were selected. In Kano State, the sample covered Bunkure, Doguwa, Kura and Tudun Wada LGAs for rice and maize production and processing. From Jigawa State, the selected LGAs were: Auyo, Gumel, Guri, Kaugama, Kirikasamma, Kazaure and Mallam-madori for rice, groundnut, sesame, and beniseed production and processing. Lastly, in Gombe state, local government areas taken as the sample areas included, Akko, Balanga, Billiri and Kaltungo for maize, soya beans and locust beans production and processing.

Through the use of questionnaires and interviews, data on crop productivity enhancement in Nigeria were obtained from 280 farmers selected from the four States where Sasakawa Africa Association (SAA) operates in Nigeria on the basis of typology as TOP, WAD and PTP trained and those who learnt through stepped down. On the other hand, views were collected from the Extension Agents and ministries of Agriculture staff on various issues on Crop productivity enhancement through Focus Group Discussions. The data were coded and

analysed using SPSS version 19, for descriptive statistics and presented in frequency-percentage tables, pie-charts, and bar-charts among others.

4. Data Analysis

The data is being analysed to assess the adoption of SG 2000 Technologies by farmers in the four participating States. This analysis is done under four thematic areas which SG is actively involved. These include promotion of improved seed; agricultural practices; promotion of pest and disease control; and land preparation and soil fertility management.

i. **Promotion of improved seed use**

One of the strategies for poverty reduction through increased agricultural productivity is to promote the production of high yielding crop varieties (Nkonya et al., 2004). Significant increases in crop production in Nigeria has be achieved from improved and open-pollinated varieties developed with a comprehensive breeding system which incorporate multi-sage selection for important agronomic traits such as disease resistance, insect resistance, drought and stress tolerance, high yield, and high response to improved cultural practices.

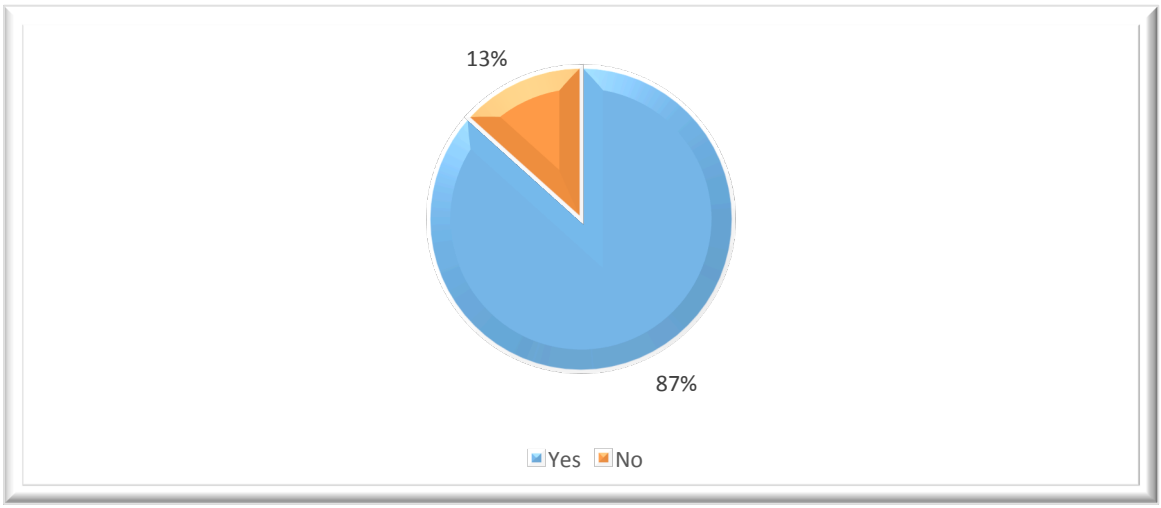
SG 2000-Nigeria as one of its major strategy for improved Crop Productivity Enhancement (CPE) has improved such practices among the partnering states among the smallholder farming families. This adoption of use of improved seed in the project area include recommendation of using SAMMAS 14, 15, 16 and 17 for Maize in Kaduna, Kano, Adamawa, Gombe and Jigawa and Paro 44, 52 and Upland NERICA (New Rice for Africa) 8 for Rice basically in the entire country through Federal Ministry of Agriculture and Rural Development (FMARD), Agricultural Green Revolution Alliance Project (AGRA), West African Agricultural Productivity Program (WAAPP) and other collaborations.

Breeding strategies are being used by research organizations to reduce the impact of drought stress, low nitrogen availability, aluminium toxicity, diseases and insects in Nigeria (Diallo et al., 1989). It has been demonstrated in numerous experiments in Nigeria that the performance of improved maize varieties is superior to the traditional varieties in most farmers' fields. It is established that yields of maize on smallholder farms are often limited because farmers do not have the improved seed varieties.

The analysis reveals that the level of success and the impediments to complete adoption of the technologies. Figure 1 indicates that 87% of small farm holders' respondents within the

participating States have used of improved seed variety as against 13% who have not used improved seeds variety.

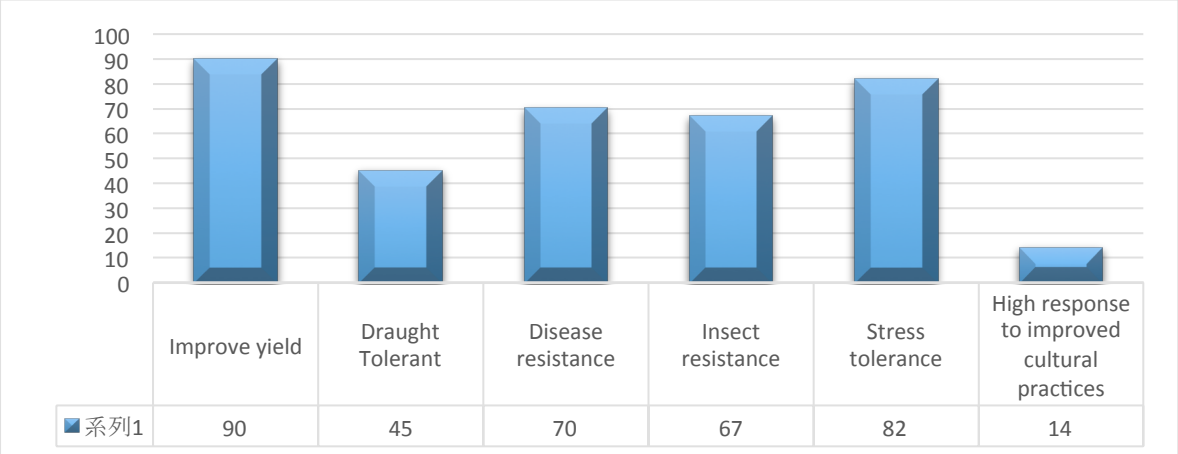
Figure 1: The Use of Improve Seed variety among the SG 2000 Partnering States



Indeed, figure 1 reveals clearly that the level of using improved seed among the trained SG 2000 farmers have been encouraging with 80% complying with the use of improved seed in Adamawa, Gombe and Jigawa States.

From figure 2, the major reasons for the use of improved variety are the resultant improved yield (90%), Stresses and Disease tolerance both 82% and 70% respectively.

Figure 2: Reasons for Using improve seed among the SG 2000 farmers in Nigeria



Insect resistant and drought resistant improved variety also account for 67% and 45% respectively of why the farmers in the study area are attracted to improved seed variety.

Table 1: Impediments for not using improved Seeds

Reason for not Using Improved Seed	Percentage
Access to the improve seed	40
Distribution System is not favouring locals	60
Awareness	60
Pricing	15
Resistance to Change	10

The results in table 1 also show that the failure of the hybrid seed distribution system to access the grass-root, villages and communities which accounts for 60%; lack of awareness of sourcing and usage of the improved seed (60%) are major factors for non-usage. Other reasons associated with non-usage include high prices and economic condition of the farmers and also there were farmers who are change resistant, represented by 40%, 15% and 10% respectively.

ii. **Agronomic Practices**

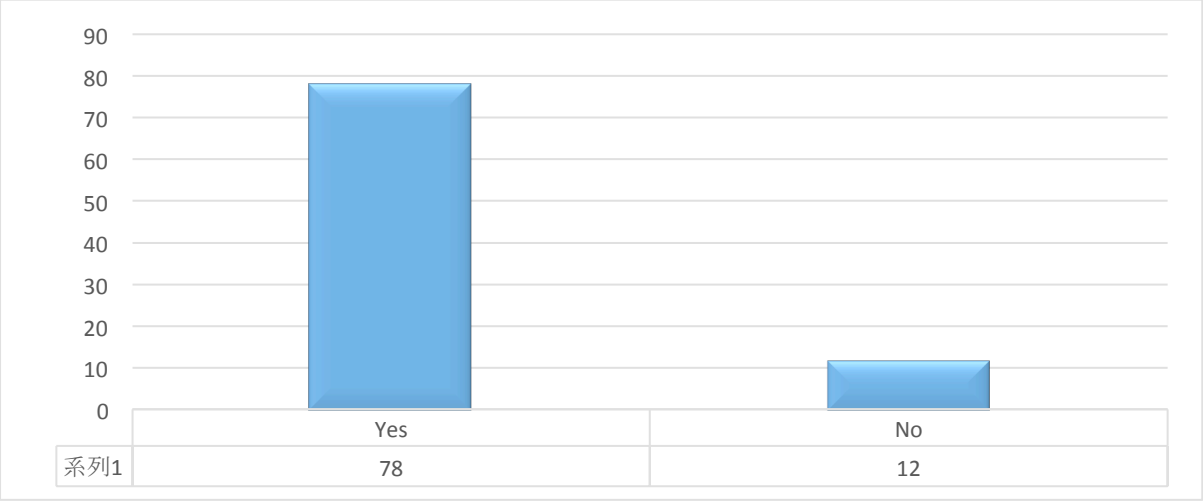
SG 2000-Nigeria has been significantly advocating the increase in the use of improved agronomic practices in addition to improved hybrids varieties in the partnering states. The project emphasizes on the use of good soil fertility management and effective land preparation, ensure timely date of planting within the season, optimum planting rate through one seed per hole, pest and disease control management, good soil and water management and Crop Rotation (legume with a cereal). SG 2000-Nigeria has been at the fore front in promoting the application and usage of other Agronomic practices in its partnering States. The 87% in figure 1 who use improved seed abide to these procedures.

iii. **Promotion of Pest and Disease Control**

SG 2000 is promoting pest and diseases control which is the attempting to stop pest, weeds and other crop diseases, especially from competing with the planted crops in the field. Many strategies have been developed in order to contain these plants by the SG 2000 staff and Extension Agent. These technologies are demonstrated through series of trainings to the farmers and have learnt to use them in the safest ways. The original strategy was manual removal including ploughing, more recent approaches include herbicides (chemical weed killers) and reducing stocks by burning and/or pulverizing seeds. It was prominent to

note that weed problem in smallholder agriculture in Nigeria has been an issue which continuous training and re-training has made many farmers to handle them effectively.

Figure 3: The usage of Pest and Disease Control technology by SG 2000 farmers in Nigeria



From Figure 3, it will be observed that among the farmers interviewed 88% are applying the technologies of pest and disease control learnt from SG 2000-Nigeria Project, while 12% of the respondents do not use such technology. From the study that Pest and Disease control is complicated by rainfall patterns and cultural practices which lead to a build-up of pest and other crop diseases. It was also obvious that, the mode of land preparation, onset of rains, intercropping reduces the smallholder agricultural productivity.

iv. **Land Preparation and Soil Fertility Management**

Also, SAA focuses on effective and efficient utilization of fertilizers, application rates, with consideration on the cultural practices. The CPE theme also emphasizes on organic sources of manure, method of application, time of planting, spatial arrangements, crop rotations and cropping sequences as factors for improve farm production. In attempt to ensure productivity increase, SG 2000-Nigeria emphasizes on smallholder farmers to practice intercropping which offers a diversity of organic sources of manure which may add to the soil fertility. It was observed that despite the call by SG 2000, majority of the smallholder farmers are not making full use of organic sources of manure for reasons such as un-availability and scarcity. The expensive inorganic fertilizer option in raising agricultural productivity should be combined with cheaper local alternatives. A study by (Nkonya et al., 2004) shows that in most sub-Saharan African smallholder farming systems, organic manure

application to crop production systems is constrained by low biomass production, coupled with limited availability of land or small landholding sizes. Other constraints identified to be inhibiting increased fertilizer use among smallholders include: lack of knowledge and ability to differentiate between various nutrient sources; and lack of understanding of cost-effective methods of soil fertility management.

Table 2: The Use of Improved Soil Management Practices among SG 2000 – Nigeria farmers

Option	Response (%)
Yes	78
No	12
No Response	10

Table 2 shows that a majority of the respondents (78%) in the SG 2000 intervention areas are using improved soil Management practice they leant from SG 2000. It also reveals that the 12% do not use improved soil management practices. The reasons for this could be attributed to: high cost and unavailability of such fertilizers.

Reasons for adoption of SG 2000 technologies in Nigeria

SG 2000 promotes several technologies from Land preparation to harvesting. Most prominent among the series of technologies include; fertilizer use, timely planting, Line planting, proper seed rate, timely weeding, pest and disease control, crop rotation and use of herbicides. The main factors affecting technology adoption among smallholders in these States as revealed from the responses:

Low Education and skills: It was noticed that assets of the farmer is a major determinant of adoption of the CPE technologies. It deals with whether farmers have the requisite physical (material) and abstract possessions (e.g. education) essential for technology adoption. A lack of these assets will limit technology adoption. Several evidences arising from the survey shows that learned farmers who jotted down what they were trained on, have better capacity to observe, understand and practice what they were taught.

Low financial and credit access: Financial and Credit facilities provides access to all the services of agricultural development, such as finance, insurance and information dissemination. They also include facilities and mechanisms that enhance farmers' access to productive inputs and product markets. Most smallholder farmers do not have such access.

The major option for increased adoption of technology is to overcome the income/ capital constraint through increased credit provision.

Poor Institutional guides: Present Institutional guides are not helping smallholder farmers. These are embedded in the norms, behaviours and practices in society. Equally one of the most discernible features around credit in most sub-Saharan African countries is the lack of an educational package linked to credit for small rural producers. It is imperative that agricultural training and extension programmes be intensive enough to promote adoption not only of improved yield-raising technologies, such as improved seeds, but also of fertility-restoring and conservation technologies (Nkonya et al., 2004), as well as procedures and guidelines for accessing some of the opportunities available to them.

Conclusion

Conclusively, this paper finds that over 85% of the smallholder farmers in the study area are adopting the SG 2000 technology adoption framework. These technology adoptions are in the areas of improved seed variety, better agronomic practices, pest and disease control, land preparation and soil fertility management. These adopted technologies go a long way in improving the smallholder agricultural productivity in the selected States. Reasons advanced for adopting these technologies include: higher crop yield, drought tolerant crops, diseases resistant crops and stress tolerant crops, which at the end enhances produces better results. However, SG technological diffusion among smallholder schemes are inhibited by: low level of education and skills, poor assets and lack of access to financial and credit windows, and institutional (traditional and modern) setbacks.

This paper recommends that measures that can enhance adoption of yield-enhancing technologies include, like: Lowering fertilizer costs; Lowering the price of other inputs and raising agricultural product prices; Improving smallholder farmers' access to finance for agricultural development; Adopting a "package" approach to provision of agricultural development technologies; and Development and rehabilitation of infrastructure for agricultural inputs and product markets; regular in-service training of extension workers to equip them with up – to date research knowledge; should be pursued by all the stakeholders. Also, researchers should seek to understand the rationale behind traditional

smallholder farmers' resistance to the use of technology in agriculture, as this will make future technological interventions in smallholder agriculture more effective.

References

Anderson J. R. (2007). Agricultural advisory services. Background paper for World Development Report 2008, Agriculture for Development. Washington, D.C.: World Bank. http://siteresources.worldbank.org/INTWDR2008/

Anderson J. R. and Feder G. (2004). Agricultural extension: Good intentions and hard realities. World Bank Research Observer 19(1): 41–60.

BTOR (2010). CPE Theme Back to Office Report. SG 2000 – Nigeria.

Davis K., Swanson, B., Amudavi D., Daniel A. M.; Flohrs A., Riese, J., Lamb C. and Elias Z. (2010). In-Depth Assessment of the Public Agricultural Extension System of Ethiopia and Recommendations for Improvement. IFPRI Discussion Paper 01041. Eastern and Southern Africa Regional Office. SAA, 2005. Annual Report 2003 - 2004. Feeding the Future, Issue 26. Sasakawa Africa Association, Addis Ababa, Ethiopia.

Diallo A. O., Edmeaes, G. O., Tang, C. Y., Deutsch, J. A., and Bjarnason, M. (1989). Breeding Strategies to Overcome Constraints and Increase Maize Productivity in Sub-Saharan Africa.

Feder G., Murgai R. and Quizon J. (2004). Sending Farmers Back to School: The Impact of Farmer Field Schools in Indonesia, *Review of Agricultural Economics*, Vol. 26, No. 1.

Federal Government of Nigeria [FGN] (2001). The New Nigerian Agricultural Policy Document.

Federal Government of Nigeria [FGN] (2006). National Policy for Fertilizer.

Federal Government of Nigeria [FGN] (2010). Millennium Development Goals (2010) MDG Report.

Gladwell M. (2000). *The Tipping Point: How Little Things Can Make a Big Difference*. Little Brown, USA.

Hanel P. and Niosi, J. (2007). Evolutionary theories of technological diffusion and their policy implications. A paper presented at the Annual meeting of EAEPE, Porto, Portugal, November.

Kanu R. U and Imo A. N. (2006). "Determinants of Adoption of Improved Cassava Varieties by Small Scale Farmers in Ikwuano Local Government Area of Abia State". Proceedings of the 40th Annual National Conference of the Agricultural Society of Nigeria. NRCRI, Umudike, Oct.16th -20th 2006.

Kennedy E. T., and Bouis H. E. (1993). Linkages between Agriculture and Nutrition: Implications for Policy and Research. Washington DC, International Food Policy Research Institute (IFPRI), Occasional Papers.

Koyenikan M. J. (2008). Issues for Agricultural Extension Policy in Nigeria. *Journal of Agricultural Extension*, Vol. 12, No.2.

Lionberger H. F. (2006). *Adoption of new ideas and practices*, Iowa State University Press, Ames, Iowa.

Madukwe M.C. (1993). Communication Process and the Effectiveness of Agricultural Extension Supervisors in Nigeria. *Nigerian Journal of Agricultural Extension*, Vol. 8, No. 1.

Matata P. Z., Ajaisil O. C, and Aguniyi A. (2008). Socioeconomic factors influencing adoption of improved fallow practices among small holder farmers in western Tanzania. *International NGO Journal*, Vol. 3, No. 4.

Mazonde I. N. (1993). Food Policy and Agriculture in Botswana. *Food policy and agriculture in Southern Africa.*

Meinzen-Dick R., Knox A., Place F. and Swallow B. (2002). Innovation in Natural Resource Management: The Role of Property Rights and Collective Action in Developing Countries. Washington, D.C.: IFPRI.

Muktar M. (2011). *Determinants of Food Insecurity in Nigeria: Application of Binary Choice Modeling Technique.* Essays in Social Sciences, Edited by Bandara H. L. and Gunashekara K. R. H., Godage Int. Publishers PVT LTD Colombo Sri Lanka.

Nagy J. G and Edun O, (2008). Assessment of Nigerian Government Fertilizer Policy and Suggested Alternative Market-Friendly Policies. International Fertilizer Development Centre.

Naibakelao D. (2008). General Overview of the 'SAFE' Initiative in Africa. West Africa regional SAFE Networking Workshop, Ahmadu Bello University Zaria, Nigeria.

Nkonya E., Pender J., Jagger P., Sserunkumo D., Kaizzi C., and Ssali H. (2004). Strategies for Sustainable Land Management and Poverty Reduction in Uganda.

Nwawuisi J. U., Okoye B. C. and Odaji C. O. (2007). Adoption of Improved Cassava Varieties, TMS 30211 and TMS 3001, in Ivo Local Government Area of Ebonyi State. In ASN Proceedings Samaru, pp 527- 530.

Obasi A. O. (2004). Adoption of improved Farm Practices: A choice under uncertainty. *Journal of Agric. Extension Society of Nigeria Vol.* 5, No. 2.

Ogboru I. (2002). Agricultural Development Policies in Nigeria: A Critique. *Jos Journal of Economics*, Vol. 11, No. 1.

Okoye A. (2007): Factors affecting Adoption Processes by farmers in selected Local Government Areas in Anambra State. *Journal of Agricultural Administration, Vol.* 9, No. 2.

Oladele O. I. (2005). A tobit analysis of propensity to discontinue adoption of agricultural technology among farmers in south-western Nigeria. *Journal of Central European Agriculture*, Vol. 6, No. 3.

Osuntade O. B., Adebayo K., Iposu S.O. and Banmeke T. O. A. (2011). Lessons from the Management of Microcredit for Supporting Technology Adoption in Ogun State.

SAA (2005). Annual Report 2003 - 2004. Feeding the Future, Issue 26. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2005). Annual Reports 2003 – 2004. Feeding the Future, Issue 26. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2008). New Priorities and Directions for SAA. SAA, Tokyo, Japan.

SAA (2010). Nigeria Baseline Report. Sasakawa Africa Association, Nigeria.

SAA (2010). Crop Productivity Enhancement: Concepts and Procedures. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2010). Crop Productivity Improvement and Extension Log frame. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2010a). New Expanded Programme. Feeding the Future, Issue 26. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2010b). Reinventing and Revitalizing SAA. Feeding the Future, Issue 26. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2011a). Strategic Plan. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2011b). Twenty-fifth Anniversary: Transformation based on historic legacy. Feeding the Future. Sasakawa Africa Association, Addis Ababa, Ethiopia.

SAA (2012). Report on Assessment of Cassava Post Harvest and Agro-Processing Learning Platform (PHELP) Technologies Among Women/Women Groups in Adamawa State, Nigeria.

Saddiq N. M., Muhammad A. A. and Akinola M. O. (2012). Factors influencing adoption of 'Striga' resistant maize production by farmers in Kaduna State, Nigeria. Proceedings of the 46th annual conference of the agricultural society of Nigeria held at Bayero University, Kano Nigeria 5th – 9th November.

Salawu J. A. and Adedoyin, S. F. (2008). An introduction to agricultural extension and rural sociology. National Open University of Nigeria Lagos, Course Guide.

von Braun J., Teklu T., and Webb P. (1999). *Famine in Africa: Causes, Responses, and Prevention*. Hopkins University Press for the International Food Policy Research Institute, Baltimore.

Vries C. A. (1968). Agricultural Extension in the Developing Countries: A Bibliography. International Institute for Land Reclamation and Improvement Wageningen / the Netherlands.

Walsh B. (2007). A Green Tipping Point. The Times Magazine. http://www.time.com/time/world/article/0,8599,1670871,00.html.