International Journal of Bio-resource and Stress Management 2012, 3(1):068-072

Analysis of Indigenous Knowledge System and Mechanism for Up-scaling in the Eastern Part of Nigeria

R. N. Nwakwasi[1*], F. N. Nnadi[1], E. C. Matthews-Njoku[1], O. M. Adesope[2], J. Chikaire[1], F. O. Ugwoke[1] and C. C. Ifeanyi-Obi[2]

[1]Department of Agricultural Extension, Federal University of Technology, Owerri, Nigeria
[2]Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Port Harcourt, Port Harcourt, Nigeria

Article History

Manuscript No. 236
Received in 6th December, 2011
Received in revised form 15th January, 2012
Accepted in final form 6th March, 2012

Correspondence to

**E-mail:* nwakwasinkeonyere@yahoo.com

Keywords

Indigenous knowledge, IPM, FFS, participatory technology

Abstract

Farmers in south-eastern Nigeria depend greatly on cassava for its many products. The production however is beset with a myriad of constraints of which the rural farmers despite the influx of modern scientific knowledge still carry out indigenous production practices. Recently the Farmer Field School (FFS) strategy has come to fore, with a view to up-scaling Indigenous Knowledge (IK) to scientific knowledge. This study used the FFS approach to compare improved and indigenous cassava production practices. The study was carried out in Owerri North Local Government Area, Eastern part of Nigeria. Data were collected with the aid of structured questionnaire. 100 respondents were randomly selected from the study area. Descriptive statistics was applied in the data analysis. At the end of the 1st year planting season of 12 months, yield of cassava on Integrated Pest Management (IPM) plot of 1 ha was 33 t of cassava. Using farmers' local cassava variety, farmers' plot of 1 ha gave a total yield of 8 t of cassava. Finally, in the 2nd planting season yield on the farmers' plot using improved cassava variety gave a total yield of 18 t, while the IPM plot was 34 t. It was recommended therefore that farmers can improve on yield if they include some of the IPM practices in addition to the use of improved cassava varieties as was carried out in the FFS which is an effective and, bottom-top, participatory method of technology transfer.

1. Introduction

In most poor food-insecure countries, the two greatest potential resources are the people and the productivity of the land and water. To defeat chronic hunger and poverty, investments will have to be made in both people and productivity. Many developing countries including Nigeria lack appropriate technological and scientific knowledge application. In many countries, the productivity and incomes of the poorer farmers have stagnated or even decreased. This is not solely due to a lack of investment in education, research or extension, it can also be traced to a number of other causes, such as poorly functioning agricultural knowledge base, poor markets for inputs, products, or credit. They have not been responsive enough in addressing the problems and opportunities facing farmers. Cassava is a staple food of more than 200 million individuals worldwide, most of whom live in Africa. Cassava is drought tolerant and grows well in soils with modest nutrient composition. Worldwide, cassava production is approximately 225 mt, an increase of 30% over the past 15 years. Cassava, however, has the lowest P: E of any staple crop; the protein content among common cassava cultivars is typically only 1% (Stephenson et al., 2010).

In Nigeria cassava is cultivated indigenously almost in all parts of the country all year round because of its high level of drought tolerance. To optimize the productive ability of the available labor, most small-scale farmers in developing nations and in different agro-ecological zones need access to a wide variety of locally validated technologies if they are to improve on their productivity. It is recognized that those states which invest more than 3% of GNP in science and technology, are likely to have the most productive and competitive economies. The observed slow progress towards global competitiveness of most African, Caribbean and Pacific (ACP) states is due partly to their inability to innovate and/or access information in a timely manner and at an affordable cost to facilitate sound decision making (Francis, 2003).

Nigeria is the world's largest producer of cassava roots. Its output is over 34 million metric tonnes per annum, but in spite of this impressive situation, little of this total national output is processed and exported. Much of it is consumed locally mainly because it is the country's number one staple food. Yet commercial cassava cultivation, processing and exporting, if adequately encouraged, funded and practised, can turn out to be a strong contender for the number-one foreign exchange earner for the country (Oni, 2010). In order to keep pace with the rapid rate of food demand that is attendance upon rapid population growth and help to improve the gloomy food situation and its consequences, continuous research in food production and efficient extension services is highly desirable, increased use of modern agricultural technology will contribute significantly to agricultural development and the gap between developed and developing countries in the area of agricultural production can be attributed largely to differences in the level of technological development, adaptation and transfer process. Many improved varieties of various crops for use by the farmers have been developed by the research system in an attempt to improve on the yields at farm level. The adoption and use of these crop varieties just like other technologies is very low. Many factors ranging from socio-economic, delivery systems to policies have affected the availability and accessibility of these varieties to the farming communities particularly the resource-poor small-holder farmers. Consequently, the farmers continue to use locally sourced varieties or purchased planting materials from the local markets, resulting in their growing low quality cultivars with mixed varieties, giving them low returns. Given the good management packages and improved varieties at affordable price to the farmers, will certainly result in improved yields which should accompany them. Innovative systems that will help to improve multiplication, availability and accessibility of improved planting materials; need to be enhanced especially now that former President of Nigeria Olusegun Obasanjo once announced the need for immediate action in five agricultural sub-sectors—cassava, rice, vegetable oils, livestock and tree crops. The cassava initiative alone seeks to generate US$5 billion in export revenue by 2007. To compliment this Initiative, IITA together with the Nigerian National Petroleum Corporation (NNPC) recently signed a four year action plan providing local communities with cassava mosaic disease resistant planting materials and production and marketing support. These improved cultivars produce more cassava plant^{-1} (Phillips et al., 2004).

Louise Grenier defines indigenous knowledge (IK) as the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area. Indigenous knowledge, also is referred to as traditional or local knowledge, is embedded in the community and is unique to a given culture, location or society. The term refers to the large body of knowledge and skills [Indigenous Knowledge Systems and Practices (IKSP), Indigenous Technological Knowledge (ITK)] that has been developed outside the formal educational system, and that enables communities to survive. The dominance of the western knowledge system has largely led to a prevailing situation in which indigenous knowledge is ignored and neglected. It is therefore easy to forget that, over many centuries, human beings have been producing knowledge and strategies enabling them to survive in a balanced relation with their natural and social environment. As IK is closely related to survival and subsistence, it provides a basis for local-level decision making (Grenier, 1998).

Agricultural knowledge and information system for rural development should link people and institutions to promote mutual learning and generate, share, and utilize agriculture-related technology, knowledge, and information. The system should integrate farmers, agricultural educators, researchers, and extensionists to harness knowledge and information from various sources bearing in mind the culture, custom, values, ideologies and level of development of the beneficiaries in mind for better farming and improved livelihoods. The problem is that most developers do not incorporate these in their planning process and thus achieve less. Objectives of the present investigation were as follows:

a. To identify the cultural practices of the respondents in the study area

b. To compare the yields of two different cassava varieties, the local best (Nwajenni) and an improved variety NR 8082 using different planting practices (farmers' indigenous practices and improved pest management practices)

c. To compare the yields of an improved cassava variety (NR 8082) using farmer's indigenous practices and improved pest management practices

The FAO supported Farmer Field School (FFS) works in an experiential learning-by-doing mode to help farmers reduce the quantities of harmful chemicals they were using in their fields (World Bank/FAO/IFAD, 2009). The FFS approach encourages good and already existing cultural practices, where farmers are seen as co-innovators as they are seen to have sound knowledge of their indigenous practices which will aid sustainability in the absence of facilitators and other government bodies. FFS was developed by an FAO project in South-east Asia as a way for small-scale rice farmers to investigate and learn for themselves. The FFS was based not on instructing farmers on what to do but on empowering them through education to handle their own on-farm decisions using experimental learning techniques developed for non-formal adult education (Mero, 2000).

The FFS method of knowledge and technology transfer uses integrated management control mechanism and at the same time takes cognizance of the farmers' indigenous practices, combining it with modern practice as it is to up-grade existing local varieties, it includes production of crops that fit the ecological conditions by use of genetically resistant seeds, research into pest and disease control through symbiotic relationship of crops and insects (Thomas, 1992) against low yielding varieties adopted to local environment used by farmers in their indigenous practice that have poor resistance to diseases and pests. FFS indicates a multi-disciplinary approach involving multiple stakeholders/collaborators in the investigating team, sufficiently oriented to promoting participatory approaches it also indicates the multiple objectives addressing all the aspects of farmers' problem.

2. Materials and Methods

The study was carried out in Owerri North Local Government Area, Eastern part of Nigeria. Data were collected with the aid of structured questionnaire. 100 respondents were randomly selected from the study area. Descriptive statistics was applied in the data analysis. Two cassava varieties were used for the experiments. An improved variety that is a high yielding variety, resistant to cassava mosaic disease (NR 8082) and a local variety (Nwajenni) were planted in 2 ha of land. 1 ha of land was planted with the local variety which is regarded as the farmer's plot while the improved variety NR 8082 was planted in the other 1 ha of land referred to as the IPM plot. In the first planting season, March 2008, planting procedure and decision activities on the farmer's plot was initiated and super headed by the farmers according to their indigenous practices, while on the IPM plot planting procedure and decision was initiated and super headed by the extension agent. The extension agent and farmers both participated and observed what happened on both plots. The extension agent's plot adopted the use of IPM. Agro-ecosystem analysis (AESA) was done. In AESA, the following information are sought and recorded properly every 2 weeks; crop variety, date of planting, date of germination, soil condition, weather condition, measurement of plant height, number of leaves on plants to determine growth rate, plant canopy, length of internodes (depending on the crop), type and quantity of fertilizer applied, date of application, date of flowering, age and date of harvesting crops and quantity of tubers harvested. Plants were observed regularly for pests and disease infestation. Natural enemies to crops such as disease causing pests, and the general environment (biotic and abiotic activities in the farm and their relationship, i.e. the eco-system was also observed. Farmers were supposed to observe, learn and become experts. Cassava harvesting on the two plots was done at the same time (March, 2009) and records on yield were taken.

The purpose of AESA was for continuous field check and to be able to take informed management decision. The learning objective of AESA was to improve decision making skills of farmers by observing and discussing in small groups, observing natural enemies to crops such as pest and diseases, farm operations on the IPM plot in the first planting season (March, 2008-March, 2009). Clearing and de-thrashing, cassava cuttings were bagged in air tight plastic bags and kept in a dark room for 6 days to induce sprouting faster before planting on the field. AESA taking was started after cuttings were bagged, planting was done on the seventh day, and supply of missing stands was done, NPK 15: 15: 15 fertilizer was applied; weeding was done according to AESA decision (three times). Larger mounds were made when compared to the farmer's plot, supply of missing stands was done, length of cassava cuttings 20-25cm, harvesting of cuttings, and harvesting of tubers were done. Planting operations on the farmer's plot in the second planting season (April, 2009-April, 2010) were done. Clearing and de-thrashing, tilling and planting, cuttings were kept for 5-6 days to reduce the moisture content before planting. Length of each cassava cutting was 10-15 cm, about 2-3 cassava cuttings were planted on a mound. Irregular plant spacing, no fertilizer was applied, NR 8082 was planted here, farmers had more than 10,000 cuttings. Weeding was done manually and twice in the planting season. Smaller mounds were made when compared to the IPM plot, missing plant stands were supplied.

3. Results and Discussion

At the end of the 1st year planting season of 12 months yield of cassava on IPM plot of 1 ha was 33 t of cassava. Using farmers' local cassava variety, farmers' plot of 1 ha gave a total yield of 8 t of cassava (Table 1).

In the 2nd planting season, planting procedure and decision activities on the farmer's plot was initiated by the farmers according to their indigenous practices and according to AESA results, while on the IPM plot planting procedure and decisions were initiated and super headed by the extension agent according to AESA results and also taking cognizance of the organizational context of the area and incorporating farmers' indigenous knowledge. The extension agent and farmers both participated and observed what happened on both plots, as they were meant to work together. Yield on the farmers' plot using improved cassava variety (NR 8082) gave a total yield of 18 t, while yield on the IPM plot using improved cassava variety (NR 8082) was 34 t (Table 2).

Table 1: Cost and return analysis for the production of improved cassava variety NR 8082 and a local best Nwajenni at the end of the first planting season

Variety	Items/cost	Yield (1 ha)t	Unit price (₦)	Total cost/ return in ₦ (1 ha)
NR 8082 (IPM)	Total fixed cost			12,500.00
	Total variable cost			99,549.30
	Total			112,049.30
	Harvested stem cuttings	819 bundles	450.00	368,550.00
	Harvested tubers	33 t ha^{-1}	5 kg^{-1}	165,000.00
	Gross farm income			533,550.00
	Net farm income			421,500.70
Returns/Naira				376%
Nwajenni (Farmer's plot)	Total fixed cost			12,500.00
	Total variable cost			75,450.00
	Total			87,950.00
	Harvested stem cuttings	553 bundles	400.00	221,200.00
	Harvested tubers	8 t ha-1		40,000.00
	Gross farm income			261,200.00
	Net farm income			173,250.00
Returns/₦				197%

Source: Field Survey, 2009-10; ₦: Naira (1 US$=100 ₦ as on dated 07.03.2012)

Table 2: Cost and return analysis for the production of improved cassava variety NR 8082 on the farmer's plot and IPM plot using two different cultural practices (farmers' indigenous practice and IPM practice)

Variety	Items/ cost	Yield (1 ha)	Unit price (₦)	Total cost/ return in ₦ (1 ha)
Farmers' practice	Total fixed cost			12,500.00
	Total variable cost			75,450.00
	Total			87,950.00
	Harvested stem cuttings	553 bundles	400.00	221,200.00
	Harvested tubers	18 t ha^{-1}	5 kg^{-1}	90,000.00
	Gross farm income			311,200.00
	Net farm income			223,250.00
Returns/ ₦				253%
IPM Practice	Total fixed cost			12,500.00
	Total variable cost			99,549.30
	Total			112,049.30
	Harvested stem cuttings	819 bundles	450.00	368,550.00
	Harvested tubers	34 t ha^{-1}		170,000.00
	Gross farm income			538,550.00
	Net farm income			426,500.70
Returns/ ₦				380%

Source: Field Survey, 2009-10

4. Conclusion

Cultivation of improved cassava variety NR 8082 using IPM practices and Agro-ecosystem analysis could be a tool that can help farmers not only enriching their knowledge but also improving livelihood through higher income generation. However, there is need to institutionalize the client-oriented research and improve research-extension and farmer linkages including appropriate technologies

5. References

Francis, J.A., 2003. Proposal for CTA's science and technology strategies program. Paper presented at the 2nd Meeting of ACP Informal Working Group on Science & Technology, Ede, The Netherlands, November 28-December 3, 2004.

Grenier, L., 1998. Working with indigenous knowledge: a guide for researcher. http://www.unesco.org/most/bpikpub.htm

Mero, A.N., 2000. Extension and training activities under the Special Program for Food Security in the United Republic of Tanzania. In: Qamar, M.K. (Ed.), Human Resources in Agricultural and Rural Development, FAO, Rome, 75.

Oni, O., 2010. How to set up a multipurpose cassava processing plant: finance, analysis, comments and views from Nigeria business day. http://www.businessdayonline.com/ARCHIVE/index.php?option=com content&article&id=8627:how-to-set-up-a-multi-purpose-cassava-processing-plant&catid=81:entrepreneur-news&Itemid=599.

Phillips, T.P., Taylor, D.S., Sanni, L., Akoroda, M.O., 2004. The global cassava development strategy: a cassava industrial revolution in Nigeria—the potential for a new industrial crop. IFAD and FAO, 1.ftp://fpt..fao.org/docrep/fao/007/y5548e/y554800.pdf.

Stephenson, K., Amthor, R., Mallowa, S., Nungo, R., Maxiya Dickson, B., Gichuki, S., Mb Anaso, A., Manary, M., 2010. Consuming cassava as a staple food places children 2-5 years old at risk for inadequate protein intake: an observational study in Kenya and Nigeria. Nutritional Journal 9(9), 2. http://www.nutritionj.com/content/pdf/1475-2891-9-9.pdf.

Thomas, B., 1992. Science and technology: Africa's dilemma. In: 7th Distinguished ARPPIS Lecture. ARPPIS Network 3(1), 2-3, ICIPE, Nairobi, Kenya.

World Bank/FAO/IFAD, 2009. Thermatic note 2: gender and participatory research, module 7- gender in agricultural innovation and education. Agriculture and Rural Development, Gender in Agriculture Source Book, 274.