Program for African Seed System (PASS)

Alliance for a **G**reen **R**evolution in **A**frica

FINAL REPORT:

EVALUATION OF EXPIRED AGRA-PASS PROJECTS IN NIGERIA

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ABBREVIATIONS

ADP	Agro-Dealer Development Program
AfrEA	Africa Evaluation Association
AFRGM	Africa Rice Gall Midge
AgSSIP	Agricultural Services Sub-Sector Investment Programme
AYT	Advance Yield Trial
BTRDC	Biotechnology Research and Development Centre
CIFS	Community-Driven Initiatives for Food Security
CSOs	Civil Society Organisations
EACI	Education for African Crop Improvement
FIAAC	Fund for the Improvement and Adoption of African Crops
FSNC	Food Security in Northeastern Corridor
GDP	Gross Domestic Project
GIS	Geographic Information System
GIZ	German International Development
IFAD	*International Fund for Agricultural Development*
M&E	Monitoring and Evaluation
MER	Monitoring, Evaluation and Reporting
METs	Multi Environment Trials
NAFCON	National Fertilizer Company of Nigeria
NASC	National Agricultural Seed Council
NCRI	National Cereal Research Institute
NCS	National Seed Council
NGOs	Non-Governmental Organisation
OYT	Observation Yield Trial
PASS	Program for African Seed System
PPP	Public-Private Partnership
PRB	Participating Rice Breeding
PVS	Participating Varietal Selection
R&D	Research and Development
RTIP	International Fund for Agricultural Development
RYMV	Rice Yellow Mottle Virus
RYT	Replicated Yield Trial
SEPA	Seed Production for Africa Initiative

TOR	Terms of Reference
TUAL	The Urban Associates Limited
UNDP	United National Development Programme

EXECUTIVE SUMMARY

Introduction

Nigeria agricultural sector, for a long time, suffers extremely low productivity, reflecting antiquated methods and abandonment due to over reliance on oil and gas for national development effort. Although overall agricultural production rose by 28 percent during the 1990s, per capita output rose by only 8.5 percent during the same decade (World Bank, 2002). Nevertheless, in recent times, domestic food production is on the increase but not enough to meet national food demand.

One area that needs attention is research and development. Investment in agricultural research and development has remained negligible which correlated the low contribution to GDP, poor funding regime, low agriculture technologies, stagnated returns of farmers' income; seasonal rural employment attributes, high food price, poor incentives for establishment of agro-based industries, and low economic growth.

Within the framework of AGRA-PASS, implementation of projects in Nigeria is required to fit into the National Policy environment. The Programme for Africa's Seed Systems (PASS) is aimed at vitalizing the value chain process by promoting access to improved seed varieties to resource poor smallholder farmers through institutional strengthening and human resource capacity building. Even more so, the breeding of improved seed varieties needs institutional anchorage to support the process.

There are five (5) Projects that grants had expired and required to be evaluated. The evaluation was focused on determining the extent that project results/outputs had been met against relevance of project objectives, performance, impact and sustainability.

Education for Africa Crop Improvement

Investment in building human capacity for breeding of Plant Breeders and Crop Scientist needs to be consistent with the national agriculture policy directive and relevance to needs of smallholder farmers. In other words, human resources capacity building within agricultural sector should impact on the food production and supply chain that has trigger effect. Within the context of national and sub-regional agricultural policy the increase number of plant breeders – 10 in each institution (University of Ibadan and Ahmadu Bello University) - should feed into the need of agricultural research institutions for increase capacity of these institutions.

The relevance of the training transcended the bounders of Nigeria in both Institutions. Scholarships were awarded to Non-Nigerians. West Africa countries can be said to face similar agricultural challenges as pertained in Nigeria. Inadequate researched and development due to low capacity of research institutions and lack of investment. . 20 Plant Breeders and Crop Scientists, under EACI, have been trained to feed agriculture research institutions within the West Africa Sub-Region.

Aside increased enrolment, there have been other interventions. University of Ibadan has reviewed content of its curriculum in teaching and researching in Plant Breeding and Crop Science; equipped it laboratories and upgraded its green houses to conform to modern trend in agronomy. The Department is also affiliating the Pan-African University to establish a hub in Plant Breeding for the Sub-Sahara Africa Region. This new initiative is a direct result of improved teaching and research work promoted by AGRA. The Department of Plant Science of Ahmadu Bello University, through the EACI Sub-Programme, has established a computer laboratory to aid effective teaching and research. This, together with new books and the other facilities provided under the project, has significantly improved the effectiveness of teaching and learning at the two Universities.

There existed quite variance between planned logistical supports and the actual. In Ahmadu Bello University, there was no internet connectivity, although it was provided in the proposal. University of Ibadan has a stand-alone computer connected to the internet, although the Department has a well-furnished computer room. Evidence suggests that patronage of the computer laboratory is on the lower side. Nevertheless, students had alternative sources of accessing the internet.

Even though lecturers of both Universities unequivocally asserted that there is, largely, adequate access to teaching, learning and research facilities, there were divergent positions expressed by students. 20% AGRA sponsored graduates of University of Ibadan were of the opinion that access to text books were inadequate. Similar ratio (20%) favoured adequate access whilst 40% contended there was some access to the books. 30% of the Graduates of Ahmadu Bello indicated adequate access; 40% some access, whereas 30% did not respond. The students view also runs contrary to the superb conditions of lecture rooms, screen houses and laboratories/lab equipment attested by Managers of the Projects in the two Institutions.

It must also be stated that the project outputs/results were expected to translate into outcomes which will affect external environment of increasing productivity of small holder farmers. Within the framework of the two projects, the research areas were strategically selected to instigate the development of seed genotypes that could be propagated as an input into agro-system within a define ecological system.

Within the context of the proposal, University of Ibadan budgeted $394,042 and by 30th June 2010 an amount of US$259,760 has been released to the University. Within the same reporting period US$187,817.57 was spent on project activities. With respect to Ahmadu Bello University, US$ 362,422 of the budgeted amount of US$363,390 was spent on the Project by the end of the project period.

Analysis of the expenditure pattern indicates misapplication of funding (especially at the Ahmadu Bello University). It is evident that amount saved on research, travels and publications were spent on students' accommodation and stipends, facilities at the Department, project manager allowance and administrative cost.

The situation is quite different at the University of Ibadan where an amount of US$71,943 has been saved and not spent on any other project item. Total actual expenditure per student is about $36,242 at Ahmadu Bello University and US$18,782 at the University of Ibadan

Although, there is no evidence to suggest that the EACI projects intend to produce crop varieties that have the danger to distort a given ecosystem, this aspect needs to be integrated into the curriculum of training professional for the agricultural industry. In assessing the environmental impact of the training programme from the perspective of the stakeholders was positive as none of the respondents seemed to have noticed any. However, the weak link of the process of training professional for improved productivity of smallholder farmers by translating the expertise acquired to the improvement of live of smallholder farmers is obvious.

Fund for the Improvement and Adoption of African Crops (FIAAC)

Only one project was implemented in Nigeria under the FIAAC sub-programme, namely: *Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice for Poor Resource Farmers in Nigeria.* The goal of the project, which was to develop, breed, release and make available to smallholder farmers rice seeds that are high-yielding, stable, drought-tolerant and resistant to diseases and insect pests, was found to be relevantt to achieving both Nigeria's agricultural policy objectives and AGRA's vision.

The main output of the project was the release of 11 improved varieties of rice (i.e. IWA-1 to IWA-11). Results of tests at four locations across Nigeria show that the new varieties perform better than two previously released varieties (FARO-52 and FARO-44). Some of the observed/expected benefits of the project included increased access of smallholder farmers to seeds that are high-yielding, early-maturing and adapted to biotic and abiotic stresses and, consequently, increased yield, food security and income.

(At least 200 farmers are known to have received seeds from the Centre in addition to an unknown number who sourced seeds from the NSC and ADPs). The project also helped to boost R&D activities at Ebonyi State University, built the capacity of the Biotechnology Research and Development Centre and enhanced the image of the university. However, the long-term sustainability of the project can only be ensured if measures are put in place to further popularize and commercialize the varieties.

Seed Production for Africa Initiative (SEPA)

Two projects were implemented in Nigeria under the SEPA sub-programme: i) Enhancing access to quality improved seeds for better livelihood of resource-poor farmers in North Western Nigeria; and b) Community seed production to increase access to improved Seeds for small scale farmers in southern Borno State of Nigeria. The goals of the two projects, which were about making high-quality improved seeds available and affordable to smallholder farmers, increase their incomes and increase food security among them. Both projects involved producing (through out-grower farmers) and selling (through agro-dealers) various improved varieties of maize, rice, soybean and cowpea.

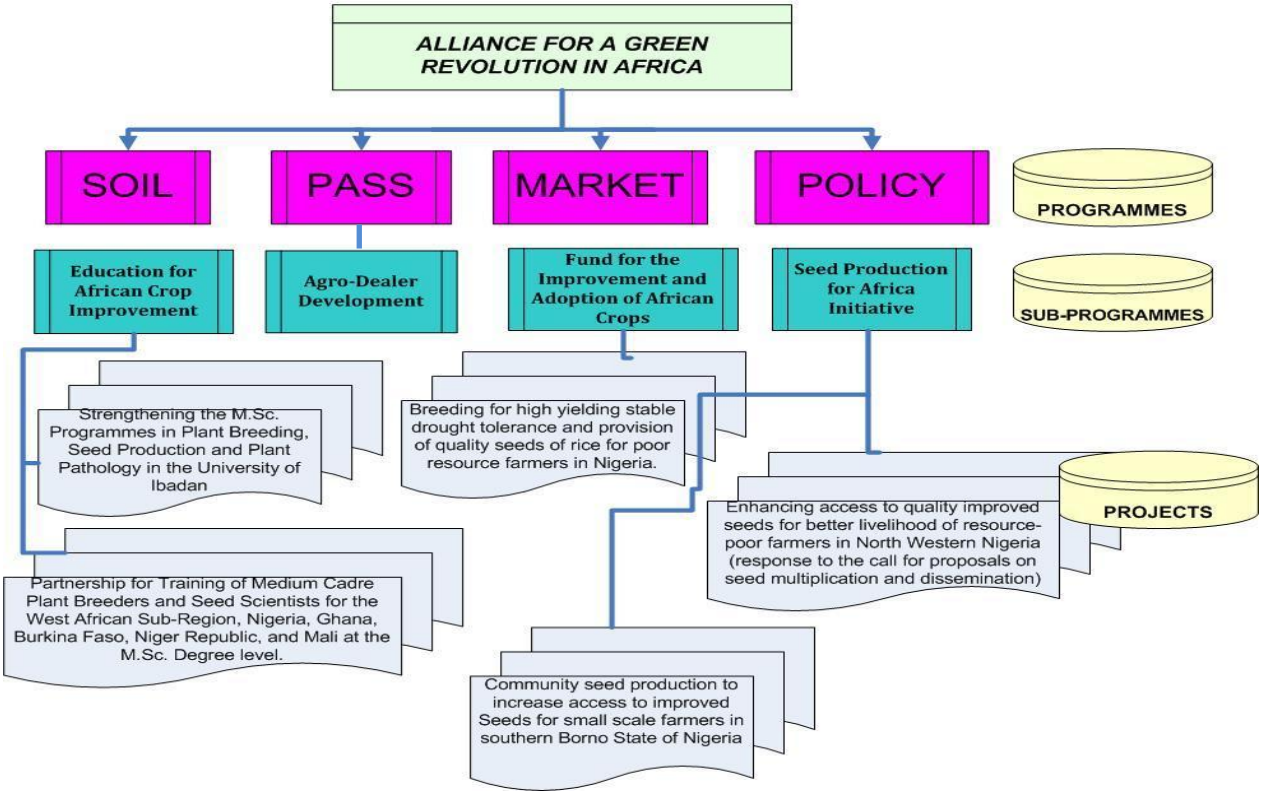
Evaluation of the projects has shown that getting improved seeds to smallholder farmers is an effective means to help them increase food production, household food security and household income. Agro-dealers are found to be farmers' main source of information about improved seed varieties. This implies that agro-dealers' level of knowledge about improved varieties is an important determinant of the extent of farmers' awareness and subsequent adoption of those varieties. It was also found that there was no significant variance between farmers' knowledge/awareness about the improved varieties and their adoption of those varieties. In other words, 83% of the farmers who know about the improved seeds have actually adopted them. It also shows that the single most important reason why farmers do not cultivate improved seeds is the fact that they do not know about them. This underscores the need to intensify awareness creation and education about improved seed varieties among the crop farming population (and obviously the consuming population).

1.0 INTRODUCTION

1.1 Background

AGRA was established in 2006 to achieve a smallholder-based African Green Revolution that would assist in transforming African agriculture into a highly productive and sustainable system, and enable Africa to be food self-sufficient and ensure food security. AGRA's aims to increase the productivity of smallholder farmers, while seeking to protect biodiversity, promote sustainability and advance equity.

Figure 1.1.1: Diagrammatic Representation of AGRA's Programs, PASS Sub-Programs and Funded Projects



1.2 Objectives and Scope of the Assignment

AGRA-PASS with its partners in Nigeria has implemented these 5 expired projects and there is the need to assess:

i. the level of consistency of the AGRA-PASS interventions and the Agricultural Policy of Nigeria
ii. the extends to which project implementation and resource allocation is translated into expected results/outputs;
iii. The extent to which the projects have benefited small holder farmers within their catchment area who are the ultimate beneficiaries of the 5 projects; and

iv. To limited extent, conduct ex-anti evaluation of the long-term effectiveness of AGRA-PASS intervention on Agricultural sector.

1.3 Nigeria: Food production and security situation

Nigeria agricultural sector, for a long time, suffers extremely low productivity, reflecting antiquated methods and abandonment due to over reliance on oil and gas for national development effort. Although overall agricultural production rose by 28 percent during the 1990s, per capita output rose by only 8.5 percent during the same decade (World Bank, 2002). Nevertheless, in recent times, domestic food production is on the increase but not enough to meet national food demand.

Agriculture has suffered from years of mismanagement, inconsistent and poorly conceived government policies, and the lack of basic infrastructure. Although, within the past decade (2000 to 2010), the country has witnessed strong economic growth, averaging 8.8 percent real annual GDP growth, agriculture sector has lagged behind GDP growth, growing at 3.7 percent in 2007 (worldbank.org/DATASTATISTICS/Resources/GNIPC). Average maize yield in Nigeria is 1.66 t/ha compared to 2.88 t/ha in South Africa and the world average of 4.97 t/ha. Also, rice yield in Nigeria is only 1.86 t/ha compared to the world average of 4.15 t/ha and is 68.2% of the 2.29 t/ha in South Africa (FAO, 2008). Critical for formulating agriculture policy and implementation is analysis of challenges the sector faces with respect to factors mitigating production performance and post-harvest constraints affecting productivity.

One area that needs attention is research and development. Investment in agricultural research and development has remained negligible which correlated the low contribution to GDP: The poor funding regime, low agriculture technologies, stagnated returns of farmers' income; seasonal rural employment attributes, high food price, poor incentives for establishment of agro-based industries, and low economic growth.

Research and Development (R&D) spending by both Federal and State Government has not been stable. The area that is fundamental to the improvement and modernization of the agriculture has been left idle in the hands of farmers to improvise their own techniques in improving yield and combating both biotic and abiotic stresses posed by ecological trends. Nevertheless, since the late 1990s, higher education and research agencies have been receiving both recurrent and capital budgets on monthly basis. The trend has abated some of the challenges but spending pattern on recurrent and personnel emolument leaves little or provides no space for long-term research investment.

The use of required inputs for improved productivity in the sector is limited. Farmers are not able to afford fertilizers, improved seed varieties, farm labour to enhance their yields. As elsewhere in Africa, low fertilizer use poses constraints to agricultural productivity, where fertilizer use averages 10–15 kg/ha as compare to recommended 30kg/ha in Sub-Sahara Africa (FAO. 2008). Between the late 1980s and mid-1990s, domestic fertilizer production as a percentage of the total supply varied from 46% to 60%. There has been no domestic production of fertilizers since the early 2000s because the National Fertilizer Company of Nigeria (NAFCON), the dominant fertilizer producer in Nigeria, has been shut down and its assets acquired by a private entity - Notore Chemical Industries Limited.

With the dwindling access to input and changing soil fertility due to climatic changes, there is increasing call for improved seed varieties that could withstand varying ecological stress. Even more so, in recent times, attempt to implement the policy of input subsidy has caused distortions in the input market which often benefit unintended beneficiaries manipulating the supply and creating artificial scarcity in the market. In spite of economic reforms to address market imperfection and eliminate unstained input subsidies in the 1980's, fertilizer subsidies are still operational. Nearly a third of the yearly capital expenditure on agriculture by the Federal Government is devoted to providing fertilizer alone (***Olomola, S., 2006).*** Indeed, the likely reoccurrence of unsustainable subsidies is quiet high as fertilizer subsidies are getting expensive to finance without commensurate return on productivity of smallholder farmers.

The communal system of land ownership prevails among most ethnic groups, in which individual ownership of land is embedded in group or kinship ownership. This has implication for the size of farm holdings: farm size hardly exceeds 1.5 hectares. It also has been associated with problems as limited tenure security, restrictions on farmers' mobility, and the inevitable fragmentation of holdings among future heirs. Other obstacles worth mentioning are:

- Soil Infertility problems which are caused by water and wind erosion;
- Reliance on rain-fed agriculture; and
- Non fine-tuning of macroeconomic and agricultural sector policies.

1.4 Agricultural Policy Trend

To attain agricultural sector goals, several policies have been formulated and implemented over the years with the aim of achieving food self- sufficiency. A synthesis of objectives of the various policies can be summed up as follows:

1. Sufficient in basic food production: The target is to produce enough food that can make the country food sufficient, especially those that have huge foreign exchanged implication when they are imported. The target crops are mainly rice, cassava, sorghum and maize which are stable crops of the people. Policies in Agriculture are intended to increase production and productivity to the level comparable to leaders in food crop production for domestic consumption and/or for export.

2. Increase production of farm inputs: The increased productivity of agriculture is correlated to the development of improved inputs and crop varieties with high yield as well as adaptation to local ecologies. Essentially, improved inputs – machinery, seeds, fertilizers etc – is aimed at high productivity in the mist of fragmented landholding among farmers. Improved seeds from breeding as a component of the process of increase productivity have been instrumental in boosting crop production (DeVries and Toenniessen, 2001).

3. Institutional and marketing structures within the agricultural value chain: Establishment of appropriate institutions and creation of administrative organs to facilitate integrated agricultural sector development have been the main feature of Nigeria's Federal Government policies over the years. Among these is the participation of the private sector in marketing of farm inputs and purchase of produce for distribution within the market chain. Policies over the years support government being the forerunner in addressing market failure where the private sector is unable to fix market failures in the production and distribution of inputs and agric produce. This policy provision is strategic in enhancing private sector synergy for agric development.

5. Increase export of processed food*:* Increase in production and processing of exportable commodities has been national policy direction over several years. This is envisaged to increasing foreign exchange earnings and further diversifying the country's export base which is currently dominated by oil. To achieve this public sector drive, provision of adequate post-harvest infrastructure facility like food procurement centres, grading, waxing, packing units, cold storage etc., within agriculture enclaves has been paramount. Modernization of agricultural production, processing, storage and distribution through the infusion of improved technologies and management so that agriculture can be more responsive to the demands of other sectors of the Nigerian economy had also been envisaged.

4. Rural employment generation: Creation of more agricultural and rural employment opportunities to increase the income of farmers and to productively absorb an increasing labour force in the nation has been policy focus over the year. In the light of this, agricultural sector development is, hereby, used to reduce rural poverty and avert mass exodus of rural youth migrating to urban areas in search of non-

existing jobs. Against this backdrop, public sector institutions have continuously attempted to repair malfunctioning irrigation assets with the aim of increasing arable land and all year round food production.

1.5 Contextualizing AGRA-PASS Projects within Nigeria Agricultural and Food Security Policies

It is the expectation of AGRA to meet policy requirements of its host countries. Consistency of programme development framework and Agriculture Policy of Nigeria is crucial for evaluation of the 5 expired sub-grant projects and contextualize the policy environment that the projects were implemented.

It is worthwhile to note that a clear and consistent national policy provides the environment for success in achieving desire project results, and also provide the incentive for adoption of project innovation by government actors for replication. On the other hand, conflicting situation between government policy, and project design and implementation has the propensity to give wrong signals to the intended beneficiaries/project actors and distorts information within the agricultural sector, especially those in project catchment areas. This may even retard the attainment of project results and outcomes.

The Programme for Africa's Seed Systems (PASS) is aimed at vitalizing the value chain process by promoting access to improved seed varieties to resource poor smallholder farmers through institutional strengthening and human resource capacity building. The breeding of improved seed varieties needs institutional anchorage to support the process. For that matter, agricultural research institutions are the suitable place to host such a venture of crop breeding. The support to this initiative includes the training of new plant breeders and crop scientist who will support these research institutions by researching into the improve seeds that could stand the ecological stresses posed by environment factors. As indicated, the Government of Nigeria has invested somehow into research and development of hybrid seed for higher productivity, indications are that budgetary allocations barely meet the personnel emoluments leaving virtually little for actual research work. EACI and FIAAC are practical cases that could be replicated for nationwide impact on generation of improved seed varieties.

Within the perspective of Nigerian agriculture development framework, access to improved seed varieties with characteristics of minimal external inputs, including fertilizer, for small landholding farmers is critical to increase productivity. Even more so, the policies over the years anticipate production of improved seed varieties but paid little attention to access by the small holder farmers. The consideration was and is still through state run distribution channels which have been inefficient to the extent that the seeds released do not reach the target groups. The Seed Production for Africa Initiative (SEPA), sub-component of PASS, is purposely designed for the propagation and distribution of improve seed varieties

through small private seed/agro dealing companies: A typical market approach for managing production and distribution of the agricultural input. The difference between the government policy and the SEPA approach is medium of distribution. The Government focuses on public sector-led production and distribution network whilst SEPA promotes private sector led approach - A private sector led agricultural development strategy.

2.0 AGRA-PASS PROJECTS IN NIGERIA

There are five (5) Projects that grants had expired and required to be evaluated. The evaluation focused on determining the extent that project results/outputs had been met against relevance of project objectives, performance, impact and sustainability. In a way, the objectives set within the proposals as submitted to AGRA were consist with the PASS programme and, in that sense, it is assumed the attainment of projects objectives enhance the achievement of AGRA ideas in Nigeria. The projects being evaluated cut across two (3) of the six (5) ecological zones of Nigeria: Guinean Forest Savannah and West Sudanian Savannah.

The overall purpose of these projects is to contribute at different levels of the seed supply chain by producing improved seed varieties for distribution to smallholder farmers in order to increase the farmers' propensity to raise productivity with minimal inputs. They also fulfill national policy objective of increasing food production for the attainment and ensuring food security. Ultimately, the projects, within the chain of food production, endeavours to reduce poverty among the smallholder farmers who most often live below the national poverty line.

2.1 AGRA-PASS intervention in improving crop breeding research and development in Nigeria

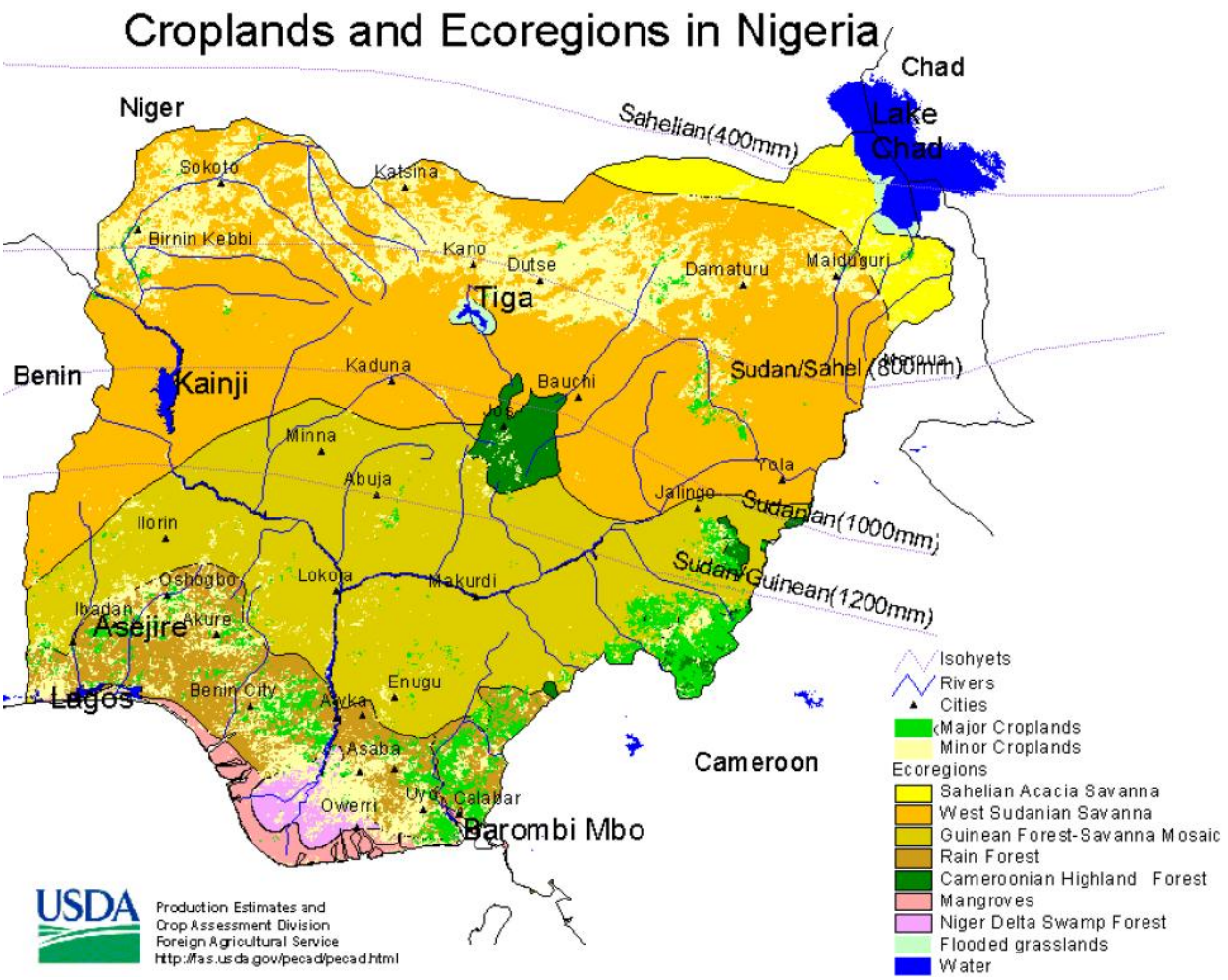
The EACI sub-programme in Nigeria is providing funding for training of crop scientist in plant breeding to feed research institutions with qualified personnel who could breed improved seed varieties within specific ecological situations. Department of Agronomy of University of Ibadan and the Department of Plant Science of Ahmadu Bello University executed this mandate.

In Nigeria and other African countries, the yields of major crops are low compared to yields in other parts of the world, resulting in increase in poverty among smallholder farmers that produce the bulk of Africa's food crops. To increase crop productivity and livelihood of farmers in the continent, more productive varieties of improved seed adapted to the diverse growing conditions needed to be developed, multiplied and adopted for cultivation by farmers. These activities required the concerted effort of plant breeders, seed scientists and plant pathologists working in research institutes, seed companies and related agencies.

The numbers of these trained specialists in many crop-based organizations are low for the number of crops requiring urgent attention.

To address this problem, the projects were expected to train specific number of students to M.Sc. level in the fields of plant breeding, crop science, and plant pathology at the two training institutions to feed into the crop breeding industrial.

Fig. 2.1.1: Ecological Zones of AGRA-PASS Projects in Nigeria



2.1.1 Strengthening the M.Sc. Programmes in Plant Breeding, Seed Production and Plant Pathology in the University of Ibadan.

This Project was executed at the Departments of Agronomy and Crop Science of University of Ibadan to increase the number of M.Sc. graduates of plant breeding, seed science/production and plant pathology to feed them into crop research institutions and crop breeding entities within West Africa Sub-region. Under

the project, award of scholarships to 10 students was expected to been carried out. This was in addition to other sponsorship arrangements.

The project was expected to lead to an increase in the awareness of the role of plant breeding, seed production and plant pathology in achieving food security in Africa, churn out a greater number of well-trained professionals in these fields, leading to improved research outputs manifesting in the development of a higher number of highly productive varieties of diverse staple food crops that can impact positively on the income of farmers and their families in West Africa. The duration of the project was, in the first instance, two years (January 2009- December 2010).

2.1.2 Partnership for Training of Medium Cadre Plant Breeders and Seed Scientists for the West African Sub-Region, Nigeria, Ghana, Burkina Faso, Niger Republic, and Mali at the M.Sc. Degree level

The content of the project was to produce high calibre of crop scientist with the expertise of genetic manipulation of plants to develop suitable genotypes with high yield and consumer preferred quality traits at the postgraduate level. The aim of this project was therefore to:

i. Provide advanced training to up to 10 young Africans, particularly from the West African Sub-Region of, Nigeria, Ghana, Burkina Faso, Mali and Niger Republic, in Master of Science Crop Breeding and Seed Science; and
ii. Strengthen the capacity of the Plant Breeding Program in the Department of Plant Science, Ahmadu Bello University, in Zaria State of Nigeria, through updating of teaching and research facilities at the university.

The training was expected to use split-site approach where students spent time receiving theoretical training after which they returned to their institutions to undertake a research-for-development projects targeted at solving local plant breeding problems. The graduates were also expected to feed into the crop breeding research and development markets both the government and private sectors.

2.2 Expired Project under FIAAC

In line with the efforts of the Government of Nigeria to reduce food importation and retain foreign exchange, FIAAC in Nigeria focused on breeding improved varieties of staple food to boost productivity and income among farmers and other actors along food production value chain as well as meet the taste and demand of consumers. The only project which is being evaluated in Nigeria under the FIAAC sub-programme is, "*The Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice for Poor Resource Farmers in Nigeria".*

The project was implemented by the Department of Crop Science of Ebonyi State University. Its ultimate goal was to reduce yield gap and increase yield potential of rice varieties in rainfed lowland and upland ecologies by developing, breeding, releasing and making available to smallholder farmers rice seeds that are high-yielding, stable, drought-tolerant and resistant to diseases and insect pests. The project's specific objectives were as follows:

i. The initiative sought to address the problem of drought stress, which is one of the major production constraints of rice production in Nigeria, by using a number of different drought-tolerant lines as parents in inter-specific breeding efforts;
ii. The project was also to develop stable and high-yielding rice varieties for rain-fed lowland and rain-fed upland ecologies;
iii. Varieties developed were to have the ability to perform well under low external inputs such as fertilizer;
iv. The project was to engage farmers in the breeding process and include their trait preferences in the development of the new varieties of rice;
v. The project was to develop inter-specific progenies between different rice species for drought-tolerance in the two rice ecologies;
vi. The effects of genotypes, environments and their interactions on rice traits were to be examined before releasing the new high-yielding stable varieties to these ecologies;
vii. Varieties developed were to have multiple resistances to diseases and insect pests. These include: Rice yellow mottle virus (RYMV), leaf blast, bacterial blight, leaf blast and leaf scald for diseases and Africa rice gall midge (AfRGM) and stem borer for insect pest.

2.3 Expired Projects under the SEPA

Improvements in agricultural productivity hinges very much on the production, distribution and adoption of improved varieties. Seeds of appropriate characteristics are required to meet the demand of farmers in diverse agro-climatic conditions and intensive cropping systems. Data available indicates that less than 15% of farmers in Northern Nigeria have ready access to quality seeds to improve crop yield. The majority of the farmers use recycled farm produce from the previous year's harvest as seeds for planting. The effect is the persistence low crop productivity and food insecurity. It is within this perspective that two projects under the Seed Production for Africa Initiative (SEPA) sub-programme were funded in Northern Nigeria during the period under review. The projects were expected to enhance the production and distribution of improved seed varieties to farmers through private and public distribution channels. They were focused on enhancing the capacity of target seed companies/societies to provide improved

quality seeds required to increase food production of small holder farmers in Northern Nigeria. The following are a brief description of the two projects.

2.3.1 Enhancing access to quality improved seeds for better livelihood of resource-poor farmers in North Western Nigeria

The project was designed and implemented by Manoma Seed Company Ltd, a private seed company that produces improved seed varieties through an out-grower scheme and supplies them through small-scale agro-dealers in Northern Nigeria. It is a registered legal entity incorporated in 2003 and located in Funtua, Katsina State, in the Savannah region of North-Western Nigeria. The company is owned by a group of farmers with a capital share of 4.5 million shares at N2.00 per share (USD$1.67 a share). The seed company currently has 16 staff members, out of which 6 are permanent.

Within the framework of the project, the company was expected to achieve the following objectives:

i. Source breeder seeds from research institutes;
ii. Employ farmer out-growers to produce certified seeds;
iii. Facilitate seed certification by the National Agricultural Seed Council (NASC);
iv. Provide safe and appropriate storage, processing, and packaging facilities;
v. Popularize improved varieties among farmers through on-farm demonstrations and organizing field days; and
vi. Sell certified seed at reduced prices to resource poor farmers through a network of dealers operating at village level.

The above objectives were expected to translate into the following outputs:

i. 200 metric tons of certified seeds of maize, soybean and rice produced through out-growers scheme (100 metric tons of hybrid maize, 40 metric tons of open pollinated maize, and 30 metric tons each of rice, and soybean);
ii. 40 demonstration plots cultivated in the target zones for farmer education;
iii. 40 field days organized for practical training and raising farmer awareness on improved seeds;
iv. 12 radio programs aired to cover the target zone with information on seeds and other production enhancing technologies;
v. A network of at least 32 trained and certified agro-dealers established for distribution of improved seed varieties; and
vi. 10,000 farmers reached with improved seed varieties through direct sale and a network of agro-dealers.

2.3.2 Community seed production to increase access to improved Seeds for small scale farmers in southern Borno State of Nigeria

This project was being implemented by Jirkur Seed Producers Cooperative Society, a group of seed producers in the Borno State of Nigeria. It is registered as a co-operative society with the aim of producing improved seed varieties for it members and resource-poor farmers in the State. Through a network of village seed producers associations, the cooperative strengthens the capacity of seed producers in training, provision of foundation seeds, inputs, processing and storage facilities. The project was expected to:

i. Produce and distribute 5 tonnes each of foundation seeds of maize, soybean, rice and 2 tons of foundation seeds of cowpea;
ii. Purchase from out-growers and disseminate to poor farmers 50 tonnes each of maize, soybean and rice, and 5 tonnes each of soybean and cowpea annually;
iii. Network 60 agro-dealers for the distribution of improved seed varieties to farmers within project's catchment area; and
iv. Reach 5,000 smallholder farmers with improved seed varieties each year.

3.0 EVALUATION OF 5 EXPIRED AGRA-PASS PROJECTS

3.1 Evaluation methodology

To successfully execute the task of evaluating the five (5) expired projects in Nigeria, the evaluation team adopted the case study approach, which included both qualitative and quantitative methods of data gathering and process. This approach allowed empirical assessment of contemporary and complex entities (such as projects) within real-life contexts. Compared to other approaches such as conventional surveys and quasi-experimental studies, the main strength of case study was the emphasis on context and detail in analyzing the links between various elements of the 5 projects. In addition, the case study approach enabled the team to gain deeper insights about the 5 projects from the perspectives and live experiences of individuals and groups who are related to the projects.

In terms of their objectives, strategies and contexts, each of the five (5) expired projects were clearly unique and independent but are within the context of the AGRA-PASS Sub-programme areas. Therefore, each project was approached as an independent case under investigation—with each case focusing on a different aspect of AGRA-PASS and being located in a different context. However, it is also important to note that, in addition to the peculiarities, critical cross-cutting issues emerged from the five cases. For this reason, the analysis phase of the study was carried out on both case-by-case and cross-case bases. Thus, in essence, the adopted approach can also be described as a *multiple-case* evaluation.

As far as evidence gathering is concerned, the team viewed project evaluation as a process of guided dialogue and as such the stakeholders associated with the implementation of the expired projects were not just sources of data but dialogue partners. Thus, the qualitative aspects of the data collection phase involved a series of participatory, dialogical consultations with key stakeholders at all levels of project implementation which addressed questions relating to the purpose of the evaluation. Insights gained from this dialoguing process supplemented gathering and analysis of quantitative data—gathered mainly through random surveys and a review of documentary records. The rest of this section is an elaboration of the conceptual and analytic framework and methods that were employed to operationalize the multiple-case approach of the evaluation.

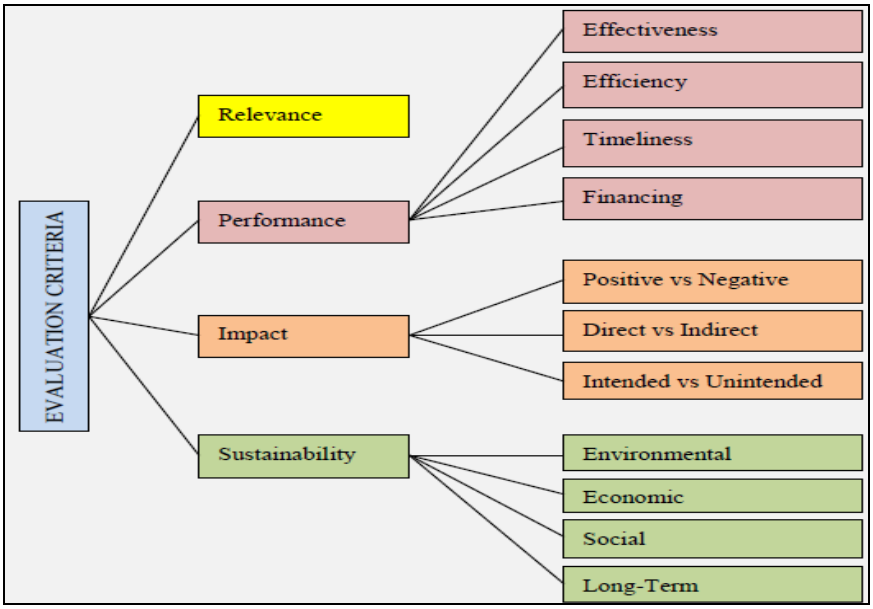
3.1.1 Evaluation Questions: What to Evaluate

Key issues addressed in the evaluation process reflect the attributes of each expired project as a unique case, stakeholders involved and target areas. Therefore, in terms of what to evaluate, the consultants were guided by the specific objectives and strategies of each project as well as the core objectives of the exercise as spelt out by AGRA in the TOR, namely:

i. Assess the extent to which major project objectives were achieved;
ii. Assess how economically projects converted inputs into results;
iii. Assess the status of project outputs/results and whether results have translated into benefits to smallholder farmers (and, if yes, how); and
iv. Assess the likelihood of continued, long-term benefits from project results.

To operationalize these evaluation objectives, the consultants formulated a set of broad evaluation questions organized under four (4) main evaluation criteria: relevance of project goal, project performance, project impact and project sustainability (see Figure 3.1.1 and Box 3.1.1). As Figure 3.1.1 depicts, each broad evaluation criterion was divided into sub-criteria. Box 1 is a set of broad evaluation questions that were formulated based on the core evaluation objectives and evaluation criteria discussed above. These broad questions guided the evaluators in gathering and reviewing project documents as well as carrying out customized guided dialogues, interviews and other data collection tasks.

Figure 3.1.1: Criteria for Evaluating Project Success



Box 3.1.1: General Evaluation Questions Based on Set Evaluation Objectives and Criteria

Relevance:

Do the goals and objectives of the project under review coincide with the needs of beneficiaries (especially smallholder farmers) as well as AGRA's goal?

Effectiveness:

Have project objectives (as represented by expected outputs and targets specified in the proposals) been achieved?

Were the strategies (activities, procedures, etc) stipulated in the project proposals and/or carried out during implementation the most effective ways to achieve the stated objectives?

Could the objectives have been achieved by other (more effective) ways?

What should be done differently in future by way of project design/strategy formulation?

Efficiency:

What are the direct (immediate) outputs of the expired projects under review?

What are the anticipated positive outcomes (broader impacts) resulting (or expected to result) from these outputs?

What was the direct cost involved in producing these outputs (human, material, financial, etc)?

Are there any indirect costs (negative social costs/externalities) associated with these outputs?

Do the outputs and the associated positive outcomes merit the direct and indirect costs paid by society to produce them?

Timeliness:

Were planned activities executed within their stipulated timeframe?

Were there any planned activities there were not implemented at all? If so, what were the reasons?

Did the delays or non-execution of activities in any way affect the achievement of project objectives/targets?

What should be done differently to ensure timely execution of planned activities in future?

Financing:
Were there instances of project costs exceeding the budget?

What caused the cost overruns, if any?

Were funds released for planned activities in a timely manner?

Was project implementation affected in any way by irregular/untimely release of funds?

What needs to be done differently in future to avoid/minimize budget overruns and cash flow problems?

Impact:
Have the outputs produced by the projects translated (or are they likely to translate) into any positive impacts on the lives or performance of the target beneficiaries (especially smallholder farmers)?

Have there been any negative, unintended impacts on the target beneficiaries?

Are there any positive, unintended impacts on either the target beneficiaries or others who were not project participants?

Are there other similar or related interventions that either ran side by side or overlapped with the project under review—in terms of content/design, geographical coverage, target beneficiaries, etc?

If such parallel interventions exist, how much of the observed outputs and impacts (if any) could be attributed to the expired AGRA-funded projects?

On the whole, has AGRA achieved (or is it likely to achieve) in Nigeria its overall goal of "increasing income, improving food security and reducing poverty through the promotion of the development of seed systems that deliver improved crop varieties to small-scale farmers in an efficient, equitable and sustainable manner"?

Sustainability:
Has the expired project had any positive or negative effects on the natural environment?

Has the expired project in any way affected productivity, employment generation or other aspects of local/regional economic development in its target areas?

Has the expired project had any effect on poverty and inequality in its target areas?

What is the long-term sustainability of the structures and benefits produced by the expired projects beyond PASS funding?

In addition to the general questions listed above, the consultants identified key project-specific questions that needed to be addressed in the evaluation (see Table 3.1.1). These key questions, which were formulated based on the set objectives and strategies of each project, have been synchronized with the criteria-based, general questions by ensuring that the two sets of questions together serve as a basis for the preparation of customized data-gathering instruments.

Table 3.1.1: Key Evaluation Questions Based on Specific Objectives and Strategies of Each Project

Project	**Key Evaluation Questions Addressed**
Training of Plant Breeders and Seed Scientists **(Ahmadu Bello University)**	Has the project led to the strengthening of the capacity of the Plant Science Department of Ahmadu Bello University to train more crop breeders and seed scientists? Did beneficiary students (those sponsored by AGRA) successfully complete the MSc programme in crop breeding and seed science? and Are the graduates of the MSc programme working with agricultural research institutions and contributing to the development of improved seed varieties in Nigeria or targeted countries?
Strengthening M.Sc. Programmes in Plant Breeding, Seed Production and Plant Pathology **(University of Ibadan)**	Has the project resulted in: The resorting of lecturers/staff of the Department of Agronomy, University of Ibadan to better perform their duties (teaching and research) in the areas of Plant Breeding, Seed Science and Plant Pathology? The development of a career-oriented curriculum in the areas of Plant Breeding, Seed Science and Plant Pathology? an increase in number and quality of graduates of the M.Sc. programmes in Plant Breeding, Seed Science and Plant Pathology produced by the Department of Agronomy, University of Ibadan? Did beneficiary students (those sponsored by AGRA) successfully complete the MSc programme in crop breeding and seed science? and Are the graduates of the MSc programmes working with agricultural research institutions and contributing to the development of improved seed varieties in Nigeria or elsewhere in Africa?
Enhancing Access to Quality Improved Seeds for Better Livelihood of Resource-Poor Farmers in North Western Nigeria **(Manoma Seeds Limited)**	Has the project resulted in an increase in the quantity and quality of maize, rice and soybean seeds produced by Manoma Seeds Limited and/or participating out-grower seed producers? Has there been an improvement in the awareness of resource-poor farmers in North Western Nigeria about improved seeds? How many quantities of seed was produced by Manoma Seeds Limited and how many were disseminated and to whom and when? Is there an improvement in access to and use of improved seeds by resource poor farmers in North Western Nigeria? If resource-poor farmers in North Western Nigeria have adopted and are using improved seeds, what has been the outcome?
Community Seed Production to Increase Access to Improved Seeds for Small Scale Farmers in Southern Borno State of Nigeria **(Jirkur Seed Producers Co-op. Society)**	Has the project led to an increase in the production and quality of seeds required by resource-poor farmers in Southern Borno State to increase food production? Has there been an improvement in the awareness of resource-poor farmers in Southern Borno State about the existence and qualities of improved seeds? How many quantities of seed was produced by Jirkur Seed Producers Co-op. Society and how many were disseminated and to whom and when? Is there an improvement in access to and use of improved seeds by resource poor farmers in Southern Borno State? If resource-poor farmers in Southern Borno State have adopted and are using improved seeds, what has been the outcome?
Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice to poor farmers (Ebonyi State University)	Has the project led to the development and release of new, improved varieties of rice seeds? If so, what are the attributes of these new varieties? What quantities of breeder and foundations seeds were produced and how many seed companies accessed the seed? What is the extent of acceptance/adoption of these new, improved varieties by seed companies, smallholder farmers and consumers? How accessible are the new varieties to farmers? and What measures have been put in place to ensure that these new, improved varieties reach smallholder farmers?

3.1.2 Data Sources (Documents, Objects and People), Collection Procedures and Instruments

Data needed to address the questions and issues raised in the preceding sub-section are mainly qualitative in nature—data that take the form of *narratives* about events, activities, behaviours and other phenomena related the expired projects. Where possible, efforts were made to supplement these with quantifiable data (such as production figures, crop yield, enrolment and graduation rates, etc): photographs and other graphic information. These data were obtained from three (3) main sources: managers, students, farmers and other production and marketing value chain actors associated with the projects; project documents (project proposals, monitoring reports, mid-term/end-of-project reports, etc); and direct observation of some of the tangible project results.

The data-gathering process began with a review of project documents, which was obtained from both AGRA and managers of the five projects. This review was critical for the evaluators' initial understanding of the context, conceptualization, content and performance of each project. They were necessary to ensure that the primary data collection phase (interviews, direct observations, etc) focused on the right issues and questions needed to successfully complete the exercise within the time and resource constraints.

As shown in Annex 3, primary data collection involved guided (semi-structured) dialogues, focus group discussions and structured interviews with several individuals and groups associated with each project, as well as observing, photographing (where possible) and taking field notes about tangible project results (e.g. buildings, equipment, farms, etc). Guided dialogues focused on group discussions and structured interviews carried out with the aid of project- and respondent-specific evaluation instruments (see Annex 3). They included open-ended questions (designed to engage participants in informal and semi-formal conversations) and structured questions that focused on addressing the research questions and issues discussed earlier. As expected, the guided dialogues, focus group discussions and structured interviews were carried out during visits to project sites by the evaluators. The evaluators also resorted to emailing and telephone calls in cases where face-to-face interactions with respondents became impossible.

3.1.3 Adopted Sampling Techniques

Within the evaluation framework, varying sampling methods and combination of techniques were employed. The choice of technique or combination was influenced by:

i. Nature and quality of the sample frame;
ii. Availability of auxiliary information about units on the sample frame;
iii. Accuracy requirements, and the need to measure accuracy; and
iv. Whether detailed analysis of the sample is expected Cost/operational concerns.

The following illustrate the sample technique or combination of techniques applied for data capture for the necessary statistical inference and attribution made on the evaluation of each sub-programme area:

i. ***Sampling technique applied for EACI Projects:*** Sampling technique adopted was informed by the nature of the two EACI projects in the University of Ibadan and Ahmadu Bello University. The Universities were supposed to have trained 10 graduate students each; as such census survey was applied targeting the total population of the AGRA financed graduate students. Moreover, the evaluators targeted all persons involved in managing the projects within the confines of the universities for the purpose of eliciting data for either qualitative inference or triangulation.

ii. ***Sampling technique applied for FIAAC Project:*** The only project under FIAAC applied, to a large extent, qualitative analysis in supporting claims with evidence generated from the data gathered from single source – the Principle Investigator. Nevertheless, further information was gathered from the other personalities involved in the project management for validation of data.

    The evaluators also employed random system to give opportunity to all sampled population – Farmers Association – for focused group discussion among beneficiary rice farmers who patronises the genotype of rice seeds breed by the Principal Investigator. Unfortunately, the techniques did not yielded the necessary results as the members of farmers group selected were not available. In a way, convenience sampling, which is a non-probability sampling method, was adopted since only the leader of the Association was available for interview.

iii. ***Sampling technique applied for*** SEPA ***Project:*** Multiple sampling technics were visibly deplored to make meaningful assessment of the 2 expired projects under SEPA. Virtually, census survey was crucial in investigating role of the out-growers within food production value chain of the projects. All the out-growers involved in propagation of seed varieties from the parents supplied by the seed agency were interviewed.

Nevertheless, the Agro-dealers and the farmers were sampled. This was based on stratification were Dealers were grouped within States (4 States) and a quota system (simply) of 5 dealers per state was applied. A sample size of 34% of the population was interviewed. In the case of the farmers, they were clustered around the dealers who were asked to invite 5 farmers for interview. In summary, I could say, in this instance of SEPA Project, sampling was done on multi stages.

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3.2 Limitations/Challenges

The evaluators faced a few limitations and challenges during the exercise. First, there were delays in receiving responses from some of the project stakeholders who were given questionnaires to complete. For example, a questionnaire sent to the principal investigator (project manager) of the rice breeding project at Ebonyi State University is yet to be received.

Secondly, the travel distances between the project sites had been under-estimated. As a result, the evaluators spent a lot of time and energy travelling by road during the field work and that resulted in a lot of fatigue. This problem was once aggravated when the team was confronted and held up by thugs at Ayambra State while travelling by road from University of Ibadan to Ebonyi State University (Abakaliki); the journey took 13 hours. Nevertheless, the evaluators managed to collect most of the information that needed to be collected during the field visit.

Thirdly, the evaluators were unable to go to Borno State where Jirkur Seed Producers Cooperative Society's project1 is located. Although visiting the site to interview project stakeholders (project managers, members of the cooperative, farmers, etc) was part of the agenda during the field work, had no choice but to call off that component of the trip following security concerns raised by several people who were contacted. This was communicated to officials of AGRA, who agreed to the decision. The evaluators went round this problem by sending a questionnaire to the chairperson of the Cooperative who provided most of the basic information needed.

[1] Community Seed Production to Increase Access to Improved Seeds for Small Scale Farmers in Southern Borno State of Nigeria

4 ANALYSES AND RESULTS

4.1 Projects under Education for African Crop Improvement (EACI)

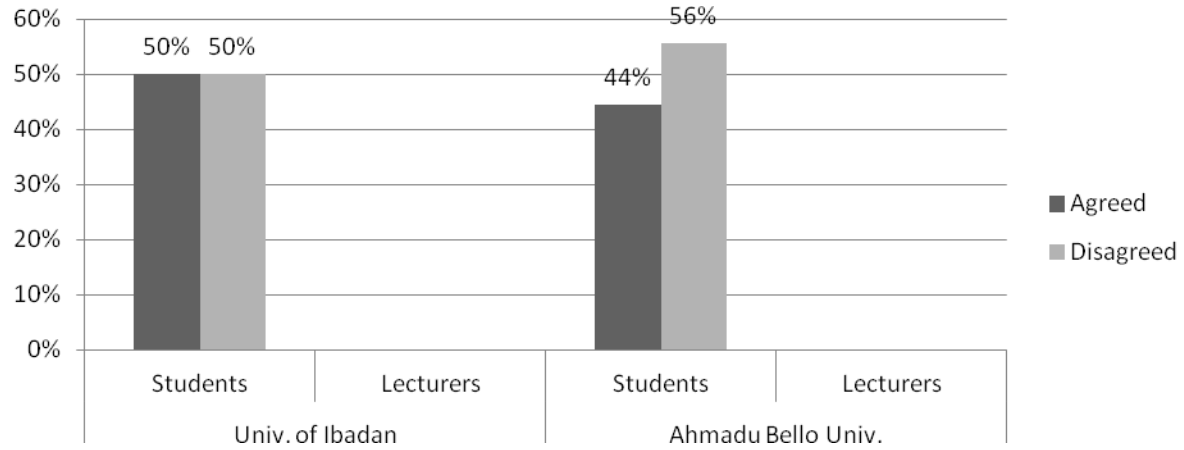
4.1.1 Relevance of EACI Intervention

Investment in building human capacity for breeding of Plant Breeders and Crop Scientist needs to be consistent with the national agriculture policy directive and relevance to need of smallholder farmers. In other words, human resources capacity building within agricultural sector should impact on the food production and supply chain should have trigger effect. Within the context of national and sub-regional agricultural policy the increase number of plant breeders – 10 in each institution (University of Ibadan and Ahmadu Bello University) - should feed into the need of agricultural research institutions for increase capacity of these institutions.

With the framework of the evaluation, 67% of students of University of Ibadan and 71% of Ahmadu Bello University strongly indicated the relevance of training of Plant Breeders and Crop Scientists to National Policy and AGRA goal of improving food security and income levels and reducing poverty among small holder farmers. Their position was confirmed by the lecturers.

Even more so, eliciting the opinion of stakeholders and beneficiaries on whether the strategy of sponsoring training at the Masters of Science in Crop Breeding is the effective option of improving human resources to boost the production of food and ensure food security in the West Africa sub-region, 100% of the responded gave positive affirmation. Nevertheless, it was clearly indicated that providing human capacity in crop breeding only is not sufficient for food security and poverty reduction. To a larger extent, other aspect of the agricultural production chain needs to be strengthened to ensure food security and poverty reduction.

Fig. 4.1.1: Effect of Training of Crop Breeders on food security and income levels of small holder farmers.



However, there was divergence position relationship between training of crop breeders and food security and poverty reduction among smallholder farmers. Whilst all the lecturer "strongly agreed" the existence of relationship between training of plant breeders and improve food security and income levels of small holder farmers, just 50% of students at the University of Ibadan strongly agreed. (See Figure 4.1.1).

Criteria for selection of Candidates

1. Nationality: West Africa Sub-Region
2. Gender (60% males; 40% females)
3. Type Degree: BSc. Agriculture or related field
4. Class of Degree: Not below Second Class
5. Employment: Agricultural Research field

The relevance of the training transcended the boundaries of Nigeria in both Institutions. Scholarships were awarded to Non-Nigerians. West Africa countries can be said to face similar agricultural challenges as pertained in Nigeria: Inadequate investment into research and development due to low capacity research institutions and lack of investment into it.

Picture 4.1.1: Lecture session at Ahmadu Bello University

	***Picture 4.1.2: Group picture of AGRA sponsored students at University of Ibadan***
	***Picture 4.1.3: New pick-up vehicle scripted with the programme at University of Ibadan***

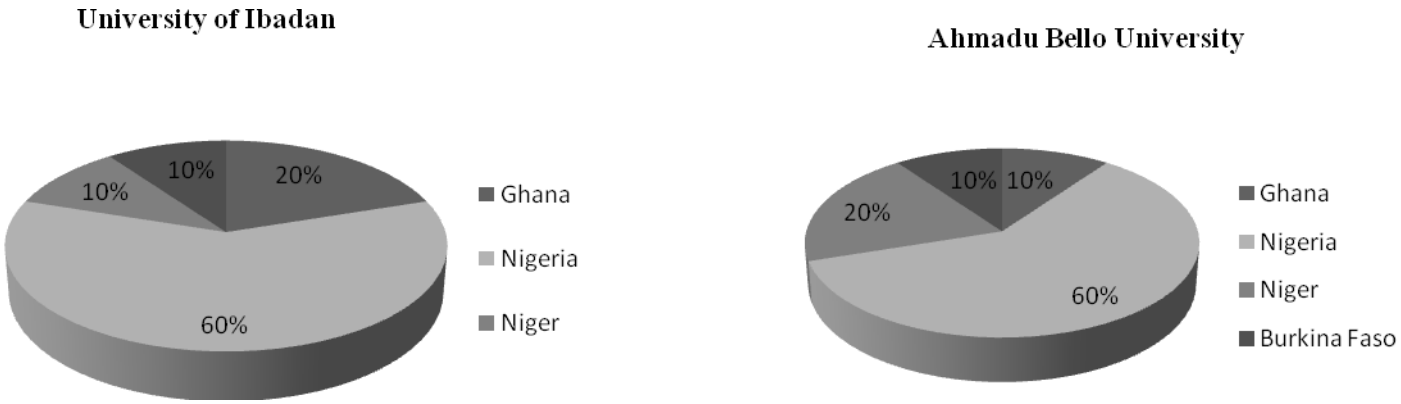
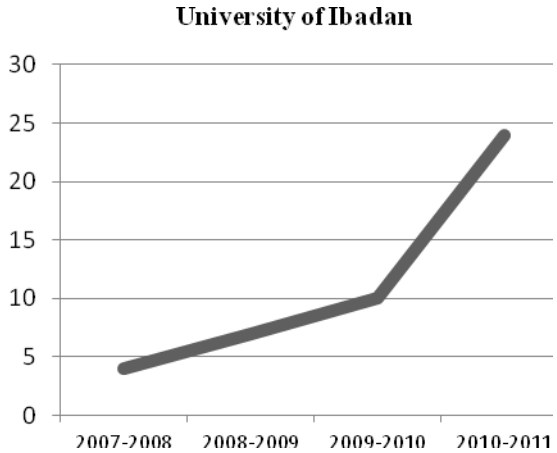


Figure 4.1.2: Nationality of Graduates

20 Plant Breeders and Crop Scientists, under EACI, have been trained to feed agriculture research institutions: 12 from Nigeria; 3 from Ghana; 2 from Niger; and 1, Burkina Faso. The strategy of

augmenting the number of trained Plant Breeders is consistent with the programme objective of the two Institutions which had been challenged by poor enrolment levels over the years. Using 2007/2008 academic year as base, increase in cumulative enrolment has been slow over the years. The rate jumped sharply with the scholarship scheme put in place: This is explained in Figure 4.1.3. The gradient of the graph from 2009-2010 to 2010-2011 academic year indicates the impact of AGRA sponsorship on enrolment levels. Enrolment rate grew by 250% and 333% in 2010-2011 academic years at University of Ibadan and Ahmadu Bello University respectively as compare to the previous year - 25% for University of Ibadan and 33% for Ahmadu Bello University.



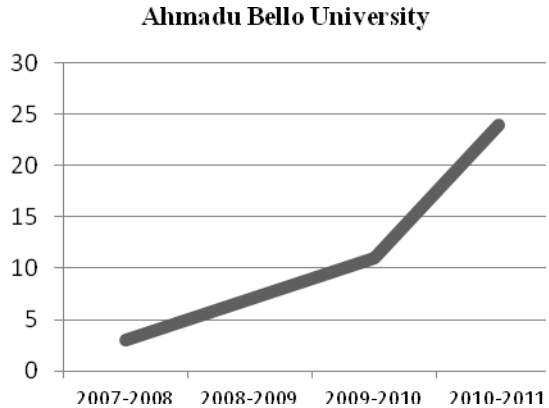
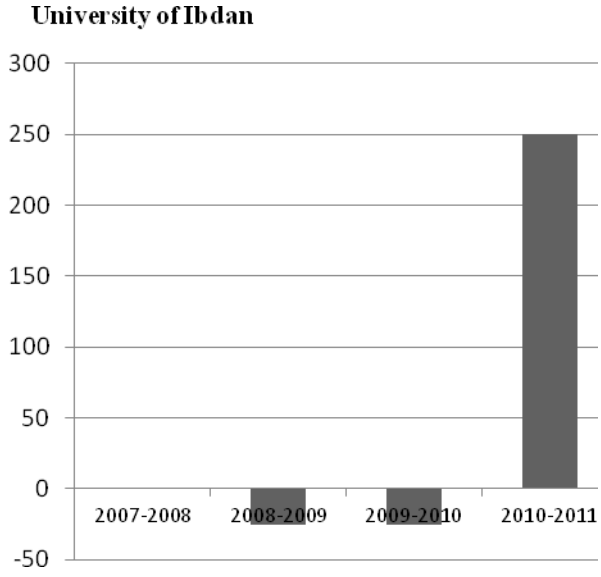


Figure 4.1.3: Cumulative increase in enrolment



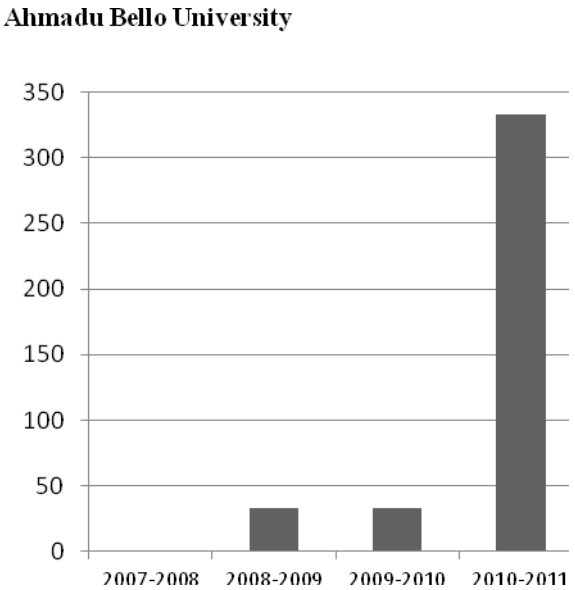


Figure 4.1.4: Percentage increase in enrolment

QUESTION:

On the whole, would you say the project has led to an increase in the number and quality of M.Sc. students the Department is able to graduate in the last few years?

Scholarships provided by AGRA has enabled us to enrol more students than usual. Since, the average number of students enrolled in plant breeding and seed production has been 3-4; but now we have 10 students receiving scholarship from AGRA. In addition, AGRA's support has increased the publicity of the programme. Because of that there are some applicants who failed to receive AGRA scholarship but still came with their own funding

Dr. Mohammed F. Ishiyaku, Project Manager, Ahmadu Bello University

Aside increased enrolment, there have been other interventions. University of Ibadan has reviewed content of its curriculum in teaching and researching into Plant Breeding and Crop Science; equipped its' laboratories and upgraded its green houses to conform to modern trend in agronomy. The Department is also affiliating the Pan-African University to establish a hub in Plant Breeding for the Sub-Sahara Africa Region. This new initiative is a direct result of improved teaching and research work promoted by AGRA.

The Department of Plant Science of Ahmadu Bello University, through the EACI Sub-Programme, has established a computer laboratory to aid effective teaching and research. This, together with new books and the other facilities provided under the project, has significantly improved the effectiveness of teaching and learning as far as the (M.Sc. in Crop Breeding) programme is concerned. However, the absence of internet connectivity to computer lab is making it less functional and operating under capacity.

Table 4.1.1: Issues negatively affecting effectiveness of the strategy

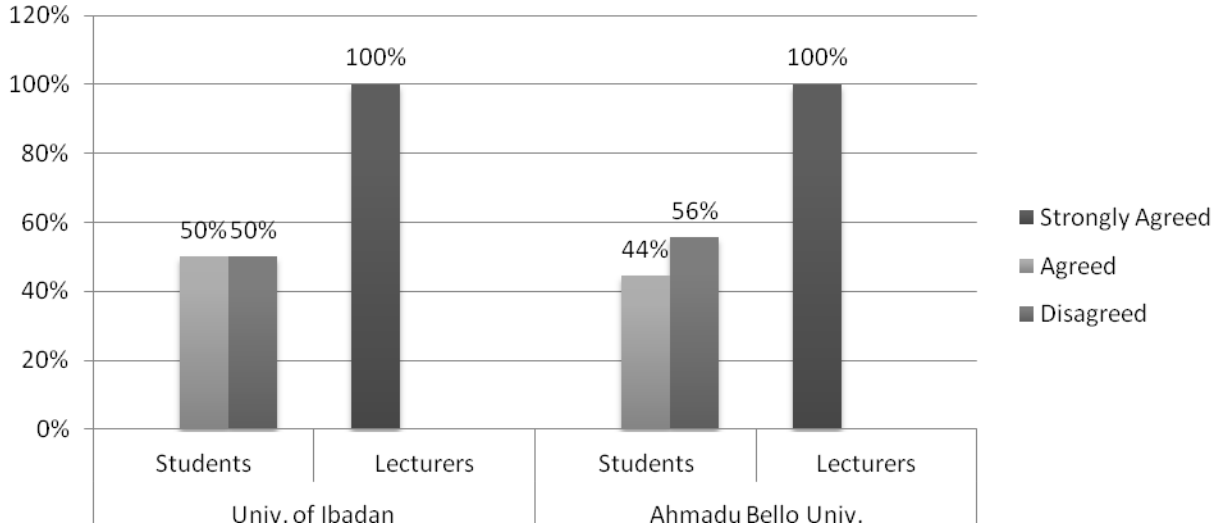
University of Ibadan	Ahmadu Bello University
Students could easily drop out with no recouping expenditure on the student; Inadequate practical experience with external industry players.	Less diversity in teaching with there involvement of other subject areas including physiology, climatology, bio-technology etc Increase variety of readers and books Construction of computer laboratory with internet facility for teaching and research for the use of lecturers and students.

4.1.2 Effectiveness of Project Strategies/Activities of EACI

This section assesses the effectiveness of achieving project outputs. It addresses the question, "how were the students trained", and evaluates strategies of building human capacity for increase production of improved seed varieties for farmers. It also evaluates other options of providing human capacity for crop breeding to assess whether they are even more viable options. It also looks at project outcomes: Are the

trained Crop Breeders and Scientists practicing their profession within institutions in the West Africa Sub-region and contributing to general effort of improving food production and security.

Fig. 4.1.5: Effectiveness of Teaching and Supervision



Eliciting the perception of students on the effectiveness of teaching and research supervision, although 100% strongly agreed training professionals in Crop Breeding is relevant in attaining food security and poverty reduction, some expressed dissatisfaction in effectiveness of teaching and supervision of research: 50% and 56% of students in University of Ibadan and Ahmadu Bello University respectively were dissatisfied. 100% of lecturers of both institutions interviewed strongly agreed to the statement that, "*teaching, student supervision and other aspects of the training were effectively delivered"*.

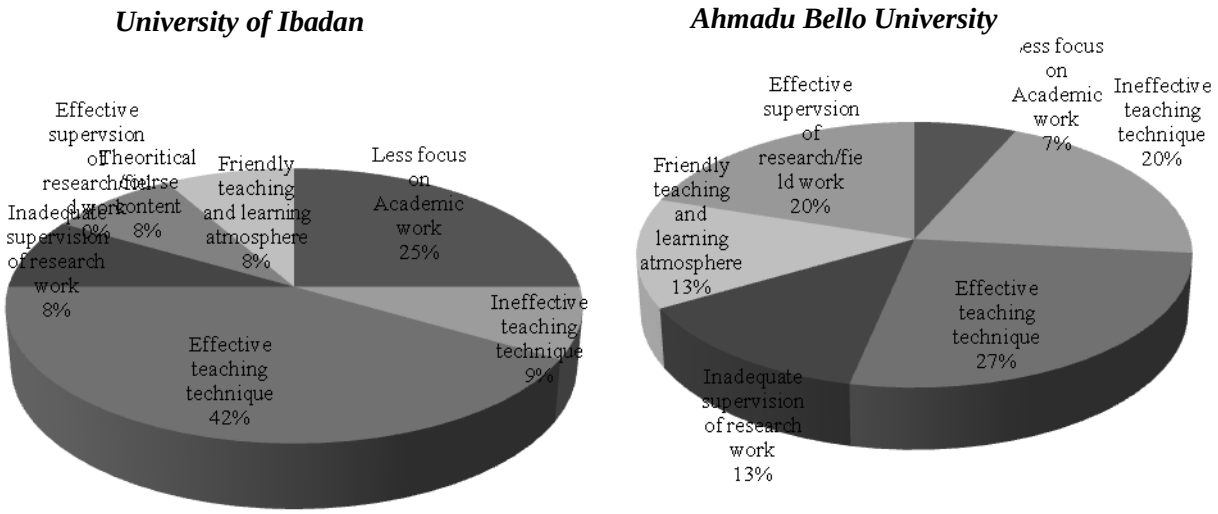


Figure 4.1.6: Level of effectiveness of teaching, research and supervision

Students indicated that most lecturers lack effective teaching techniques and not problem solving; focus too much on theories than related to what is relevant to their local agricultural practice. Others were of the view that the lectures over concentrated on other administrative and academic issues rather than teaching. Nevertheless, effectiveness of academic environment could also be expressed by the access to learning materials including text books and readers (both virtual and hardcopies) and research facilities etc. As apart of the project conceptualisation, finance and implementation, logistical support has been planned to be crucial component of the training. The logistical supports were explicitly provided in the proposals of the two Universities.

Table 4.1.2: Logistical Support for Teaching and Research for training of Crop Breeders

University of Ibadan		**Ahmadu Bello University**	
Proposed Logistics to be Supply	**Logistics provided**	**Proposed Logistics to be Supply**	**Logistics provided**
One greenhouse repaired for teaching and research	- 1 Green house repaired; - Retiling, painting and installation of air-conditioner in the Seed Room; - Fencing of the experimental field on side prone to encroachment	Two screen houses and laboratories	- 1 screen house constructed; - 1 screen house refurbished
Acquisition of vehicle for field work	- 1 Toyota 4x4 pick-up vehicle provided	Acquisition of vehicle for field work	- 1 Toyota 4x4 pick-up vehicle provided
Acquisition of laboratory equipment (Molecular biology equipment refrigerators, desiccators, sealing machines, air coolers, microscopes	- Microscope, Front table top loading autoclave, Laminar flow workstation	Acquisition of laboratory equipment	
Computers to improve students' learning facilities	- 1 IT laboratory with 10 computers and internet connectivity provided	Establishment of internet connectivity in the Department	- Refurbishment of Computer room; - Refurbishment of Post Graduate Lecture room and Common Room
Subscription to Crop Science (On-line and Print) and Crop Protection		Essential text books for Plant Breeding and Seed Science and Technology	- …. copies of Plant Breeding, molecular genetics and physiological genetics text books procured
		Refurbishing of Post Graduate lecture rooms	- Refurbished postgraduate students lecture room;

	***Picture 4.1.4: Newly constructed AGRA financed Greenhouse at Department of Agronomy of the University of Ibadan***
	***Picture 4.1.5: Furnished laboratory at Department of Agronomy of the University of Ibadan***

Through observation, informant sources and documentary evidence teaching aid provided in project design is compared with their availability. This is indicated in Table 4.1.2 and Picture 4..1.4 and 4.1.5. However, there existed some variance between the propose logistical support and the actual: In Ahmadu Bello University, for example, the access to internet connectivity to the modern computer was absent which was likely to affect students effort to explore further literature for coursework and research. University of Ibadan had a stand alone computer connected to the internet, although the Department has a well furnished computer room. Evidence suggests that patronage of the computer laboratory is on the lower side. Nevertheless, students had alternative sources of access to internet facility.

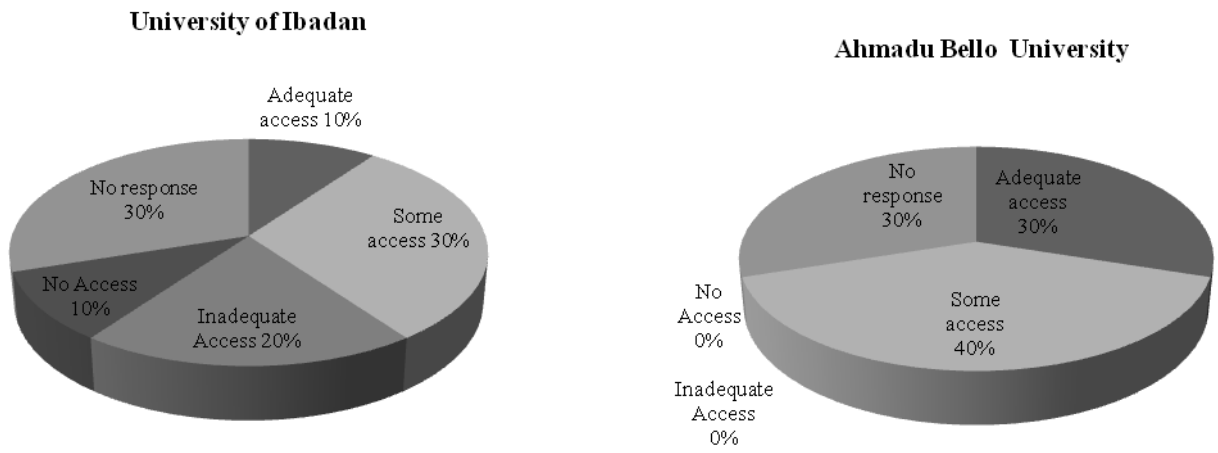
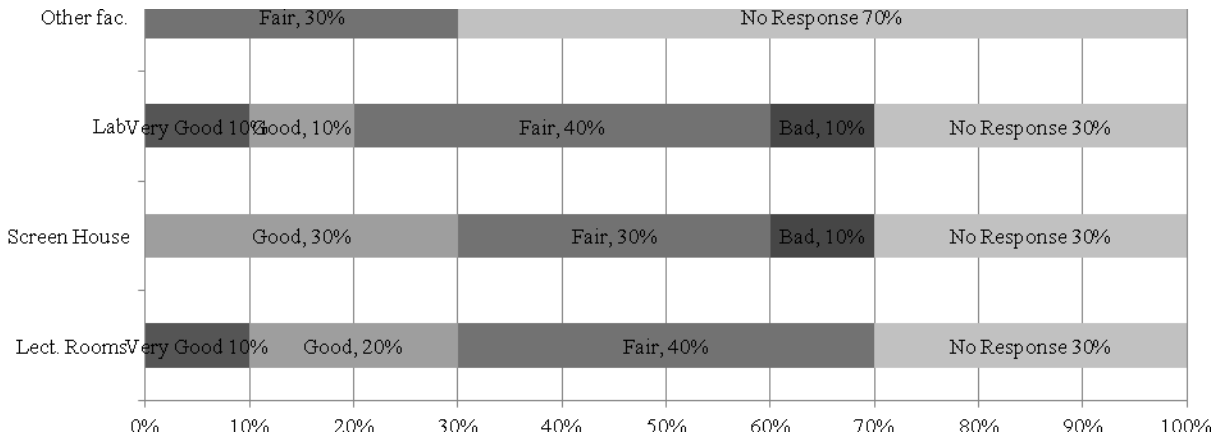


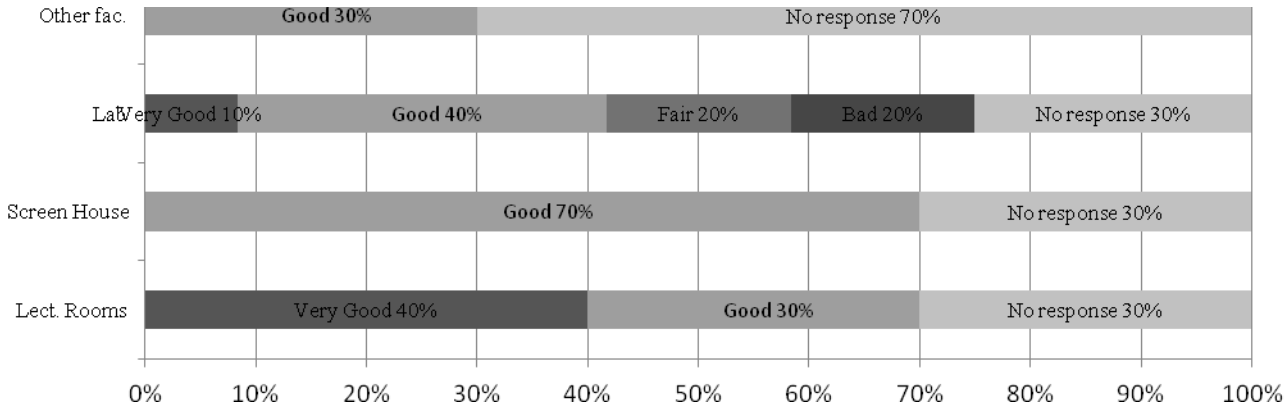
Figure 4.1.7: Level of access to essential books

Even though lecturers of both Universities unequivocally asserted that there is, largely, adequate access to teaching, learning and research facilities, there were divergent positions expressed by students. 20% AGRA sponsored graduates of University of Ibadan were of the opinion that access to text books were inadequate. Similar ratio (20%) favoured adequate access whilst 40% contended there was some access to the books. Graduates of Ahmadu Bello claims included the following; adequate access, 30%; and some access, 40%. 30% did not respond. The students view also runs contrary to the superb conditions of lecture rooms, screen houses and laboratories/lab equipments attested by Managers of the Projects in the two Institutions.

Figure 4.1.8: Conditions of Teaching, Learning and Research Facilities



University of Ibadan



Ahmadu Bello University

The AGRA finance Graduates expressed various levels of satisfaction to facilities that were at their disposal. 10% Graduates of University of Ibadan were of the view that class room facilities were very good whilst 40% thought they were just fair for teaching and learning. However, at the Ahmadu Bello University 40% described the facilities as very good which confirms the position of managers of the project – lecturers, while 30% of students responded fair.

The Screen house at University of Ibadan received worst rating among the Graduates: 30% responded "good" whilst 40% claimed they were just “fair" and sometimes below "fair". 30% did not respond. 70% of Students of Ahmadu Bello University saw the screen house to be in good condition, and was of great benefit in conducting research; 30% did not respond. Various reasons were assigned to buttress the claim made by graduates and lecturers. Their response are captured in Table 4.1.3

Table 4.1.3: University of Ibadan – State of Teaching, Learning, and Research Facilities

Lecture Room	**Screen house**	**Laboratory**
The classroom is not conducive for learning and has limited chairs to accommodate students for joint courses.	Facility in good shape but needs proper maintenance	No plant breeding/ seed technology laboratory
Lecture rooms are poorly ventilated and not adequately furnished with comfortable chairs for students	One functional screen house	Not well equipped with basic modern instruments.

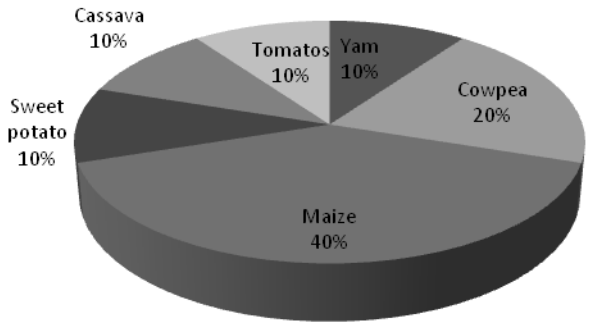
Poor illumination	Inadequate water supply to screen house and limited pots for planting	Over 90% of laboratory equipment are not working and are out dated. Also majority of laboratory reagents and chemicals needed for bench work are lacking; those available were very limited.
		Access to the laboratory is limited
		Defective tissue culture laboratory in the department is not functional.

4.1.3 Project outputs/results and outcomes

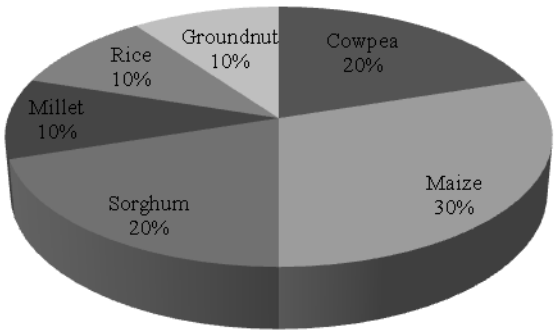
As part of the training and output of the project, students were supposed to breed various seed varieties. Maize, at both Universities, was the crop that received most attention by the students: At the University of Ibadan 40% of students' research work focused on varying aspects of improving maize seed variety; it was 30% at Ahmadu Bello University. Cowpea also received considerable attention – 20% at both Universities.

Figure 4.1.9: Crops researched by students

University of Ibadan



Ahmadu Bello University



The research work of the students are also important output of the process of training crop breeders for the West Africa Sub-Region. The research work did not just expose the student to practical training in plant breeding and crop science; it provided genetic materials for the development of various varieties that could fit into specific ecological zones for improved productivity of farmers. Table 4.1.4 and Annexes 5 give vivid impression of the work of the students indicating research problems, objectives and findings.

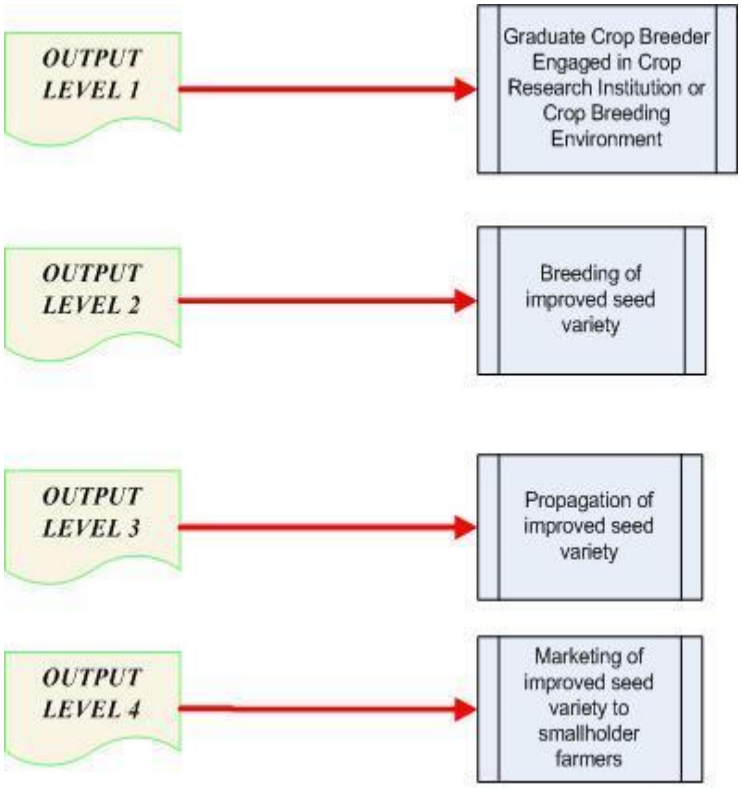
Table 4.1.4: Students Research Area

	University of Ibadan	Ahmadu Bello University
1	Optimization of cryopreservation techniques for yams (*Dioscorea* spp) and cassava (*Manihot esculentus*) Specialization: Plant Breeding	Estimation of heterosis for seed quality and other agronomic traits in sorghum (Sorghum bicolor (L) Moench). Specialization: Plant Breeding
2	Genetics of resistance to aphids (*Aphis crassivora*) in cowpea Specialization: Plant Breeding	Genetics of thrips (Magalurothripssjostedti) resistance in cowpea (Vignaunguiculata (L.) WALP.) Specialization: Plant Breeding
3	Evaluation of cowpea accessions for sources of resistance to multiple virus infection Specialization: Plant Breeding	Yield evaluation of hybrids and their parents in pearl millet Specialization: Plant Breeding
4.	Heterotic patterns of extra-early tropical maize yellow inbred lines under striga and drought Specialization: Plant Breeding	Generic analysis from dialled crosses among either genotypes of different maturity periods of maize **(Zea mays L.)** Specialization: Plant Breeding
5	Inheritance of time to flowering in maize of West and Central Africa adaptation Specialization: Plant Breeding	Inheritance of grain and fodder yield in two land races of cowpea Specialization: Plant Breeding
6	Effects of different planting materials on yield of sweet potato Specialization: Seed Production	Genetic studies of blast *{Pyriculariaoryzae}* resistance in rice {*Oryzasativa*}. Specialization: Plant Breeding
7	Screening of cassava genotypes for improved establishment ability Specialization: Seed Production	Characterization for Sorghum Midge Resistance (*Stenodiplosissorghicola*) in Niger Republic Specialization: Plant Breeding
8	Molecular characterization and pathogenicity of root-knot nematodes on the growth, development and yield of four tomato varieties Specialization: Plant Pathology	Genetic Analysis of Resistance to Stem Borer (*Sesemiacalamistis* and *Eldanasaccharina*) in Maize (*Zea mays*) Specialization: Plant Breeding
9	*In vitro* screening of experimental maize hybrids for aflatoxin production and contamination Specialization: Plant Pathology	Genetics of resistance to *Aspergillusflavus* in groundnut
10	Synergistic effects of aflasafe and resistant hybrids in aflatoxin reduction in maize Specialization: Plant Pathology	

It must also be stated that the project outputs/results were expected to translate into outcomes which will affect external environment of increasing productivity of small holder farmers. Within the framework of the two projects, the research areas were strategically selected to instigate the development of seed genotypes that could be propagated as an input into agro-system within a define ecological system. However, there are varying degrees of expected outcomes that need to be contextualised: They could be categorised into 4 levels.

The Level 1 suggests that the graduates after training are expected to engaged in crop breeding as a profession either within a research environment or seed production entity. This could be said to be the minimum outcome expected to be derived from the project.

Fig.4.1.10: Levels of outputs and outcomes



The level 2 relates to engagement of the trained Plant Breeding Professional leading to improved research outputs manifesting in the development of highly productive varieties of seeds with a propensity of impacting farmers' productivity. In this respect, there should be strong linkage between research outputs and the seed production industry. The seed production firm looks at the propagation, marketability and acceptability of the improved seed variety to farmers. In other words, these levels are components of an improved food production chain which start from research and development feeding into improved food production and security.

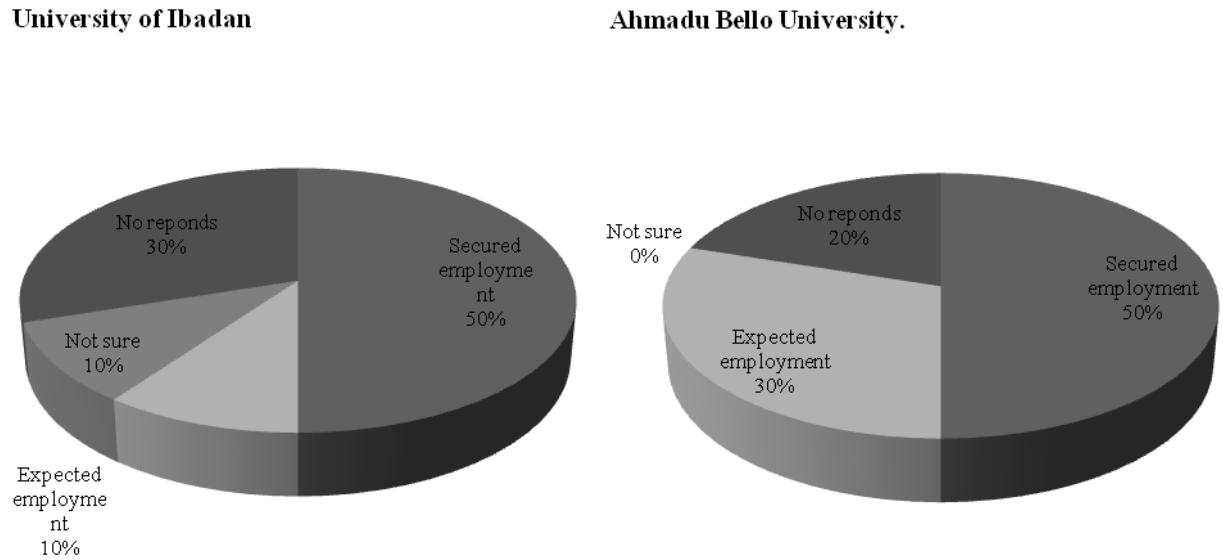
I will like to mention that outcomes of levels 2, 3 and 4 within the chain will not be relevant to measure since they are outside the scope of this evaluation due to longevity of attaining or assessing them, and the weak relationship they have with the two EACI projects. However, the Level 1 - Graduate Crop Breeder

Engaged in Crop Research Institution or Crop Breeding Environment - is within the scope of the evaluation.

To measure the outcome level 1, there was the need to assess where the graduate were currently working especially with a crop research institute or related institution. As a limitation to this evaluation, these graduates were finalising their research work and were not graduated. Nevertheless, the evaluators improvised the methodology in ascertaining their engagement by assessing their enthusiasm levels and security of their current employment: 100% of the students at both institutions have shown enthusiasm and indicated their intention to practice the Seed Breeding as a profession. More so, 50% of the graduates of University of Ibadan are currently having employment with Agriculture Research Institution and are on study leave. 10% are sure to secure employment in Agriculture Research Institution whilst 10% are not sure.

50% of Graduates of Ahmadu Bello University have secured employment to practice Plant Breeding; 20% are not sure to be engaged to practice the profession. 30% are vigorously pursuing possible employment in the agricultural sector.

Figure 4.1.11: Probability of practice plant breeding as professions



4.1.4 Project timelines and scheduling

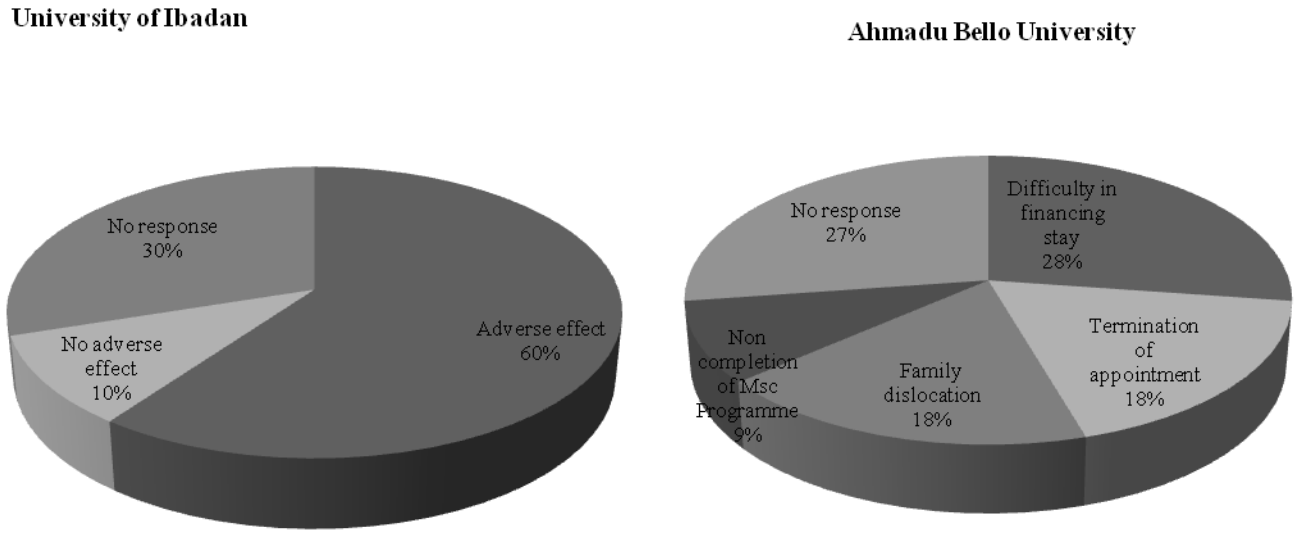
An essential component of any project is scheduling and timelines. Scheduling and timelines are constructed around activities and, when designed well, can keep a project on track toward eventual success. Project activities without timeline have the risk of applying time ineffectively or loosing sight of ultimate goal. The two projects required analytical tools for scheduling activities and allocating resources

and compare plan activities with actual progress of work. Critical analysis of all documentation indicated that proper schedule was not done which could help project managers to avoid delays in delivery of project results. The programme was just following the academic calendar of the Universities.

The MSc Programme in Plant Breeding in University of Ibadan was supposed to have started January 2009 and ended December 2010. This did not start at the said date but January 2010 due to delay in signing contract with AGRA. The project delayed at the Ahmadu Bello University because of strike action at the University: The proposed start date was December 2008 but commenced January 2010.

Other areas that suffered delay were students' research work especially at Ahmadu Bello University. Although the students claimed they completed investigation into various plant breeding and crop pathological research work, review of their work by the various supervisors and final presentation to academic panel for evaluation delayed and affected final submission. The situation affected the students with adverse implications: AGRA sponsorship funds ran-out and they had to personally finance their stay for completion of the programme. 28% of Graduate affected by the delay claimed they had difficulties in financing their stay at the University. Other reasons such as threat of termination of employment appointment and family dislocation were cited as effect of the delay.

Figure 4.1.12: Effective of delay in completion of programme on students



The Students suggested ways of averting delay in graduation since it affects the image of the programme. 23% suggested proper scheduling of content of the programme as most of them were done on advoc

basis; others also suggested intensification of monitory by AGRA which could be used in giving feed back to the project management team. Effective supervision of research work also came up as an area that needs attention.

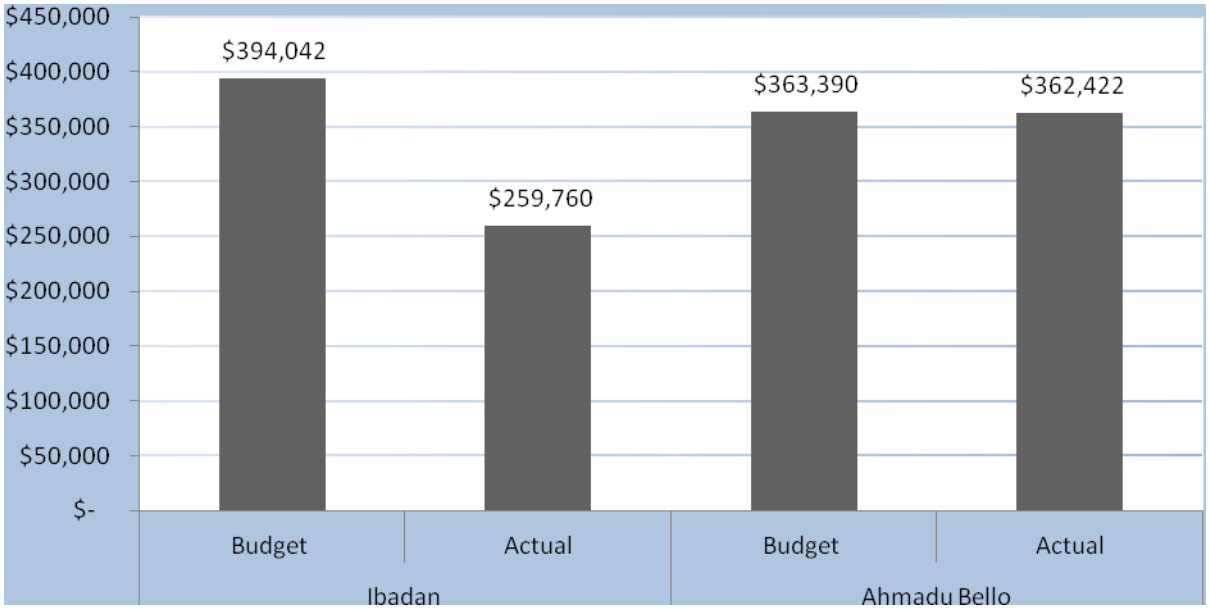
4.1.5 Funding of the expired EACI projects

This section assesses funding arrangement within the scope budget submitted to AGRA. The question being answered here includes: were expenditure made by project managers reasonable; were there variance between budget and actual expenditures; why the variance; were there delay in releasing funds to the Universities and their implication for running the projects. Securing financial data from both Universities was a challenge.

Within the context of the proposal, University of Ibadan budgeted $394,042 and by 30th June 2010 an amount of US$259,760 has been released to the University. Within the same reporting period US$187,817.57 was spent on project activities. It was difficult to secure information to ascertain end of project funding situations.

With respect to Ahmadu Bello University US$ 362,422 of the budgeted amount of US$363,390 was spent on the Project by the end of the project period.

Figure 4.1.12: Budgeted and actual expenditure



Analysis of the expenditure pattern indicates misapplication of funding (especially at the Ahmadu Bello University) and the evaluators are not sure whether they are allowable with regards to the financial regulatory requirements of the project. It is evident that amount saved on research, travels and publications were spent on students' accommodation and stipends, facilities at the Department, project manager allowance and administrative cost.

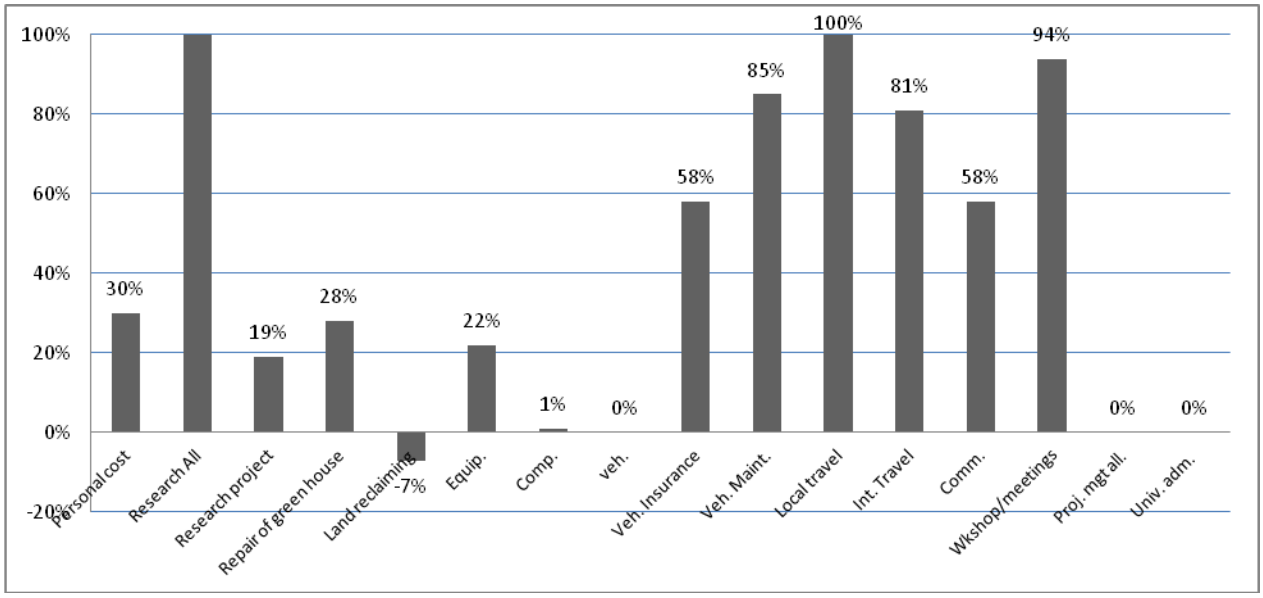
The situation is quite different at the University of Ibadan where an amount of US$71,943 has been saved and not spent on any other project item.

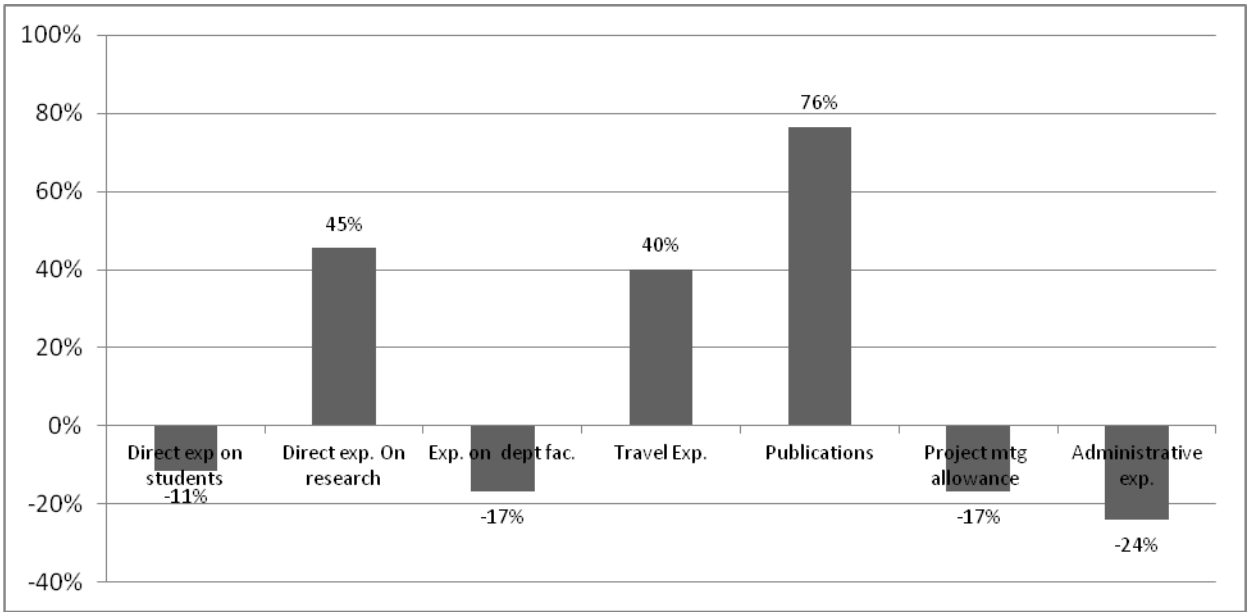
	Budgeted	Actual	Variance	% Variance
Direct exp on students	135,780	151,298	-$15,518	-11.43%
Direct exp. On research	71,000	38,735	$32,265	45.44%
Exp. on dept fac.	106,330	124,013	-$17,683	-16.63%
Travel Exp.	15,200	9,117	$6,083	40.02%
Publications	3,400	800	$2,600	76.47%
Project mtg allowance	12,000	14,000	-$2,000	-16.67%
Administrative exp.	19,680	24,459	-$4,779	-24%

Table 4.1.5: Budget and actual expenditure variance – Ahmadu Bello University

Figure 4.1.13: Variance in expenditure items

University of Ibadan





Ahmadu Bello University

Table 4.1.6.: Budget and actual expenditure per student

	Ahmadu Bello University		University of Ibadan	
	Budget	**Actual**	**Budget**	**Actual**
Total exp. on each student	$36,339	$36,242	$39,404	$18,782
Expenditure	$394,042	$187,817	$363,390	$362,422

To sum-up, total actual expenditure per student is about $36,242 at Ahmadu Bello University and US$18,782[2] at the University of Ibadan (See table 4.1.6). Nevertheless, Whatever the situation, that question is, "*is it a prudent expenditure to produce critical mass of Plant Breeders to effectively influence research into the production of improved seed varieties acceptable to the agriculture sector and smallholders farmers for higher productivity*".

Among the students of the Department, AGRA sponsored students feel superior, and the other students think they are over pampered. This is creating a class society of a sort.

Prof. H. Tijani-Eniola, Head of Dept., Agronomy, University of Ibadan.

AGRA funding, although is used to provide some facilities that benefit all the students, the sponsorship should be spread to benefit all the students. Modality could be put in place to achieve that.

Head of Dept, Plant Science, Ahmadu Bello University

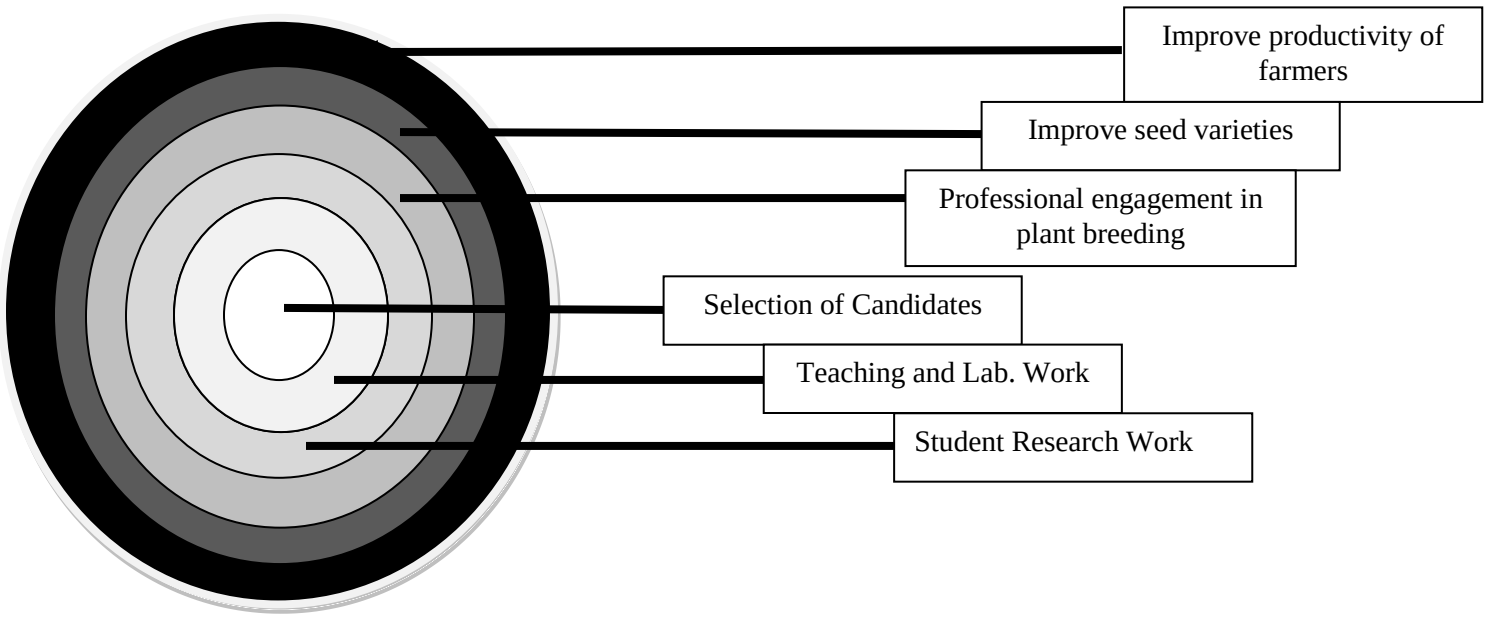
[2] The figure is not the end of project expenditure. it was difficult to secure financial data from the University of Ibadan.

4.1.6 Sustainability of the expired EACI projects

Agricultural research generates technologies and information that when adopted by end users, results in economic, social and environmental impacts. The infusion of technology and know-how into the food production chain through the training of human expertise in plant breeding and crop science will to a high degree improve productivity of smallholder farmers under the assumption that these know-how diligently serves the target farmers. Nevertheless, there is ample evidence that agricultural research and development could distort the eco-system of an ecological zone especially where new breed of crops are integrated into the natural ecology. Although, there is no evidence to suggest that the EACI projects intend to produce crop varieties that have the danger to distort a given ecosystem, this aspect needs to be integrated into the curriculum of training professional for the agricultural industry. In assessing the environmental impact of the training programme from the perspective of the stakeholders, none seems to have noticed any.

However, the assumption that the training of human capital for the industry could lead to improved productivity seems to be remote as depicted in Figure 4.1.7. With the required investment prospective candidates could be sponsored to be trained in plant breeding and crop science. This is within the control of the expired EACI Projects. Other outputs as provided in the Figure 4.1.7 which are within project control are Teaching and Research Work. As you move from the centre of the concentric circles, project control over outputs becomes minimal. This explains the practicality of the EACI Projects in Nigeria.

Figure 4.1.7: Level of Sustainability of Project outputs and outcomes



However, the weak link of the process of training professional for improved productivity of smallholder farmers by translating the expertise acquire to the improvement of live of smallholders farmers is obvious.

4.2 Project under Fund for the Improvement and Adoption of African Crops (FIAAC)

As already mentioned, one project was implemented in Nigeria under the FIAAC sub-programme, namely:

> *Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice for Poor Resource Farmers in Nigeria.*

The relevance of this project for agricultural development and food security in Nigeria, and in relation to AGRA's vision, as well as its performance and outcomes are analyzed below. Information used for the assessments was generated through a review of project documents, field visits and direct observations, and key informant interviews with two (2) project staff (one lecturer and a project assistant who were involved in implementing the project)[3] and three (3) beneficiary farmers.

4.2.1 Project Relevance

The ultimate goal of this project was to develop, breed, release and make available to smallholder farmers rice seeds that are high-yielding, stable, drought-tolerant and resistant to diseases and insect pests. The relevance of this goal vis-à-vis Nigeria's agricultural policy, the needs of farmers and AGRA's vision cannot be overemphasized. Nigeria's agricultural sector, which is dominated by smallholder farmers, is faced with the problem of low productivity resulting partly from the use of low-yielding seeds due to low investments in seed research and development as well as ineffective mechanisms for getting improved seeds to farmers. The effect is that the country imports a lot of food, including rice which has become one of its staples. To address this problem, one of the policy objectives of the government is to make the country self-sufficient in the production of rice, cassava and maize, and thus reduce the importation of food.

Stakeholders interviewed (including one lecturer and a project assistant who were involved in implementing the project) 'strongly agreed' that the goal of this project was 'very relevant' to AGRA's efforts to improve food security and income levels and reduce poverty among smallholder farmers in

[3] The evaluation team was unable to meet the Project Manager (Principal Investigator) during field visits and a questionnaire sent to him to be completed had not been returned at the time of finalizing this report.

Nigeria and other African countries. This is because farmers' lack of access to improved seeds is a serious problem that contributes to food insecurity in the country. In addition, low agricultural productivity has made the country a net importer of food with serious implications for foreign exchange reserves. It also needs to be emphasized that seed is a vital agricultural input, to the extent that even if a farmer has all the other inputs but does not have improved seeds, there is no way he/she can realize his/her full output potential. As far as the above respondents are concerned, making improved seeds affordable and easily available to the farmer is a solution to one of his/her main problems. This is underscored by the following statement made by a beneficiary farmer during an interview:

> *In the past, we used to cultivate any seed we got hold of. Most of the time, these seeds did not yield much. But with the new improved varieties (from the project) our yield is not only going up but the cost of production (control of weeds, diseases and pests) is also going down. That means more profit and more income.*

It is also important to note that Ebonyi State is a major rice producing area with Abakiliki and its environs (where the project is located) being a major centre as far as the industry is concerned. Activities within the industry include lowland and upland rice cultivation, processing and transportation. Therefore, this project, which is expected to boost total rice production and the quality of rice, has the potential to contribute to job creation and increase incomes not only among rice farmers but also other operators (millers, transporters, sellers, etc) in the industry (**see Picture 4.2.1 below**).

Picture 4.2.1: Rice Processing and Transportation Activities at Abakaliki

	A line administrative block of the Rice Mill Owners Industrial Association at Abakaliki, Ebonyi State.
	The Evaluation Team on a visit to a rice mill at Abakaliki. This is one of many rice mills that were doing brisk business in the town during the visit.
	Trucks waiting to load milled rice at Abakaliki. These were among a large fleet of trucks transporting rice to and from the rice mills.

Source: Pictures taken by the Evaluation Team during field visit

4.2.2 Project Effectiveness

The project involved a series of activities in an elaborate process of breeding research **(see Table 4.2.1)**. The main activities are summarized as follows:

i. Collection of genetic materials and multiplication
ii. ON trials and Participatory rice breeding (PRB).
iii. Cross-pollination with landraces and materials from collaborators.
iv. Observational yield trial (OYT) for drought stress screening.
v. Screening of segregating populations for drought stress.
vi. Replicated yield trial (RYT)
vii. Participatory varietal selection (PVS) programme (planting of rice garden).
viii. Advance yield trial (AYT)
ix. Participatory varietal selection (PVS): distribution of seeds to farmers as baby trails
x. On-farm trials
xi. Multi-environment trials (METs)
xii. Multiplication of selected lines
xiii. Submission of data to the Seed Release Committee for the release of identified lines as varieties

The two project staff interviewed believed that these activities had been an effective means to breed and make available to smallholder farmers rice seeds that are high-yielding, stable, drought-tolerant and resistant to diseases and insect pests. The process involved two (2) field days, which were attended by about 200 farmers (**see Picture 4.2.2**). During these events farmers were allowed to select up to five varieties, cultivate them on their own fields and give feedback to the breeders. These strategies did not only introduce the participating farmers to the new varieties but also succeeded in using the farmers as channels to disseminate information about those varieties to non-participating farmers in their communities. Other means used by the researchers to ensure that farmers know about the improved varieties included the use of the mass media (interviews with TV station, etc), involvement of Local governments and staff of Agricultural Development Projects (ADPs) of Ebonyi State's Ministry of Agric.

While some farmers acquired improved seeds directly from the Biotechnology Research and Development Centre (BTRDC), others obtained them through the Local governments, the ADPs and the National Seed Council (NSC) all of which received seed supplies from the Biotechnology Research and Development Centre. In 2010 alone, the Centre produced and distributed 10 metric tons of improved seeds to these stakeholders.

Picture 4.2.2: A rice foundation seed/ demonstration plot of the Biotechnology Research and Development Centre

This field, which is part of Ebonyi State University's land, is used by the Biotechnology Research and Development Centre for rice foundation seed production/ demonstration

Source: Pictures taken by the Evaluation Team during field visit

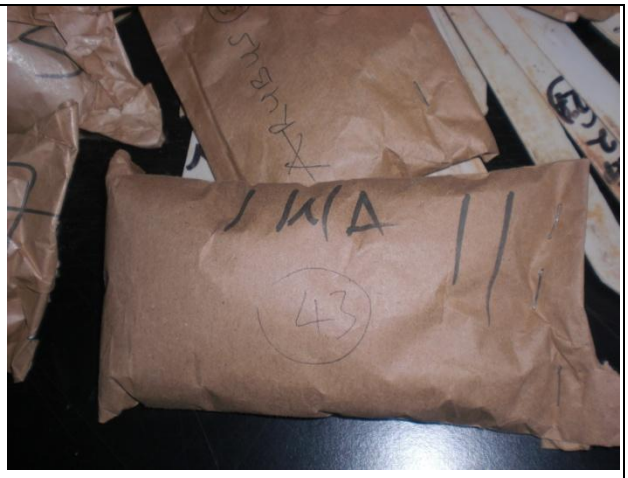
As shown in **Table 4.2.1**, the evaluation revealed that the project led to the release of 11 improved varieties of rice (i.e. IWA-1 to IWA-11) (**see also Picture 4.2.3**). The performance of these improved varieties (IWA lines) compared with two previously released varieties (FARO-52 and FARO-44) as tested at four locations across Nigeria are also shown in the table.

Table 4.2.1: Performance of IWA Lines Compared with Two Released Varieties (FARO-52 & FARO-44) across Four Locations in Nigeria

Code	Maturity	Height (cm)	Tiller Number/m^2	Yield t/ha
IWA-2	Early	103.60	172.50	7.75
IWA-6	Medium	107.50	240.00	7.75
IWA-3	Early	106.30	153.50	6.25
IWA-4	Medium	86.60	175.50	5.70
FARO-52	*Medium*	*113.40*	*219.00*	*5.47*
IWA-1	Medium	108.50	177.50	5.05
IWA-11	Medium	96.00	224.50	5.00
FARO-44	*Early*	*90.60*	*246.00*	*4.95*
IWA-10	Medium	90.10	144.50	4.50
IWA-8	Early	82.00	177.50	3.95
IWA-7	Early	86.90	206.50	3.25
IWA-9	Early	89.10	181.00	2.75
IWA-5	Early	92.00	188.00	2.00

Source: Dr. B.E. Ubi (2011): Rice Crop Improvement: AGRA-EBSU Collaboration. A Paper Presented at the Ebonyi State Rice Stakeholders Summit Held at Abakaliki, August 22, 2011

Picture 4.2.3: Samples of Improved Seed Varieties being shown to the Evaluation by Project Staff at the Biotechnology Research and Development Centre



These samples, stored at the Biotechnology Research and Development Centre, are among the eleven (11) IWA lines developed by the project

Source: Pictures taken by the Evaluation Team

Although the project staff believes the strategies and activities undertaken to achieve the project objectives had been largely effective, they thought the project could have performed better if certain conditions were present. First, there was the need for an effective seed delivery system in place to increase the coverage and sustenance of the production and distribution of the improved varieties. That is, instead of the Biotechnology Research and Development Centre combining these functions with the core business of breeding research, other stakeholders such as private seed companies and non-governmental organizations (NGOs) dealing exclusively in the production and distribution of rice seeds could have been involved. They also thought the project staff had not been adequate. There is therefore the need for more additional staff to support project implementation in the future.

4.2.3 Project Efficiency

Although considerable costs were incurred on the project, the benefits derived (or expected to be derived) from project outputs and outcomes merit the direct and indirect project costs incurred. For example, as

discussed in more detail under **section 4.2.6 (Outcomes)**, some of the project benefits are already derived by various stakeholders, including the Ebonyi State University, researchers and staff who worked on the project, participating smallholder farmers and the National Seed Council (NSC). The project staff (whose views were re-echoed by the Vice Chancellor of the University) pointed out that the University and the project managers put in measures to ensure that implementation of the project was done in the most efficient and cost effective manner. For example, the University provided free land for research and seed production, and also set up a dedicated account purposely for this project as a means to ensure smooth financial management.

4.2.4 Timeliness of Implementation

According to the managers of the project, there were no significant delays in the execution of project activities. That is to say, the project was implemented within its stipulated timeframe.

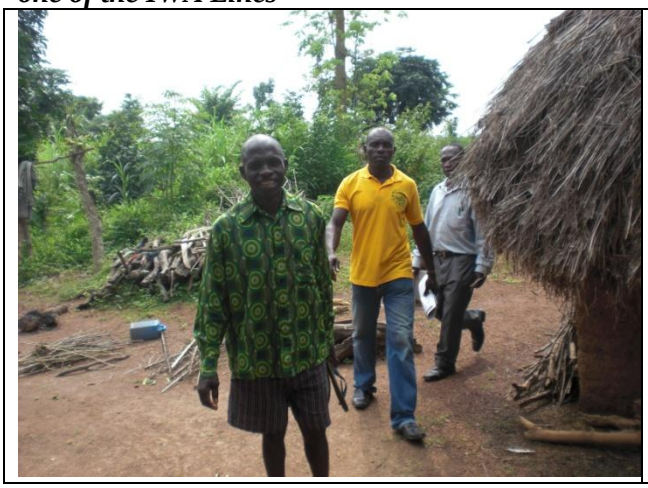
4.2.5 Financing

According to project staff at the Biotechnology Research and Development Centre, funds for planned activities were released in a timely manner. There were no delays, either from AGRA or the University, and this was partly attributed to the fact that there was a dedicated project account that helped to minimize the effects of administrative bureaucracies usually associated with universities.

4.2.6 Project Outcomes

As already mentioned, the project resulted in the development and release of eleven (11) improved varieties of rice (the IWA lines). It was also revealed that some of these new varieties (e.g. IWA-2, IWA-6, IWA-3 and IWA-4) are superior in performance to two popular improved varieties already in use by Nigerian farmers, namely FARO-52 and FARO-44, especially as far as yield (t/ha) and maturity time are concerned. As a result of their superior characteristics, the extent of acceptance and adoption of these varieties were said to be considerably high among those farmers who knew about them. As expected, the adoption rate was said to be particularly high among farmers in Ebonyi State where the project was located and over 200 farmers were known to have cultivated the improved varieties (see Picture **4.2.4**). (The evaluators could not find exact figures/statistics on the extent of adoption by farmers). Interest in the new varieties had also been shown by state agencies such as the National Seed Council, the Ministry of Agriculture and the local governments. These agencies purchased the seeds from the Biotechnology Research and Development Centre and distributed them to farmers. In addition, some farmers in Abakaliki and its environs acquired the seeds directly from the Centre—at a rate of N170 per kilogram.

Picture 4.2.4: Members of the Evaluation Team on a Visit to the Farm of a Farmer who had adopted one of the IWA Lines



Source: Pictures taken by the Evaluation Team

As some of the project stakeholders (i.e. one lecturer, a project assistant and one farmer) pointed out, this project has a great potential to contribute significantly to the achievement of the goals of AGRA and the government of Nigeria, especially with regard to improving food security, reducing rice importation, and improving the incomes and living conditions of smallholder farmers in Nigeria. **Table 4.2.2** shows some of the observed and anticipated benefits of the project among the main stakeholders. According to interviews with members of the project team, the average yield of farmers who cultivated the IWA varieties had increased from 3 tons/ha to 6 tons/ha. **Box 4.2.1** is the story of one of the farmers who participated in the project and was still cultivating one of the IWA lines at the time of the evaluation. It is an illustration of the importance of making improved seeds accessible and affordable to smallholder farmers.

Table 4.2.2: Project Benefits Derived (or to be Derived) by Various Stakeholders

Stakeholder	Observed or Anticipated Benefits (Positive Outcomes)
Ebonyi State University	• Boosted R&D activities for rice production • Helped build capacity of the department, including acquisition of equipment and computers • Intellectual property; • Image of the university and state
Researchers who worked on the project	• Source of employment (e.g. for Mr. Bartholomew Nmija who was employed specifically to assist the PI)and experience for the PI and all who worked on the project • Expertise acquired from AGRA was used in the project
Participating small-holder farmers (At least 200 farmers are known to have received seeds from the Centre in addition to an	• Increased yield—hectarage and productivity per unit area (participating farmers increased yield from 3 tons/ha to 6 tons/ha; the Centre's yield is 7.7 tons/ha, indicating that the farmers can still increase yield if other input/farm management requirements are met); • Access to seeds with adaptation to biotic and abiotic stresses; • Access to early-maturing seeds

unknown number who sourced seeds from the NSC and ADPs)	• Marginal reduction in cost of production
National Seed Council (NSC)	• the project supplies seeds to NSC to be distributed to farmers
Large-scale farmers	• Easy access to quality seeds

Box 4.2.1: The Testimony of a Farmer who adopted one of the Improved Rice Varieties from the Project

Mr. Daniel Onny is a farmer at Enjugu, a village near Abakaliki. His parents were farmers and he has been a farmer all his life. Like many other farmers in his community, he cultivates cassava, yam, maize and other staples mainly for household consumption, and rice as a 'cash crop'. In other words, rice cultivation is his main source of income. Mr. Onnyis the leader of one of four (4) cooperative societies in his village (Enjugu village)—each with a membership of 25 farmers. According to him, there are about 66 such societies in the local government area within which Enjugu is located and each society has a membership of 20-25.

Together with several other farmers (cooperative members) from Enjugu, he participated in the rice breeding project by attending the field days and also visiting the demonstration farms several times. Like the other participating farmers, he was allowed to select 5 varieties of improved rice to cultivate and, after harvest, give feedback to the breeders regarding the performance of the different varieties. He became more interested in IWA-2 than the other varieties (e.g. IWA-8, IWA-9 and IWA-10) he cultivated because of the former's peculiarity compared to others. According him, although the other varieties have much longer grains than IWA-2 (which is also long-grain), the quantity of grain from IWA-2 is more than the others. This is because IWA-2 has less husks than the others. As he pointed out, "for us more grain means more money into our pockets."

Regarding the benefits he and other farmers had derived from their participation in the project, Mr. Onny had this to say: "We used not to notice anything of this sort. We used to grow any type of rice variety we saw, not minding whether there was a gain or loss. With those (local) varieties, you have to spend a lot of money and labour to control the weed. However, because of the good tillering of this variety (IWA-2), I do not do much when it comes to weed control." He explained that the tillers of IWA-2 (which had adopted) spread out to overshadow and 'kill' the weeds. He also pointed out that cultivating IWA-2 does not require tilling of the soil as is the case in the cultivation of the varieties he used to cultivate. In addition, IWA-2 produces much larger panicles than those varieties. During harvest time, "you just cut a few panicles and your basket is full, meaning you spend less money/labour in harvesting a given quantity of rice (when you cultivate IWA-2) than is the case with the local varieties we used to cultivate." He pointed out that, as a result of adopting IWA-2, his cost of production had been reduced by 40% and that his yield had increased from 3 metric tons per hectare to 6 metric tons per hectare.

Mr. Onny also revealed that the IWA lines had become so popular that some farmers were ready to purchase the seeds from other farmers (who acquired them from the Centre) at much higher prices.

4.2.7 Sustainability

No negative effect of the project on the environment was identified. The fact that the varieties developed are high-yielding implies that less amount of land and chemical fertilizers are required to produce a given quantity of rice. It can therefore be inferred that the project has the potential to contribute to environmental sustainability by developing rice varieties that require only minimal amounts of both land and chemical fertilizers.

In addition, extensive adoption of the varieties is expected to contribute to local and regional economic development in Ebonyi State and other regions and localities in Nigeria by increasing agricultural production, employment generation and income levels of farmers, as well as contribute to a reduction in poverty and income inequalities. Thus, once further measures are put in place to intensify the production and consumption of the new varieties, the project has the potential to contribute significantly to economic and social sustainability.

However, the long-term sustainability of the project can only be ensured if measures are put in place to further popularize and commercialize the varieties. The design and implementation of the project did not include any strategies to link the project to commercial seed producers and dealers. As a result, awareness creation, seed production and distribution to farmers had been undertaken directly by the Biotechnology Research and Development Centre of the University. It is the view of the evaluators that the Centre/University is not likely to continue doing this in the long term since that is not part of its core functions. This problem is especially likely to arise when support from AGRA and other financiers ceases.

4.3 Projects under Seed Production for Africa Initiative (SEPA)

As indicated, the following two projects were implemented in Nigeria under the Seed Production for Africa Initiative (SEPA) sub-programme:

a. *Enhancing access to quality improved seeds for better livelihood of resource-poor farmers in North Western Nigeria*

b. *Community seed production to increase access to improved Seeds for small scale farmers in southern Borno State of Nigeria*

The relevance, performance and outcomes of these two projects are analyzed as follows.

4.3.1 Enhancing Access to Quality Improved Seeds for Better Livelihood of Resource-Poor Farmers in North Western Nigeria

The evaluation of this project involved a review of project reports, field visits, direct observation of project activities and outputs, a key informant interview/dialogue with the CEO of Manoma Seeds Ltd, and a field survey involving out-growers contracted by the company, agro-dealers who sold seeds for the company and farmers who patronized the company's seeds. Although the total number of out-growers

ever contracted by Manoma Seeds Ltd was 17, only 11 of them were functional as of 2011 and six (6) of the 11 were randomly selected for interview. Out of a total of 56 agro-dealers who sold seeds for the company, a random sample of 20 was selected. There was no record (list) of farmers patronizing the company's seeds, which made it impossible to define a sampling frame from which a random sample could be selected. The evaluators went round this problem by asking each of the 20 agro-dealers to identify two (2) known farmers who could be reached for interview. This yielded a sample of 40 farmers who were interviewed.

4.3.1.1 Project Relevance

The overall goal of the project was to increase adoption of improved crop varieties and increase food through a sustainable seed supply mechanism, which includes: strengthening the capacity of farmers employed as contract out-growers; training them in various aspects of seed production; facilitating the certification of seeds; purchasing seeds from the out-growers; and processing and disseminating certified seeds at affordable prices to poor farmers within North-Western Nigeria. As far as this project is concerned, 'North-Western Nigeria' covers the following areas: Southern Katsina or Funtua area (Katsina state); from Kaduna city to Zaria (Kaduna state); from Kano city towards Jigawa state border (Kano state); between Gusau and border with Katsina (Zamfara State); and areas around Kebbi city (Kebbi state). Ultimately, the project was to enhance the productivity of resource-poor farmers in these areas.

This project is very relevant to the policy objectives of Nigeria, one of which is to enhance farmers' access to improved seeds (and other agro-inputs) necessary to increase agricultural productivity and output. The project is also consistent with AGRA's objective to support the production of improved crop varieties and their distribution to farmers through small private seed companies under its Seed Production for Africa Initiative (SEPA) sub-programme. Above all, the project has the potential to contribute significantly to job creation, food security and increased household incomes among smallholder farmers and other segments of the population in North-Western Nigeria where poverty is endemic.

4.3.1.2 Project Effectiveness and Efficiency

To achieve the stated goal and objectives of the project, Manoma Seeds Ltd designed and implemented a comprehensive set of strategies. The effectiveness and outputs/results of these strategies are analyzed against the following four key project objectives and relevant planned targets:

1. Producing quality seeds of maize, rice and soybean required for increased crop production by resource-poor farmers

2. Improving farmer education and promoting the use of improved seeds by resource-poor farmers
3. Ensuring access to improved seeds by resource-poor farmers
4. Ensuring quality control through internal monitoring and evaluation of project activities

i. Producing quality seeds of maize, rice, soybean and cowpea required for increased crop production by resource-poor farmers

The company produced and sold two (2) improved varieties of rice (Nerica 1 and Sippi), three (3) varieties of maize (M-R-white, M-S-yellow and OPV), two (2) varieties of soybean (TGX 1448-2E and TGX 1835-10E) and one variety of cowpea (IT 277-1). Foundation seeds of the various rice, soybean and cowpea varieties were procured from the National Agricultural Seed Council (NASC). In the case of the maize varieties, the company produced its own foundation seeds (see Picture 4.3.1). The foundation seeds were then given to small-scale out-growers for commercial production. In all, a total of seventeen (17) out-growers were contracted to produce seeds for the company at various times. However, only eleven (11) of them were contracted in 2011. In order to maintain the quality and purity of the improved seeds, the company trained the out-growers in seed production techniques and management practices. It also provided technical backstopping during seed production. Besides providing technical backstopping, the company was also involved in facilitating the inspection and certification of improved seeds produced by the out-growers. According to the records of the company, the NASC conducted several certifications between August 2009 and October 2010.

Picture 4.3.1: Pictures Depicting some of the Processes involved in the Production, Processing, Packaging and Distribution of Improved Seeds by manoma Seeds Ltd

	Office premises of Manoma Seeds Company Ltd

	The Managing Director of Manoma Seeds Company Ltd conducting members of the Evaluation Team round one of the company's fields where foundation seeds are produced
	The Evaluation Team on a visit to a warehouse/factory at Funtua, Katsina State where Manoma Seeds treats, packages and stores certified improved seeds produced by the out-growers
	Inside Manoma Seeds' warehouse, Funtua, Katsina State

Source: Pictures taken by the Evaluation Team

By the above strategies, Manoma Seeds added three (3) new seed varieties (the Sippi, TGX 1835-10E and IT-KD-86-288 varieties of rice, soybean and cowpea respectively) to the five (5) seed varieties it was already producing and selling before the project (see **Table 4.3.1)**. It also increased its annual output from 120 metric tonnes to 249 metric tonnes (**see Table 4.3.1 and Picture 4.3.2**), which exceeded the planned target of 200 metric tonnes by almost 25%. Out of this total, 201.5 metric tonnes (representing 81%) were seeds of the M-R-White variety of maize. Interviews with agro-dealers and farmers confirmed that this is the most known and demanded among the eight (8) seed varieties produced and sold by Manoma Seeds Ltd.

Table 4.3.1: Varieties and Quantities of Certified Improved Seeds Produced by by Manonoma Seeds Ltd before and after the Project

	Before Project		After Project	
Crop	**Seed Variety**	**Quantity (Mt)**	**Seed Variety**	**Quantity (Mt)**
Maize	M-R-White	55	M-R-White	201.5
Maize	M-S-Yellow	25	M-S-Yellow	38
Maize	OPV Maize	20	OPV Maize	0.5
Rice	Nerica 1	5	Nerica 1	2.0
Rice	-	-	Sippi	1.9
Soybeans	TGX1448-2E	15	TGX1448-2E	2.3
Soybeans	-	-	TGX 1835-10E	1.5
Cowpea	-	-	IT-KD-86-288	1.0
Total		**120**		**248.7**

Source: Based on Data from Manoma Seeds Ltd

Picture 4.3.2: Samples of Treated and Packaged Improved Seeds

Source: Pictures taken by Evaluation Team

ii. Improving Farmer Education and Promoting the Use of Improved Seeds by Resource-Poor Farmers

In order to ensure the adoption and sale of improved seeds, Manoma Seeds Ltd had as one of its strategies an education and awareness-creation programme that targeted farmers. Strategies adopted to achieve this objective included organization of training workshops, establishment of demonstration fields, organization of field days and sponsoring of radio programmes to discuss the value of improved seeds. Between May 2009 and April 2010, the company organized training workshops on the importance of using improved seeds and other production techniques in fifteen (15) villages across six (6) states. The total number of smallholder farmers who participated in these workshops was 1,753 (made up of 1,666 males and 87 females), which represented almost 877% of the planned target of 200 farmers (see Annex 6). Similar training workshops were also organized to strengthen the capacity of agro-dealers who have direct interactions with farmers on a day-to-day basis.

To further deepen farmers' awareness and knowledge about the improved seeds, the company also established 46 on-farm demonstration plots of the varieties in six (6) states, which exceeded the planned target of 40 plots by 15%. In addition, it organized 39 field days across the same six (6) states with the participation of 3,318 farmers made up of 3,148 males and only 170 females; participants included

farmers, extension agents and agro-dealers. This represented about 98% of the planned target of 40 field days. These awareness-creation and educational activities were supplemented by the sponsoring of six (6) radio programmes to discuss the value of planting improved seeds to increase yield. According to the management of the company, these programmes probably reached as many as 12 million[4] farmers. However, the six (6) radio programmes sponsored represented only 50% of the planned target of 12 (see Table 4.3.2). As discussed under the next section ('Project Outcomes'), the level of awareness and knowledge of interviewed farmers about the improved crop varieties produced by Manoma Seeds Ltd is still low despite the above efforts.

iii. Ensuring Access to Improved Seeds by Resource-Poor Farmers

Treated and packaged seeds were delivered to farmers by two main methods: a) direct sale by Manoma Seeds Ltd and b) sale through a network of small-scale, community-based agro-dealers. According to the records of the company, a total of 56 agro-dealers were registered and contracted to sell its seeds. This was only 7% shy of the planned target of 60 agro-dealers. However, with the exception of M-R-White maize, the rate of adoption of the improved varieties is low as a result of the low awareness among farmers. This is discussed in more detail below (under 'Project Outcomes').

iv. Ensuring Quality Control through Internal Monitoring

An important strategy adopted by Manoma Seeds Ltd to ensure quality control was internal monitoring and evaluation. This involved nine (9) visits to the on-farm demonstration plots and seeds production fields of the out-growers; the planned target was 10 monitoring trips. The monitoring visits were undertaken by staff of the company in conjunction with officials from NASC and the Agricultural Development Projects (ADP) of the Ministry of Agriculture at Funtua.

As far as planned targets on outputs are concerned, strategies adopted by Manoma Seeds Ltd were effective in producing key project results/outputs. As **Table 4.3.2** shows, the company exceeded its targets on some of the outputs. In the case of those outputs for which planned targets were not achieved, the achievement rate was 90% or better—with the exception of the number of radio programmes sponsored for which the achievement rate was only 50%. Despite these achievements, awareness about and adoption of the improved seed varieties among farmers was found to be low.

[4] There was no planned target with regard to the number of farmers reached through radio programmes

Table 4.3.2: Achievement of Key Project Outputs

Project Output	Planned Target	Achievement	Achievement Rate (%)
Total quantity of improved seed varieties produced (metric tonnes)	200	249	124.0
Number of agro-dealers buying and selling improved seeds to farmers	60	56	93.3
Number of farmers trained	200	1,753	876.5
Number of on-farm demonstration plots established	40	46	115.0
Number of field days organized	40	39	97.5
Number of radio programmes sponsored	12	6	50.0
Number of monitoring trips undertaken	10	9	90.0

Source: Based on records of Manoma Seeds Ltd

The above project outputs/results and the project outcomes discussed below (under 4.3.1.5) were produced at a cost of US$ 151,046 (as of January 2011), which was in excess of the planned budget by $3,022. This was the direct monetary cost of providing a range of project inputs (see Table 4.3.3). Other (non-monetary) project costs included such things as land for demonstration and office premises of the company. The social benefits of the project include those derived by its direct beneficiaries, namely Manoma Seeds, out-growers, agro-sellers and smallholder farmers, as well as proceeds received by Manoma Seeds Ltd after selling the seeds. Proceeds from the sale of seeds and the various material and non-material resources received by Manoma Seeds are expected to bolster the company's capital base and its capacity to continue with efforts at getting high-quality seeds to resource-poor farmers at affordable prices. There are also indirect benefits (mainly in the form of employment and income) that will likely accrue to various categories of unintended beneficiaries—such as farm labourers and transport operators—especially if the project continues to lead to and sustains increases in output levels of the farmers. Based on these observations and assumptions, it can be concluded that the project (i.e. its outputs and associated positive outcomes) do merit the direct and indirect costs incurred on it.

Table 4.3.3: Summary of Project Costs

Approved Budget line items	Approved (estimated) Cost	Amount received from AGRA	Actual Expenditure
Project personnel cost	7,337.80	6,259.80	6,260.20
Seed production	83,170.40	83,346.43	86,271.10
Outreach	2,785.00	844.89	844.89
Field supplies & consumables	10,478.40	10,479.42	10,480.40
Local travel and transportation	3,478.30	4,796.98	4,878.98
Meetings & travelling cost	8,752.00	9,396.00	9,448.00
Communication	2348.00	2,198.89	2,198.89
Vehicles	9561.24	9,561.24	9,563.24
Storage	4,262.00	4,262.00	4,262.00
Machinery (seed processing)	1,391.30	2,407.88	2,407.88
Demonstrations	10,301.56	10,301.56	10,201.49
Field days	3,480.00	3,579.91	3,579.91
Monitoring and field evaluation	677.00	589.00	649.00
Total	**148,023 .00**	**148,024.00**	**151,046.00**
Total Budget Outrun			**$-3,021.98**

Source: Based on Manoma Seeds Ltd's financial report (reporting period November 2010 to January 2011)

4.3.1.3 Timeliness of Implementation

There were no reported delays in the execution of planned activities under the project.

4.3.1.4 Financing

According to the records of Manoma Seeds Ltd, the estimated project amount (cost) that was requested and received from AGRA was US$ 148,023. However, total project expenditure as of January 2011 was US$ 151,046 with the difference being born by the company (see **Table 4.3.3**). The company also experienced instances of delays in the release of funds by AGRA. To address the problem, it had resolved to avoid late reporting since that was a major reason for the delay.

4.3.1.5 Project Outcomes

The extent to which project outputs/results might have translated into positive or negative outcomes could not be easily ascertained as project implementation had barely been completed at the time of the evaluation. However, a number of observed/anticipated outcomes on various key stakeholders (target groups) became evident. As shown in Table 4.3.4, these key stakeholders include Manoma Seeds Ltd, the out-growers who produced the seeds for the company, the agro-dealers who sold the seeds and

smallholder farmers who cultivated the seeds. Specific outcomes on each stakeholder group are discussed below.

Outcomes on Manoma Seeds Ltd

Although the company had been in the seed production and sale business for two years before the project, the knowledge and skill levels of its staff have increased as a result of AGRA's support. For example, company staff benefited from AGRA-sponsored training programmes that enabled them to improve upon their techniques and skills in seed processing, seed storage and treatment, and seed packaging. These, together with an increase in the company's capital outlay (in the form of funds received from AGRA for vehicle and machine acquisition and to cover the project's personnel and operational cost), the company was able to increase its output to an appreciable level. As already indicated, the project led to an annual production of about 249 metric tonnes, compared to a pre-existing annual output of 120 metric tonnes. This increased output is expected to translate into increased revenue and profit for the owners of the company as well as an increase in personal emoluments for company staff and temporary workers. All things being equal, increased profits and emoluments are expected to eventually translate into an increase in disposable household incomes for those involved.

Outcomes on Out-Growers

As far as the out-growers are concerned, the acquisition of, or increase in, knowledge and skills in the production of high-quality improved seeds is a very important outcome of the project. In particular, respondents reported having gained knowledge about the M-R-White, QPM and M-S-Yellow varieties of maize and the TGX 1448-2E variety of Soybean during the project period, although some of them had been in the seed production business since 2006. Four (4) out of the six (6) out-growers contacted cited Manoma Seeds Ltd as their main source of information and knowledge about these varieties. All six (6) of them reported having received technical support and supervision from the company during the seed production process. (However, knowledge about the other varieties is very low.) In addition, all the respondents (100%) said they received input support from Manoma Seeds in the form of: supply of free breeder seeds; loans (cash credit); and the supply of other inputs on credit—tools/implements/equipment, agro-chemicals, etc. As expected, these forms of assistance reflected in the production levels of the out-growers. Four (67%) of those interviewed reported that their yield and output levels in seed production had followed an 'increasing' trend during the last three (3) years (i.e. since 2008). They attributed this to the quality of breeder seeds and increased knowledge/techniques they had received from the company.

The survey also revealed that seed production is an important source of supplemental employment and income for the out-growers. All six (6) of them reported seed production as their secondary occupation. This implies that a boost in the seed production business (as a result of this project) is a boost in the capacity of agro-dealers and their households to diversify their sources of livelihood (i.e. employment and income sources)—a vital livelihood and coping strategy among low-income people. In connection with this, five (5) out of the six (6) respondents (representing 83%) reported that their household income had followed an increasing trend during the last three (3) years; out of the five (5), four (4) attributed the increasing trend in household income to increased output in seed production.

Table 4.3.4: Summary of Observed/Anticipated Outcomes of Key Project Stakeholders

Stakeholder Group	Knowledge/ Skills	Access to Inputs/ Output Level	Employment/ Income/ Households' wellbeing
Manoma Seeds Ltd	• Improved skills in: ✓ Seed processing ✓ Seed storage and treatment ✓ Seed Packaging	○ Increased business capital ○ Increased output in seed production	▪ Increased revenue and profit
Out-Growers	• Increased knowledge about production of high-quality seeds, especially in production of seeds of: ✓ M-R-White, QPM and M-S-Yellow varieties of maize ✓ TGX 1448-2E variety of Soybean	○ Increased access to inputs: – Free breeder seeds – Loans (cash credit) – Other inputs on credit—tools/ implements, agro-chemicals, etc ○ Increased yield and output in seed production since 2008 due to quality breeder seeds and increased knowledge and technical support from Manoma Seeds	▪ Increased household income due to increased yield and output
Agro-Dealers	• Increased knowledge about improved seed varieties and their importance for increasing food crop productivity and output • Increased knowledge in business/ marketing skills	○ Improved access to inputs due to assistance from Manoma Seeds, mainly in the form of: – Supply of improved seeds on credit – Commission/ discount on seeds sold – Transportation of seeds – Return of unsold seeds ○ Increase in sale of (demand for) improved seeds, especially: – TGX 1448-2E and TGX 1835-10E varieties of soybean; – Nerica-1 rice – M-R-White and M-S-Yellow maize	▪ Increase in annual household income since 2008 ▪ Increase due mainly to increase in sale of (demand for) improved seeds
Smallholder Farmers	• Increased knowledge about improved seed varieties and their		

	importance for increasing food crop productivity and output • Adoption of improved seed varieties, particularly M-R-White maize • However, much more needs to be done as far as knowledge about the improved varieties is concerned ✓ Apart from the M-R-White variety of maize most farmers did not know about the other improved varieties that Manoma Seeds deals in ✓ Most of the farmers who knew about the lesser-known varieties (QPM variety of maize and the various varieties of soybean and cowpea) did so long before the project • Agro-dealers are the farmers' main sources of information about improved seed varieties		

Outcomes on Agro-dealers

Knowledge about Improved Seeds/ Employment: One important project outcome assessed by the evaluators was whether the project had increased awareness and knowledge about the various improved varieties among agro-dealers who are the main channels for getting seeds to farmers. All the 20 agro-dealers interviewed during the evaluation said they knew and sold the M-R-White and M-S-Yellow varieties of maize while 40% of them said they knew and sold the QPM variety of maize and the TGX 1448-2E variety of soybean, respectively (see Table 4.3.5). None of them knew or sold the Sippi variety of rice. Table 4.3.5 also shows that Manoma Seeds Ltd is one among several sources of agro-dealers'

knowledge about these varieties. The other sources of knowledge include field days, other farmers, friends, market, on-farm trials and agricultural extension officers.

Table 4.3.5: Agro-Dealers' Knowledge about and Sale of Various Improved Seed Varieties

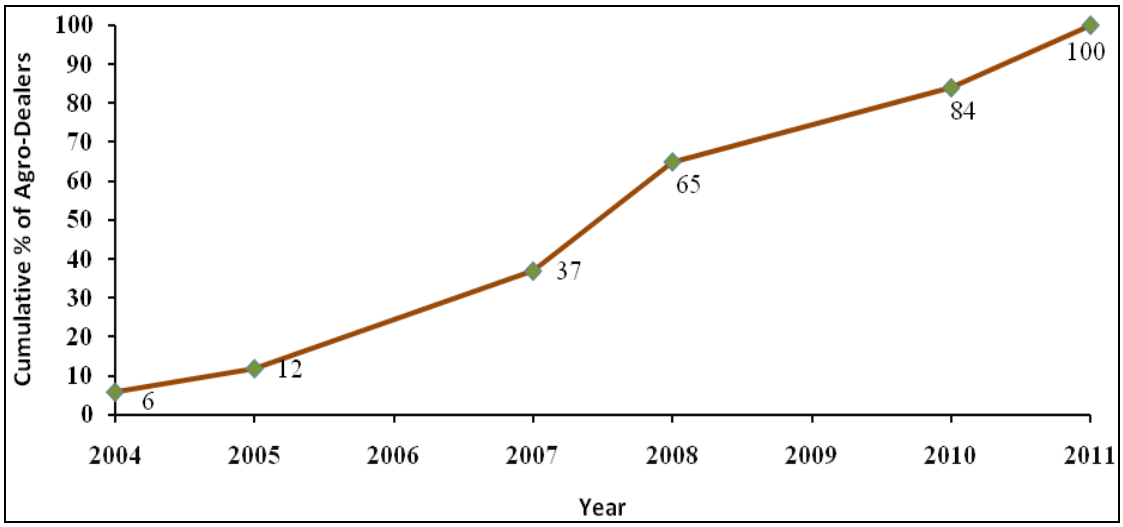
Crop/ Improved Variety	% Who Know about Variety	% Selling Improved Variety	Source of Knowledge	
			% Who Acquired Knowledge from Manoma Seeds Ltd	% Who Acquired Knowledge from Other Source
Maize M-R-White	100	100	30	70
Maize M-S-Yellow	100	100	30	70
Maize QPM	40	40	25	75
Rice Nerica 1	10	10	Nil	100
Rice Sippi	Nil	Nil	N/A	N/A
Soybeans TGX 1448-2E	40	40	50	50
Soybeans TGX 1835-10E	10	10	100	Nil
Cowpea IT-KD-86-288	20	20	50	50

Also, with the exception of the TGX 1835-10E variety of soybean and the IT-KD-86-289 variety of cowpea (which were introduced to them in 2010 and 2011, respectively), most of the agro-dealers knew about and were already selling these improved seeds before 2009 when the project began (see **Table 4.3.6**). In particular, 100% of those who knew about Nerica 1 rice and 80% each of those who knew about M-R-White and M-S-Yellow varieties of maize were already aware of these varieties as of 2008. None of them knew about Sippi rice as of 2011. **Figure 4.3.1** shows the cumulative percentage of agro-dealers who knew about any improved variety in any given year between 2004-2011. It shows that, the percentage of agro-dealers with knowledge about at least one of the seven varieties had followed a steadily increasing trend over the period. It also shows that 35% of them learnt about at least one improved variety after 2008, specifically from 2010 to 2011. Further analysis shows that they (the 35%) learnt about the varieties from Manoma Seeds.

Table 4.3.6: Percentage of Agro-Dealers with Knowledge about Improved Varieties Who First Learnt about them in a Given Year

Year	Maize M-R-White	Maize M-S-Yellow	Maize QPM	Rice Nerica 1	Soybean TGX 1448-2E	Soybean TGX 1835-10E	Cowpea IT-KD-86-289
2004	10	10	--	--	--	--	--
2005	10	10	--	--	--	--	--
2007	20	20	25	100	50	--	--
2008	40	40	25	--	--	--	--
2010	10	10	25	--	50	100	0
2011	10	10	25	--	--	--	100
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Figure 4.3.1: Cumulative Percentage of Agro-Dealers who Knew about at least One Improved Variety in a Given Year between 2004-2011



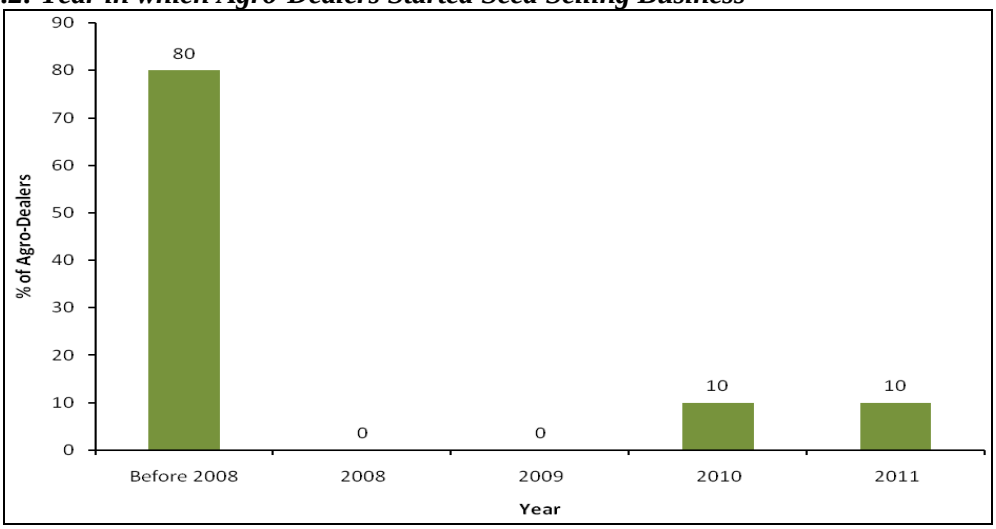
Although most of the agro-dealers knew about some of the improved seeds before the project, the project is expected to increase their knowledge and competence in the seed industry. In other words, both those who started before the project and those who started after the project are expected to increase their knowledge not only about improved seed varieties and their importance for increasing food crop production, but also in business management and marketing. It is also instructive to find out that the sale of improved seed varieties is a major source of livelihood among the agro-dealers. According to the survey, the sale of improved seeds or sale of improved seeds together with other agro-inputs was the main occupation of 70% of those interviewed (see Table 4.3.7). The remaining 30% who engaged in other activities (e.g. farming) as their main occupation sold improved seeds as one of their minor occupations.

Table 4.3.7: Main and Minor Occupations of Agro-Dealers

Occupation	Main Occupation (%)	Minor Occupation (%)
Sale of improved seeds only	20	10
Sale of improved seeds and other agro-inputs	50	-
Sale of improved Seeds and other goods	-	20
Activities other than sale of improved seeds	30	70
Total	**100**	**100**

Besides boosting the businesses of pre-existing agro-dealers, the project has contributed to expanding the network of agro-dealers. As Figure 4.3.2 shows, about 20% of agro-dealers interviewed began the improved seed selling business between 2010 and 2011. They had been recently recruited by Manoma Seeds as part of the company's efforts to increase access to improved seeds by resource-poor farmers through the expansion of the network of small-scale, community-based agro-dealers who sell its improved seeds. Thus, in addition to increasing farmers' access to quality improved seeds, the project has the potential to create new jobs in the seed-selling business.

Figure 4.3.2: Year in which Agro-Dealers Started Seed Selling Business



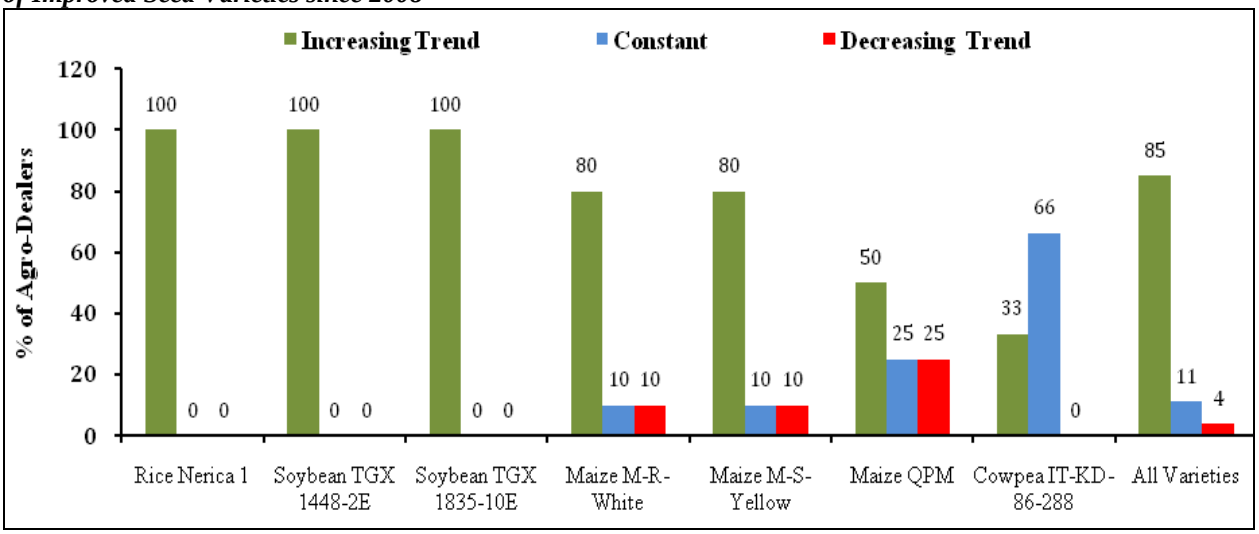
Access to Inputs: Another important outcome of the project as far as agro-dealers are concerned is improved access to business inputs. Respondents reported of various forms of assistance received from Manoma Seeds. In particular, all 20 of them mentioned supply of improved seeds on credit, commission/discount on seeds sold and return of unsold seeds as forms of assistance received from Manoma Seeds (see Table 4.3.8). In addition, about 90% of them mentioned transportation of seeds as another form of input-related assistance received from the company.

Table 4.3.8: Percentage of Agro-Dealers who Received Assistance from Manoma Seeds

Form of Assistance	% Who Received it
Supply of improved seeds on credit	100
Commission/discount on seeds sold	100
Transportation of seeds	90
Return of unsold seeds	100

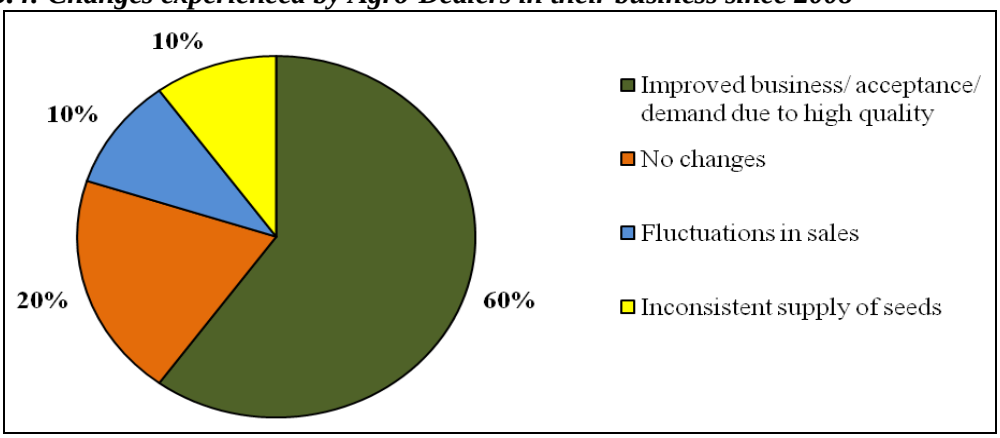
Output: As a result of improved knowledge, the various forms of assistance received from Manoma Seeds and increased demand by farmers, most of the agro-dealers had been able to increase their output (sales). About 85% of them said their sales in improved seeds had followed an increasing trend since 2008 (see **Figure 4.3.3)**. In particular, all those who sold TGX 1448-2E and TGX 1835-10E varieties of soybean and Nerica-1 rice said their sales had been increasing. The proportion of those who said their sales in M-R-White and M-S-Yellow maize had been increasing was 80% in each case. A decreasing trend in sales was mostly with respect to QPM maize—a quarter of all dealers who sold seeds of that variety reported a decrease in sales.

Figure 4.3.3: Percentage of Agro-Dealers who Reported of Increasing, Constant or Decreasing Trend in Sales of Improved Seed Varieties since 2008



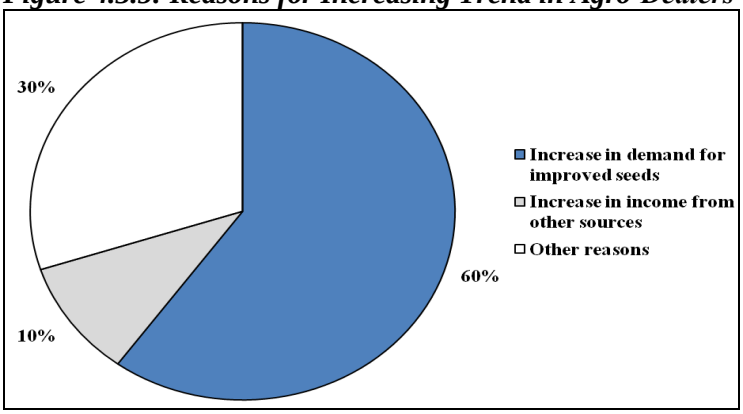
General Changes in Business: The agro-dealers were asked about changes they had experienced or observed in their seed-selling business as a result of their association with Manoma Seeds Ltd since 2008. As Figure 4.3.4 shows, about 60% reported of improvements in their business. They attributed this mainly to increased acceptance of and demand for improved seeds by farmers as a result of the high quality of the seeds supplied by Manoma Seeds Ltd. However, about a fifth of them said there had been no changes while 10% said sales had been fluctuating and another 10% said supply of seeds had been inconsistent.

Figure 4.3.4: Changes experienced by Agro-Dealers in their business since 2008



Household Income and Wellbeing: All the 20 agro-dealers interviewed said their annual household income had followed an increasing trend during the last three (3) years (i.e. since 2008). When asked to explain what had accounted for the increasing trend, about 60% of them attributed it to an increase in farmers' demand (see **Figure 4.3.5)**. All things being equal, increased income is expected to lead to improvements in the wellbeing of the households of these agro-dealers, as far as their ability to meet their basic needs—food, clothing, education, health care, housing, etc—is concerned.

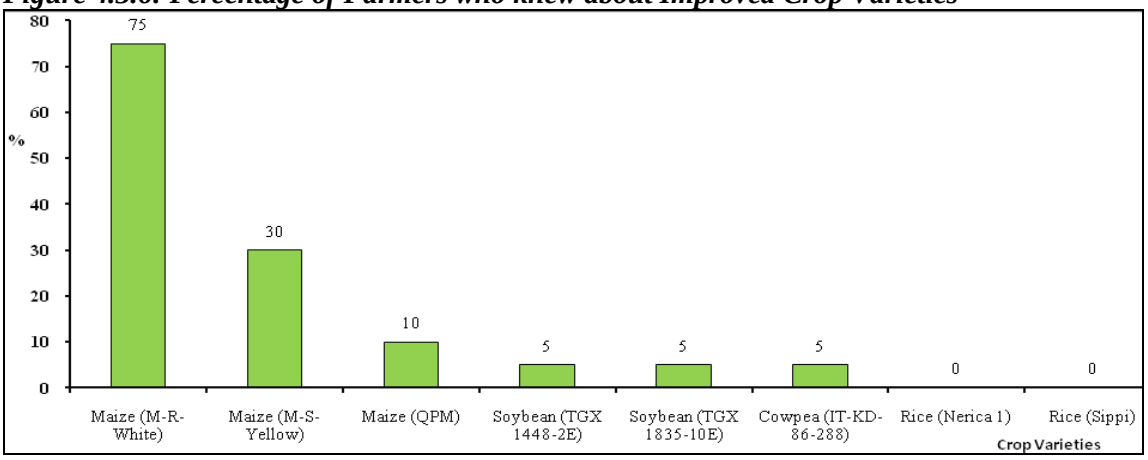
Figure 4.3.5: Reasons for Increasing Trend in Agro-Dealers' Household Income



Outcomes on Smallholder Farmers

Awareness/Knowledge about Improved Seeds: In order to ensure the adoption and sale of improved seeds, Manoma Seeds Ltd adopted a strategy to educate and increase awareness among smallholder farmers through training workshops, establishment of demonstration fields, field days and radio programmes to discuss the value of improved seeds. There is no doubt that this strategy may have resulted in increased knowledge about improved seed varieties and their importance for increasing food crop productivity and output. However, interviews with a sample of smallholder farmers who patronize improved seeds from Manoma's agro-dealers suggests that much more needs to be done in this area. Apart from the M-R-White variety of maize about which two-thirds of farmers interviewed indicated their knowledge, most farmers did not know about the other improved varieties that Manoma Seeds deals in (**see Figure 4.3.6**). Only 5% of them knew about TGX 1448-2E soybean, TGX 1835-10E soybean and IT-KD-86-288 cowpea, respectively; none of them knew about the Nerica 1 and Sippi varieties of rice.

Figure 4.3.6: Percentage of Farmers who knew about Improved Crop Varieties

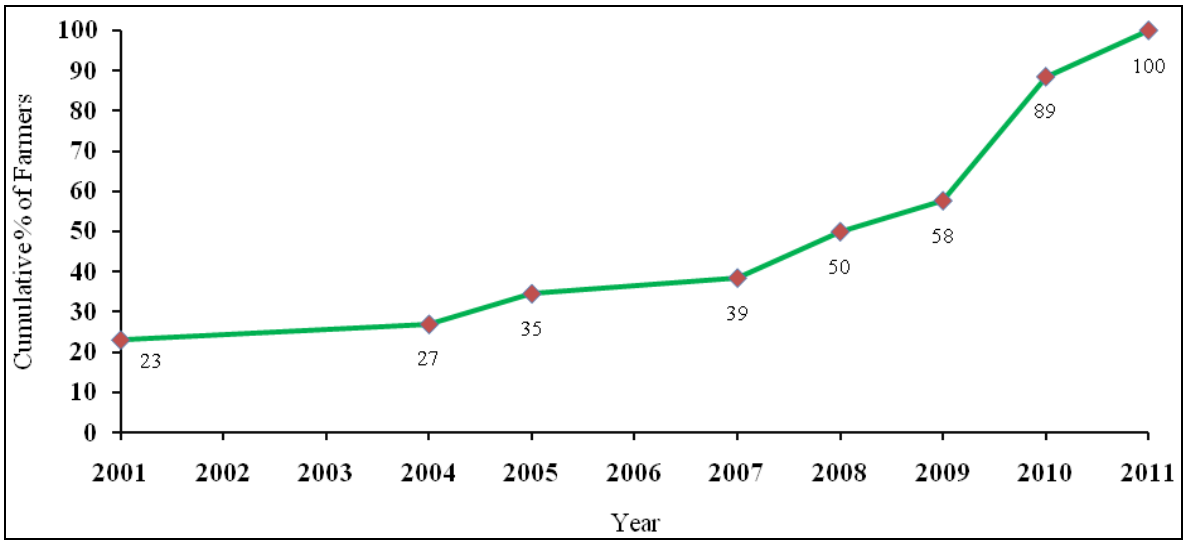


Another revelation from the analysis is that most of the farmers who knew about the lesser-known varieties (QPM variety of maize and the various varieties of soybean and cowpea) did so long before the project (**see Table 4.3.9**). For example, all the farmers who knew about the soybean and cowpea varieties said they learnt about them as far back as 2001. The two most known maize varieties (M-R-White and M-S-Yellow) seem to be the only varieties about which the project has produced considerable outcome regarding information dissemination. More than half of the farmers who knew about these two varieties learnt about them after 2008. As Figure **4.3.7** depicts, this resulted in a considerable increase during the last three years in the number of farmers who knew about at least one improved seed variety.

Table 4.3.9: Percentage of Farmers with Knowledge about Improved Varieties Who First Learnt about them in a Given Year

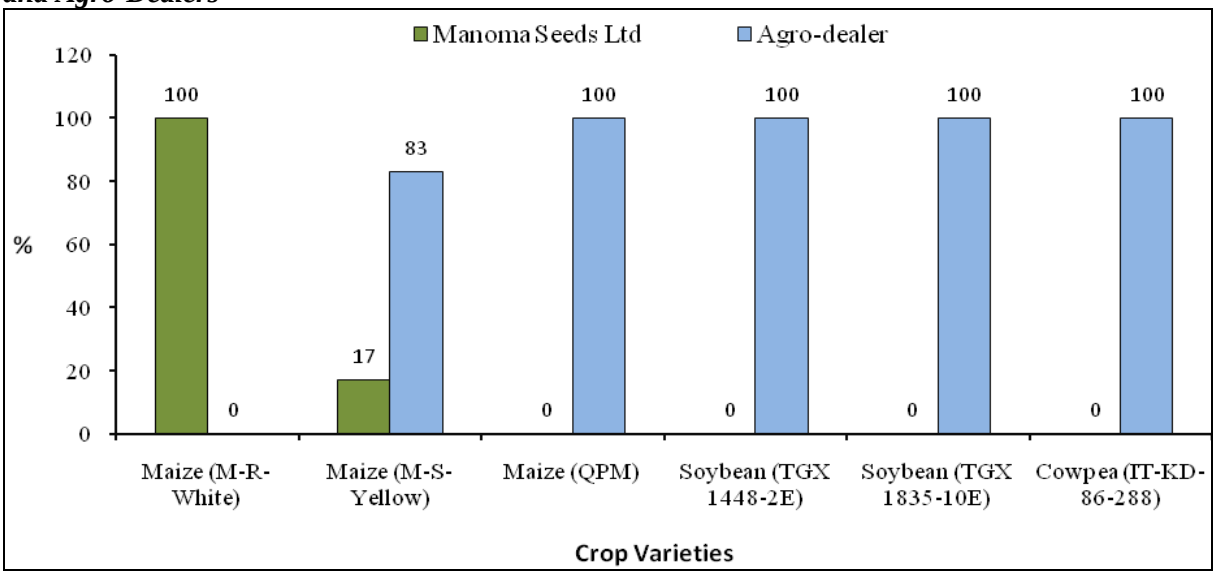
Crop/ Improved Variety	2001	2004	2005	2007	2008	2009	2010	2011
Maize (M-R-White)	6.7	-	13.3	6.7	20.0	13.3	26.7	13.3
Maize (M-S-Yellow)	16.7	16.7	-	-	-	-	50.0	16.7
Maize (QPM)	50.0	-	-	-	-	-	50.0	-
Soybean (TGX 1448-2E)	100	-	-	-	-	-	-	-
Soybean (TGX 1835-10E)	100	-	-	-	-	-	-	-
Cowpea (IT-KD-86-288)	100	-	-	-	-	-	-	-
% who knew any Variety	**23.1**	**3.9**	**7.7**	**3.9**	**11.5**	**7.7**	**30.8**	**11.5**

Figure 4.3.7: Cumulative Percentage of Farmers who Knew about at least One Improved Variety in a Given Year between 2004-2011



The analysis also reveals that agro-dealers are the farmers' main source of information about improved seed varieties (**see Figure 4.3.8**). With the exception of the M-R-White variety of maize, most farmers who knew about the improved varieties received their information from the agro-dealers. All the farmers who knew about QPM variety of maize and the various varieties of soybean and cowpea, as well as 83% of those who knew about M-S-Yellow maize, said they learnt about them from agro-dealers. This implies that farmers' knowledge about, and subsequent adoption of, improved seed varieties largely depends on the knowledge of agro-dealers about those varieties.

Figure 4.3.8: Percentage of Farmers who learnt about Improved Crop Varieties from Manoma Seeds and Agro-Dealers



Adoption/Production of Improved Varieties: Increased adoption of the improved seed varieties is one of the most critical outcomes expected to be produced by this project. However, interviews with farmers who plant Manoma's seeds showed that the rate of adoption of the improved varieties was generally low. With the exception of M-R-White maize which was planted by 70% of farmers interviewed, none of the improved varieties produced by Manoma was adopted by up to a third of the farmers. Only 30% and 10% of farmers interviewed planted the M-S-Yellow and QPM varieties of maize, respectively, while less than 10% of them planted each of the remaining five improved varieties (see **Figure 4.3.9**). None of the farmers interviewed planted the Nerica 1 and Sippi varieties of rice. This low level of adoption by farmers is a reflection of farmers' knowledge about the improved varieties. Another important finding is that agro-dealers are the farmers' main source of improved seed varieties. When those planting M-R-White maize (the most adopted crop variety) were asked to indicate their source of seeds about 100% of them mentioned agro-dealers (see **Table 4.3.10**). About 80% of those planting M-S-Yellow maize and 50% of those planting QPM maize (which are the second and third most adopted crop varieties, respectively) also mentioned agro-dealers as their source.

Figure 4.3.9: Percentage of Farmers who plant various Improved Crop Varieties

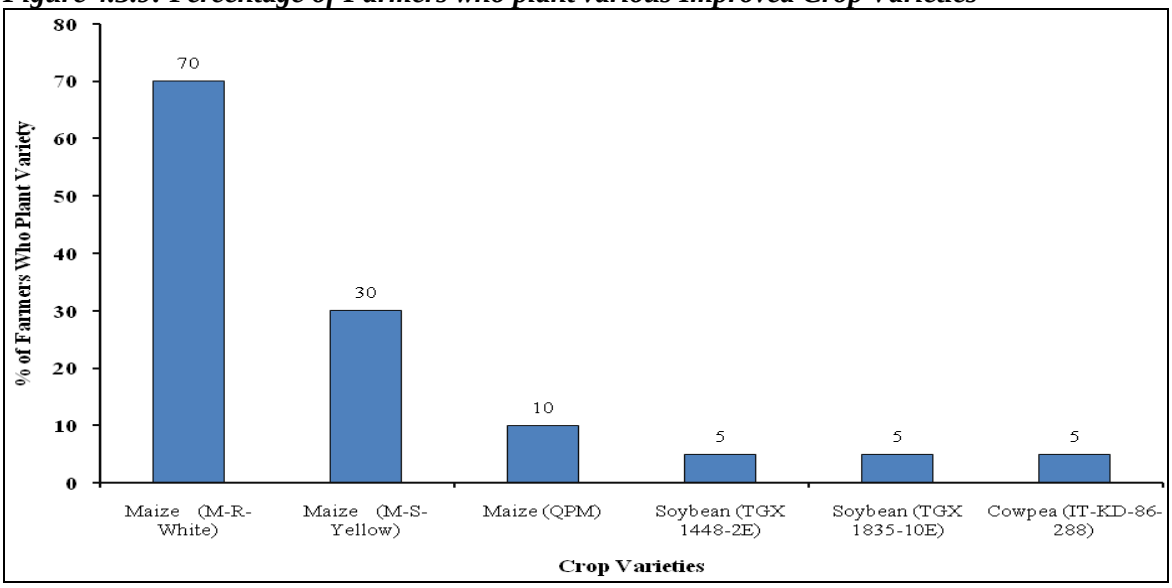


Table 4.3.10: Main Sources of Improved Seed Varieties When Farmers First Adopted Them

Crop Variety	Main source when farmer first adopted this variety	
	Manoma Seeds Ltd	**Manoma's Agro-Dealers**
Maize (M-R-White)	-	100
Maize (M-S-Yellow)	20	80
Maize (QPM)	50	50
Soybean (TGX 1448-2E)	100	-
Soybean (TGX 1835-10E)	100	-
Cowpea (IT-KD-86-288)	-	100

Although the adoption of the eight improved seed varieties is generally low, it is worth noting that the project led to a considerable increase in the adoption of the M-R-White and M-S-Yellow varieties of maize (which are also the most known and adopted varieties) and the IT-KD-86-288 variety of cowpea (see **Table 4.3.11**). In the cases of both M-R-White and M-S-Yellow varieties of maize, about two-thirds of farmers planting the varieties first adopted them between 2009 and 2011. As already pointed out, Manoma Seeds Ltd was the farmers' main source of information about the M-R-White variety and, to a lesser extent, the M-S-Yellow variety. In the case of the IT-KD-86-288 cowpea, although the farmers planting them knew about the variety before the project, they actually adopted it in 2011.

Another important revelation is that there is no significant variance between farmers' knowledge/awareness about the improved varieties and their adoption of those varieties. In other words,

most of the farmers who had knowledge about the various improved varieties were planting them (compare **Figures 4.3.6** and **4.3.9**).

Table 4.3.11: Percentage of Farmers Planting Improved Varieties who First Adopted them in a Given Year

Crop Varieties	% of Farmers in a Given Year							
	2001	**2004**	**2005**	**2007**	**2008**	**2009**	**2010**	**2011**
Maize (M-R-White)	7.1	-	7.1	7.1	14.3	21.4	28.6	14.3
Maize (M-S-Yellow)	16.7	16.7	-	-	-	-	50.0	16.7
Maize (QPM)	50.0	-	-	-	-	-	50.0	-
Soybean (TGX 1448-2E)	100	-	-	-	-	-	-	-
Soybean (TGX 1835-10E)	100	-	-	-	-	-	-	-
Cowpea (IT-KD-86-288)	-	-	-	-	-	-	-	100
At Least One Variety								

When asked to explain why they did not plant the various improved seed varieties most of the farmers who did not plant them mentioned lack of knowledge about those varieties as their reason. As **Table 4.3.12** shows, the percentage of farmers who cited this reason for not planting any of the eight (8) varieties under consideration ranged from 53% to 64%. This further underscores the need to intensify awareness creation and education about improved seed varieties. Other reasons cited for not planting the improved varieties include dislike of the variety because of low yield, low demand or preference for other varieties and lack of access to seed.

Table 4.3.12: Percentage of Farmers who did not Plant Improved Varieties for Various Reasons

Crop Varieties	% of Farmers & Reasons for not Planting Variety			
	Don't Know This Variety	Don't Like It (low yield/ low demand/ prefer other variety)	Can't Get Seed	Other Reason
Maize (M-R-White)	60.0	40.0	--	--
Maize (M-S-Yellow)	64.3	28.5	7.1	--
Maize (QPM)	58.8	17.6	5.9	17.6
Soybean (TGX 1448-2E)	61.1	16.7	5.6	16.7
Soybean (TGX 1835-10E)	57.9	15.8	5.3	21.0
Cowpea (IT-KD-86-288)	52.9	11.8	5.9	29.5
Rice (Nerica 1)	100	--	--	--
Rice (Sippi)	100	--	--	--

The survey data also indicates that most farmers who have adopted the improved seeds produced by Manoma Seeds had increased their output levels. When asked to describe their production trends, all farmers who had adopted the M-S-Yellow and QPM varieties of maize and the TGX 1448-2E and TGX 1835-10E varieties of soybean said their Production levels of those varieties had followed an Increasing trend (see Table **4.3.13)**. about 87% of those who had adopted M-R-White maize said their production levels had been increasing while none of them reported of a decreasing trend in the production of any of the varieties under consideration while only. However, all those who had adopted the IT-KD-86-288 variety of cowpea reported of a constant trend in production.

Table 4.3.13: Percentage of Farmers who said their Production of Improved Crop Varieties had followed Increasing, Constant and Decreasing Trends

Crop Varieties	% of Farmers and Production Trend		
	Increasing	Constant	Decreasing
Maize M-R-White	86.7	13.3	Nil
Maize M-S-Yellow	100.0	Nil	Nil
Maize QPM	100.0	Nil	Nil
Soybean TGX 1448-2E	100.0	Nil	Nil
Soybean TGX 1835-10E	100.0	Nil	Nil
Cowpea IT-KD-86-288	Nil	100.0	Nil
Rice (Nerica 1)	N/A	N/A	N/A
Rice (Sippi)	N/A	N/A	N/A
All varieties	88.5	11.5	Nil

Household Food Security and Income: One objective of the evaluators was to find out whether there was any indication that the project (*Enhancing access to quality improved seeds for better livelihood of resource-poor farmers in North Western Nigeria*) had contributed, or could contribute, to increasing food security and income levels among smallholder farm households. The analyses suggest that the adoption of improved seed varieties had resulted in improvements in household food security, as far as the respondents are concerned. Table 4.3.14 shows a list of various food security-related problems and the percentage of farmers who reported the incidence of each problem in their household.

Table 4.3.14: Percentage of Farmers who Reported Various Food Insecurity Problems in their Households

Food Security Problem	% of Farmers Reporting
Whether respondent or other adults in his/her household ever cut the size of your meals or skip meals in the last 12 months because there was not enough money or food	10.0

Whether respondent or other adults in his/her household ever ate less than he/she felt he/she should in the last 12 months because there wasn't enough money or food	15.0
Whether respondent or other adults in his/her household was ever hungry but didn't eat in the last 12 months because he/she could not afford enough food	5.0
Whether respondent or other adults in his/her household ever went for a whole day without eating in the last 12 months because there was not enough money or food	5.0
Whether respondent's household ever cut the size of any child's meals in the last 12 months because there was not enough money or food	5.0
Whether any child ever skipped meals in the last 12 months because there was not enough money or food	5.0
Whether any child ever went for a whole day without eating in the last 12 months because there wasn't enough money or food	Nil

The 'frequency' of each of the above food security-related problems is shown in Table 4.3.15. None of these problems had occurred in more than 85% of respondents' households during the last 12 months. Adult household members eating less than they felt they should in the past 12 months because there was not enough money or food was the most frequent problem—reported by 15% of respondents. However, two-thirds of those who reported this problem said it 'rarely' happened while the remaining third said it 'sometimes' happened (see Table 4.3.15). The next most frequent problem, reported by 10% of the respondents, was adult household members cutting the size of meals or skipping meals in the last 12 months because there was not enough money or food. All respondents who reported it said it 'sometimes' happened.

Table 4.3.15: Frequency of Various Food Security-Related Problems among Households of Farmers who had reported such Problems

Food Security Problem	**Frequency & % of Affected Farmers**			
	Rarely	**Sometimes**	**Mostly**	**Always**
Whether respondent or other adults in his/her household ever cut the size of your meals or skip meals in the last 12 months because there was not enough money or food	--	100	--	--
Whether respondent ever ate less than he/she felt he/she should in the last 12 months because there wasn't enough money or food	67	33	--	--
Whether respondent was ever hungry but didn't eat in the last 12 months because he/she could not afford enough food	100	--	--	--
Whether respondent or other adults in his/her household ever went for a whole day without eating in the last 12 months because there was not enough money or food	100	--	--	--
Whether respondent's household ever cut the size of any child's meals in the last 12 months because there was not enough money or	100	--	--	--

food				
Whether any child ever skipped meals in the last 12 months because there was not enough money or food	100	--	--	--

Changes in the ability of respondents' household to adequately meet their food needs are shown in Figure 4.3.10. As shown in the figure, the percentage of respondents whose households were able to produce/purchase enough food for consumption all year round increased from 90% in 2008 to 95% in 2009 and 2010 and 100% in 2011 (i.e. January-August 2011). Among those who reported that their households were unable to produce/purchase enough food for consumption all year round, 50% cited low crop output as the main reason in 2008. However, all of them cited land shortage as the reason in 2009 and 2010. When asked whether, in general, the ability of their households to meet their food needs had improved during the period 2008-2011, 95% of the farmers responded 'Yes'. They attributed this to various reasons. The most frequently cited reason was 'increase in food production due to the adoption of high-yielding crop varieties' (see Table 4.3.16) and was cited 42% of the time. This was followed by another food production-related reason, 'increase in food production due to the adoption of improved varieties and increased profit from trading business' which was cited 16% of the time.

Figure 4.3.10: Percentage of farmers whose households were able to produce/ purchase enough food for consumption all year round in various years

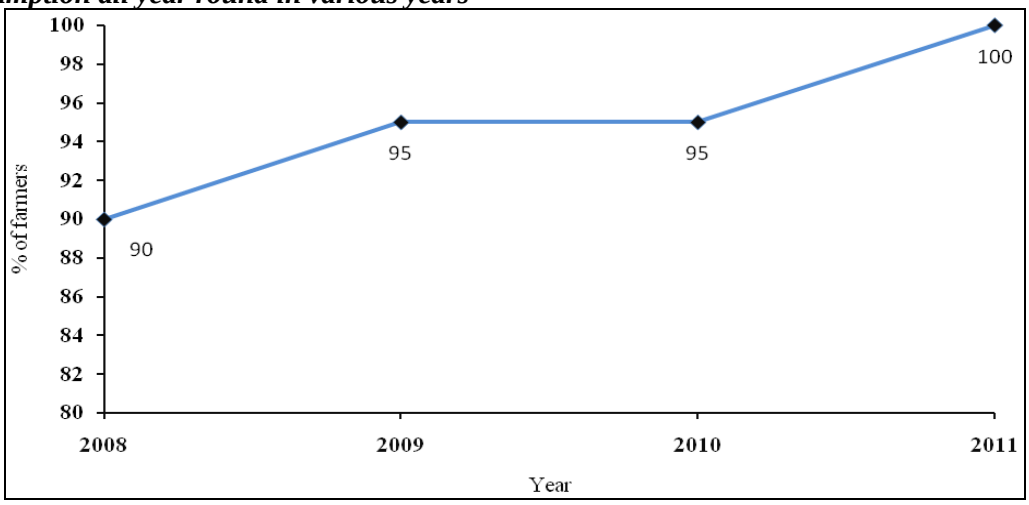


Table 4.3.16: Main reason for Improvement in Households' Ability to Meet Food Needs

Main Reason for Improvement	% Frequency
Increase in food production due to the adoption of high-yielding crop varieties	42.1
Increase in food production due to the adoption of improved varieties and increased profit from trading business	15.8
Increase in food production due to the adoption of high-yielding crop varieties with high	5.3

demand on the market	
Increase in food production because crop cultivation is now done 2 times year	5.3
Increase in food production as well as increase in household head's salary	5.3
The household has a business from which it earns income so we don't sell the food we produce—we consume it ourselves	5.3
My wife and I are both salary workers and we have been farming as well	5.3
We have a small household and our output from farming is increasing	5.3
Success in both business and farming	5.3
I have retired as salary worker, which has enabled me to concentrate more on farming—in addition to income from pension	5.3
All reasons	**100**

Apart from improvements in food security, the analyses also suggest that the adoption of improved seed varieties had contributed to increases in household incomes of the respondents. When asked to describe changes (if any) in incomes by indicating whether their household's annual income had, overall, followed an increasing trend, a constant trend or a decreasing trend during the last three (3) years and give reasons for their answer, all of them said their annual household incomes had been increasing during the period. As **Table 4.3.17** shows, most respondents cited 'increase in crop production' (40%) or 'increase in crop production and profit from trading business' (20%). Put together, the proportion of all respondents who cited 'increase in crop production' as being wholly or partially responsible for the increase in their annual household income was 80%.

Table 4.3.17: Reasons for Increasing Trend in Respondents' Annual Household Incomes during the Past 3 Years

Reason for Income Increase	% Frequency
Increase in crop production	40.0
Increase in crop production and profit from trading business	20.0
Increase in crop production and market demand for produce	10.0
Increase in crop production and salary employment	10.0
Expansion of farming activities	5.0
Improvement in the economy	5.0
I no longer spend money on children because they have completed school	5.0
Earning more income from my work as a labourer, farming and gifts	5.0

All Reasons	**100**

4.3.1.6 Project Sustainability

No direct project effects (whether positive or negative) on the environment were identified during the evaluation. Thus as far as environmental sustainability is concerned the project has no significant effect.

The project has a great potential to contribute to economic sustainability in is target area, North-Western Nigeria. As already discussed in the preceding sections, it is already contributing to an increase in agricultural productivity and output (especially in the area of maize production) as well as the generation of jobs (both main and secondary) in the crop sub-sector. Thus, although the scale and coverage of the project is probably still too small, it is expected to contribute significantly to sustainable regional and local economic development within the target area where crop farming is the backbone of the economy. In addition, since the project is designed to target resource-poor farmers, its success is expected to contribute to reducing poverty and inequality and other social aspects of sustainable development.

However, before the above expectations can be realized, efforts should be made to ensure the long-term sustainability (endurance) of strategies and arrangements put in place through the project. Examples include pricing of the improved seeds and the business arrangements Manoma has with out-growers. As part of efforts to make seeds accessible and affordable to farmers, Manoma's seeds are sold at 20% below the market price. This has become possible because of the subsidization of the cost of seed production—in the form of free transportation, provision of free breeder seeds and other inputs to out-growers—and the fact that the company buys seeds from the out-growers at a fixed price. The challenge for Manoma is whether it can continue subsidizing the out-growers and buying seeds at fixed prices, especially after AGRA's support is over. Already, most of the out-growers have expressed concern and their disagreement to the fixing of prices. They claimed that this had adversely affected their profits. The reality of this problem was corroborated by officials of Manoma Ltd by pointing out that the out-growers had demanded for upward review of the price of certified seeds produced which resulted in difficulty in getting the seeds from them after harvest.

4.3.2 Community Seed Production to Increase Access to Improved Seeds for Small Scale Farmers in Southern Borno State of Nigeria

Visiting project sites in Borno State to interview project stakeholders (project managers, members of the cooperative, agro-dealers, farmers, etc) was part of the design of the evaluation. However, this could not materialize due to security concerns that came up at the time of the field work. As a result, the assessment

of this project is based on a review of project reports and a questionnaire completed and sent by email by the chairperson of the Cooperative who provided most of the basic information needed.

4.3.2.1 Project Relevance

The overall goal of the project, which was designed and implemented by Jirkur Seed Producers Cooperative Society, was to increase crop productivity and reduce poverty among resource-poor male and female farmers of southern Borno State of Nigeria through access to and use of seed of improved and appropriate crop varieties of maize, rice, soybeans and cowpeas in southern Borno State of Nigeria. Thus the project was to ultimately lead to a reduction in poverty, increased income and improved standards of living among smallholder farmers in the target region. This was to happen through strategies to improve access to pure and certified seeds by poor farmers, which would then increase their levels of productivity and outputs in crop production, improve food security among them and lead to increased incomes among the farmers, seed producers and village input dealers. Clearly, this project is very relevant to achieving the national policy objective of enhancing farmers' access to improved seeds (and other agro-inputs) necessary to increase agricultural productivity and output. The project is also consistent with AGRA's objective to support the production of improved crop varieties and their distribution to farmers through small private seed companies under its Seed Production for Africa Initiative (SEPA) sub-programme. Above all, the project has the potential to contribute significantly to job creation, food security and increased household incomes among smallholder farmers and other segments of the population in North-Western Nigeria where poverty is endemic.

4.3.2.2 Project Effectiveness and Efficiency

To achieve the overall project goal described above, the cooperative (Jirkur Seed Producers Cooperative) pursued the following three specific objectives:

1. To provide quality seeds required for increased food production to resource poor farmers in southern Borno State
2. To improve farmer education to promote the use of improved seeds by poor farmers in southern Borno state
3. To ensure access to improved seeds by resource poor farmers in southern Borno state

Strategies (activities) adopted to achieve each of these objectives, their expected outputs and achievements are discussed as follows.

i. Providing Quality Seeds Required to Resource-Poor Farmers

The main strategies/activities undertaken to achieve this objective included: the production of foundation seeds to supply to seed out-growers; training of out-growers in seed production techniques; production of quality seeds through the out-growers; and facilitating the certification of the produced seeds by the National Agricultural Seeds Committee (NASC). These activities led to the production, certification and sale of 386 metric tonnes of improved seeds of maize, soybean, rice and cowpea to resource-poor farmers over the 2-year duration of the project (see **Table 4.3.18**). (Out of this total output, 250.445 metric tonnes were produced by the out-growers while 134.855 metric tonnes were produced on the cooperative's own farm.) The total output represented 175.5% of the planned target of 220 metric tonnes in two (2) years (i.e. 110 metric tonnes annually). The highest achievement rate at the crop level was 617% and was recorded for soybean while the lowest achievement rate of 101.5% was recorded for rice.

Table 4.3.18: Project Objectives, Strategies, Expected Outputs and Achievements

Objective	Activities	Expected Outputs/ Targets	Achievements
1. To provide quality seeds required for increased food production to resource poor farmers in southern Borno State	1. Production of foundation seeds to supply to seed out-growers 2. Training of out-growers in seed production techniques 3. Production of quality seeds through out-growers 4. Facilitating seed certification by NASC	1) 17 metric tonnes of foundation seeds produced and distributed: – 5 mt of maize – 5 mt of soybean – 5 mt of rice – 2 mt of cowpea 2) 220 metric tonnes of quality seeds produced, certified and sold to resource-poor farmers in 2 years (i.e. 110 metric tonnes annually): – 100 mt maize – 100 mt rice – 10 mt soybean – 10 mt cowpea 2) 500 out-growers trained in seed production techniques 3) Timely certification secured for 22 tons of seeds of maize, rice, soybean and cowpea	1) 386 metric tonnes of quality seeds produced, certified and sold to resource-poor farmers in 2 years: – 192.5 mt maize – 101.5 mt rice – 61.7 mt soybean – 30.4 mt cowpea
2. To improve farmer education to promote the use of improved seeds by poor farmers in southern Borno state	1. Raising poor farmers' awareness about and use of improved seeds through: – Village seed associations, meetings and campaigns – Field days to promote poor farmers' use of improved seeds – Radio programmes – Demonstration fields	1) 100,000 poor farmers reached with knowledge of quality seeds through: 2) 4 field days 4) 4 demonstrations fields 3) 8 radio programmes	1) Over 200,000 farmers reached with knowledge of quality seeds 2) 2 field days 1) 34 demonstrations fields: – 10 in 2008 – 19 in 2009 – 5 in 2010
3. To ensure	1. Building a network of	1) A functioning network of 60	1) 60 agro-dealers

access to improved seeds by resource poor farmers in southern Borno	dealers through collaboration 2. Strengthening the capacity of dealers by educating them on the benefits of improved seeds	dealers buying and selling seeds 2) Reach 5,000 smallholder farmers with improved seed varieties each year	identified and trained 2) 37 used (each year)

ii. Improving Farmer Education to Promote the Use of Improved Seeds by Poor Farmers

The objective of improving farmer education to promote the use of improved seeds by poor farmers in southern Borno State was to be achieved by raising farmers' awareness about and use of improved seeds. Specific activities implemented under this strategy included organizing village seed associations, meetings and campaigns; field days, demonstration fields; and radio programmes. Only two (2) out of the four (4) field days planned were organized but the cooperative was able to establish 34 demonstration fields, which exceeded the planned target by 750%. It also organized eight (8) radio programmes (see Table 4.3.18). By the end of the project period, the number of farmers who had been reached with knowledge about improved seeds through these activities was estimated at 200,000, representing 200% of the planned target.

iii. Ensuring Access to Improved Seeds by Resource Poor Farmers

Four (4) strategies were adopted to achieve the objective of ensuring access to improved seeds by resource-poor farmers. They were: a) selling through agro-dealers (accounting for 60% of all seed sales); b) selling through the cooperative's own outlets (accounting for 30% of all seed sales); c) NGOs (5%); and d) government subsidy (5%). The strategy of selling through agro-dealers involved establishing a network of dealers and strengthening their capacity by educating them on the benefits of improved seeds. By the end of the project period, 60 agro-dealers had been identified and trained but only 37 of them were actually used each year. This is below the planned target of establishing a functioning network of 60 dealers (see Table 4.3.18).

4.3.2.3 Timeliness of Implementation

No delays in the execution of planned activities or non-execution of activities were reported.

4.3.2.4 Financing

The evaluators do not yet have the overall financial report spanning the entire duration of the project. However, an examination of the various quarterly financial reports shows several instances of variance—i.e. instances of actual costs exceeding estimated costs and vice versa. For example, the 7th Quarter (December 2009 to February 2010) financial report shows that the actual cumulative expenditure on 'Seed Production' as of 28th February 2010 was almost twice the amount budgeted for (see Table 4.3.19).

The main cause of the cost overruns was that some activities were not implemented exactly as planned, especially as far as 'quantities' are concerned. For example, 386 metric tonnes of improved seeds were produced instead of the planned target of 220 metric tonnes. It should also be noted that the variance between estimated and actual totals was 0%, meaning that funds were 'shifted' from some activities to others. Thus, these variances do not necessarily pose a problem to the achievement of project objectives, more so if the project managers sought approval from AGRA. There were no reports of delayed or irregular release of funds for planned activities. Thus project implementation did not suffer any cash flow-related problems.

Table 4.3.19: An Extract from Jirkur Seed Producers Cooperative Society's 7th Quarter Financial Report (December 2009 to February 2010)

	Income		Expenditure				
Approved Budget Line Items	Total amount as per approved budget	Amount received to date	Previous Cumulative	Current Reporting	Cumulative Reporting to Date	(end of the	(explain +-
Project personnel costs	25000.00	20000.00	21028.00	1200.00	22228.00	(2,228.00)	(11.14)
Seed production	25000.00	23125.00	38026.00	8121.00	46147.00	(23,022.00)	(99.55)
Outreach	17000.00	16500.00	11215.00	0.00	11215.00	5,285.00	32.03
Field supplies & consumables	28000.00	28000.00	28308.00	1500.00	29808.00	(1,808.00)	(6.46)
Local travel and transportation	10000.00	10000.00	3803.00	1000.00	4803.00	5,197.00	51.97
Meetings and training costs	40000.00	30750.00	15360.00	0.00	15360.00	15,390.00	50.05
Communication	5000.00	4375.00	2875.00	500.00	3375.00	1,000.00	22.86
Equipment Rental:	-	-	-	-	-	-	
Vehicles	4000.00	3500.00	3200.00	400.00	3600.00	(100.00)	(2.86)
Storage	5000.00	4375.00	4032.00	667.00	4699.00	(324.00)	(7.41)
Machinery	5000.00	5000.00	4310.00	1070.00	5380.00	(380.00)	(7.60)
Other (land)	2000.00	1750.00	1725.00	0.00	1725.00	25.00	1.43
Project Monitoring & Evaluation	4000.00	3000.00	3797.00	0.00	3797.00	(797.00)	(26.57)
TOTAL DIRECT COSTS	**170000.00**	150375.00	137679.00	14458.00	152137.00	(1,762.00)	(1.17)
Bank charges & taxes	2000.00	1750.00	527.00	167.00	694.00	1,056.00	
Grand Total	172000.00	152125.00	138206.00	14625.00	152831.00	(706.00)	0%

4.3.2.5 Project Outcomes

Information needed to ascertain whether the project outputs discussed above have translated or are likely to translate into real outcomes/impacts on project beneficiaries (especially smallholder farmers) is not available. This is due to the inability of the evaluators to visit the project site in Borno State because of security concerns that came up at the time of the evaluation (see the section on 'Limitations' for details). Nevertheless, if the project has really succeeded in increasing poor farmers' access to improved seed varieties then, judging from lessons from Manoma Seeds Ltd's project, there is reason to speculate that there have been, or will be, some positive impacts on those farmers. In other words, increased access to and adoption of improved seeds are expected to lead to increased productivity and output in the production of the target crops (maize, rice, soybean and cowpea). This will in turn lead to an increase in food security, income and, by implications, the general well-being of the households of the farmers.

4.3.2.6 Project Sustainability

No direct project effects (positive or negative) on the environment were identified. Its economic and social sustainability will depend on the extent to which it contributes to job creation, agricultural productivity, income generation and poverty reduction in southern Borno State.

Since the grantee, Jirkur Seed Producers Cooperative Society, is relatively new and this project seems to be its first major attempt at seed production and sale, the long-term sustainability of the project can only be guaranteed if conscious efforts are made to nurture the organization. Interviews with the chairperson/spokesperson suggested that the organization currently faces a number of challenges, including inadequate funds (capital), lack of equipment (for planting and processing), lack of qualified personnel, failure of some agro-dealers and farmers pay in time for seeds bought on credit. When asked to describe how the organization of intends to achieve long-term sustainability now that the grant is over, the chairperson/spokesperson mentioned plans to operate like a full business company, source for a loan and sell shares to investors.

5.0 KEY FINDINGS, LESSONS AND RECOMMENDATIONS

5.1 Summary of Findings and Lessons

The key findings resulting from the preceding analyses, together with their policy implications, are discussed below.

5.1.1 Education for Africa Crop Improvement

i. Coherent national agricultural policy serves as an incentive for and enhances the implementation and attainment of the goals of agricultural projects. On the other hand, conflict between government policy, and project design and implementation has the propensity to give wrong signals to the intended beneficiaries/project actors and distorts information within the agricultural sector, especially those in project catchment areas.

ii. Within the perspective of Nigerian agriculture development framework, improved seed variety distribution gives preference to state-run distribution outlets whilst AGRA-PASS intervention under SEPA accommodates private sector for production and distribution within the crop production value chain.

iii. Improving human capacity in crop breeding is not sufficient for food security and poverty reduction. Other aspects of the agricultural production chain need to be included in programme design to ensure food security and poverty reduction among targeted smallholder farmers.

iv. The research work of the M.Sc. students did not just expose them to practical training in plant breeding and crop science; it also led to the production of genetic materials for varietal development that could fit into specific ecological zones.

v. Project activities without timeline have the risk of applying time ineffectively or losing sight of project goals and objectives.

vi. There could be possible misapplication of project funds (especially at Ahmadu Bello University). Savings made on some items were spent on other items.

vii. Probability of creating a “class society” at both Universities is quite high. Non-AGRA sponsored students assume sponsored students are given preferential treatment by the University.

viii. The assumption that the development of human capital through training in seed breeding will lead to improved productivity in crop production is weak and may not withstand stringent empirical analysis.

5.1.2 Fund for the Improvement and Adoption of African Crops (FIAAC)

i. The rice breeding project[5] at Ebonyi State University led to the development of 11 improved varieties of rice code-named IWA-1 to IWA-11. In terms of yield and maturity period, some of the new improved varieties (especially IWA-2, IWA-3, IWA-4 and IWA-6) perform better than two (2) popular varieties, FARO-52 and FARO-44, which are already adopted by rice farmers in Nigeria.

ii. However, the project did not include strategies to link it to commercial seed producers and dealers. As a result, the University's Biotechnology Research and Development Centre where the project was housed had taken the responsibility of creating awareness about the new varieties as well as producing and distributing the seeds to farmers. This is not likely to be sustained in the long term since that is not part of its core functions. Therefore, linking the project to private commercial operators (seed producing and selling companies) is critical for its long-term sustainability.

5.1.3 Seed Production for Africa Initiative (SEPA)

i. Both Manoma Seeds' project[6] and the rice breeding project at Ebonyi State University have shown that getting improved seeds to smallholder farmers is an effective means to helping them to increase food production, household food security and household income.

ii. Jirkur Seed Producers Cooperative Society is relatively new and this project[7] seems to be its first major attempt at seed production and sale. In addition, the society faces a number of teething challenges, including inadequate funds (capital), lack of equipment (for planting and processing), lack of qualified personnel, failure of some agro-dealers and farmers to for seeds in time. As a

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[5] Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice for Poor Resource Farmers in Nigeria

[6] Enhancing Access to Quality Improved Seeds for Better Livelihood of Resource-Poor Farmers in North Western Nigeria

[7] Community Seed Production to Increase Access to Improved Seeds for Small Scale Farmers in Southern Borno State of Nigeria

result, the long-term sustainability of the project can only be guaranteed if conscious efforts are made to nurture the cooperative society itself.

iii. In addition to the above, the Manoma Seeds' project has led to the following revelations:
   a. Agro-dealers are farmers' main source of information about improved seed varieties. This implies that agro-dealers' level of knowledge about improved varieties is an important determinant of the extent of farmers' awareness and subsequent adoption of those varieties.
   b. There is no significant variance between farmers' knowledge/awareness about the improved varieties and their adoption of those varieties. In other words, most of the farmers who know about the improved seeds have actually adopted them. It also shows that the single most important reason why farmers do not cultivate improved seeds is the fact that they do not know about them. This underscores the need to intensify awareness creation and education about improved seed varieties among the crop farming population (and obviously the consuming population).
   c. Although women play an important role in food production in Africa, participation in the project is dominated by men. For example, only 5% of participants in the 39 field days organized by as part of the project were women and all the interviewed out-growers, agro-dealers and farmers turned out to be women.

5.1.4 Other Findings

i. There were no conscious efforts to establish linkages between the five (5) expired projects. For example, there was no link between the rice breeding project at Ebonyi State University and the two seed production projects in North-Western Nigeria and southern Borno State, respectively. Neither was there a link between the two M.Sc. training projects, the rice breeding project and the two seed production projects. Such a linkage would have created some synergy in terms of contributing to agricultural productivity, food security and poverty reduction in Nigeria as a whole.

5.2 Recommendations

The following recommendations are made for addressing key issues that emerged from the evaluation.

5.2.1 Education for Africa Crop Improvement

i. There should be persistent efforts to influence Government of Nigeria and Sub-Regional Governments to pursue private sector-led investment into agriculture whilst government improves agriculture infrastructure including feeder roads linking food producing areas to market centres.
ii. Other aspects of the agricultural production chain – from seed production to marketing - need to be strengthened within the catchment areas of the training institutions in order to maximize the impact of the training.
iii. Students' research work should be subjected to further professional analysis and integrated into development of seed varieties. The outputs of such research should be linked to the seed production industry for testing and adoption.
iv. Efficient supervisory arrangement from the AGRA should be instituted and an efficient financial regulatory framework should be put in place to ensure sound financial management during project implementation.

5.2.2 Fund for the Improvement and Adoption of African Crops (FIAAC)

i. Steps need to be taken to commercialize the new improved varieties of rice developed by the breeding project at Ebonyi State University. The measures should include identifying and linking to the project commercial seed producers and dealers in its catchment area.

5.2.3 Seed Production for Africa Initiative (SEPA)

i. Agro-dealers should be given a greater role (and capacity) in increasing farmers' awareness and knowledge about improved seed varieties. This will go a long way to increase the adoption rate of such seeds by smallholder farmers and thus contribute significantly to increasing their productivity and income.
ii. In future, there should be conscious efforts to identify and encourage female farmers to participate in similar projects. As part of project design, AGRA could require grantees to demonstrate how they would ensure women's participation in their projects. This is necessary in view of the fact that women are critical stakeholders as far as food crop production, household food security and poverty reduction are concerned.
iii. To ensure long-term sustainability of the seed production and selling project, AGRA should help nurture and build the capacity of Jirkur Seed Producers Cooperative Society to become a viable business organization. Critical issues to be addressed in this regard include access to financial capital, acquisition of seed planting and processing equipment, human capacity (personnel) and the ability to recover in time monies for seeds sold out to agro-dealers and farmers.

5.2.4 Other Recommendations

i. In future, there should be conscious efforts to establish links between projects. For example, seed companies such as Manoma Seeds Ltd and Jikur Seed Producers Cooperative Society could be linked to the rice breeding project at Ebonyi State University both at the breeding stage and, more importantly, at the commercialization stage. Measures should also be taken to allow students sponsored to pursue post-graduate training to supplement what they learn in their respective departments with experiences and lessons from practicing seed breeders, producers and dealers.

5.3 Conclusion

The expired AGRA-PASS projects implemented in Nigeria have made appreciable inroads as far as improving agricultural productivity is concerned, not only in Nigeria but also within the West African sub-region. The attention on research and development, which is somehow a virgin area, needs be replicated by governments in the Sub-Region.

There should be collaboration among the actors within the agriculture industry to ensure that farmers have access to the technologies required to support modern agricultural practices. Farmers should be supported by education and certification programs that ensure they apply these technologies with care and only when required. Locally adapted seeds should be adapted over time to the specific micro-climates, soils, other environmental conditions, field designs, and ethnic preference indigenous to the exact area of cultivation.

It is the opinion of the Evaluation Team that the work carried out fully covers the scope of the assignment as defined in the in the Terms of Reference. Methodology was carefully designed to combine relevant literature and relate them to primary and secondary data for analysis and derive findings and recommendations. The analysis has been carried out in a rigorous way base on data available. It is our desire that this report will be useful for strengthening AGRA-PASS interventions in the West Africa Sub-Region

ANNEXES

Annex 1: Summary of five (5) expired AGRA-PASS Projects in Nigeria

Strengthening the M.Sc. Programmes in Plant Breeding, Seed Production and Plant Pathology in the

University of Ibadan.	
Implementing Organisation	University of Ibadan, Ibadan, Nigeria
National Policy Direction	Research and Development: Investment in Human Resource capacity to conduct research into planting and improved seed varieties for increase agricultural productivity and food security
AGRA Sub-Programme	Education for Africa Crop Improvement
Project Location	Department of Agronomy, University of Ibadan
Project Objective	Training of Agriculture Professionals in the fields of plant breeding, seed science, and plant pathology from the sub-region who master the competency in breeding of seed varieties that can withstand the biotic and abiotic stress for high productivity for farmers.
Project Period	January 2009 – December 2010
Main Contact Person	Dr. V.O. Adetimirin and Prof. H. Tijani-Eniola of Department of Agronomy, University of Ibadan
Sub-Grant Amount	US$394,042
Partnership for Training of Medium Cadre Plant Breeders and Seed Scientists for the West African Sub-Region, Nigeria, Ghana, Burkina Faso, Niger Republic, and Mali at the M.Sc. Degree level	
Implementing Organisation	Department of Plant Science, Ahmadu Bello University, Zaria
National Policy Direction	Research and Development: Investment in Human Resource capacity to conduct research into planting and improved seed varieties for increase agricultural productivity and food security
AGRA Sub-Programme	Education for Africa Crop Improvement
Project Location	Department of Plant Science, Ahmadu Bello University, Zaria
Project Objective	Provide advanced training to up to young Africans, particularly from the West African sub-region (Nigeria, Ghana, Burkina Faso, Mali and Niger Republic), in Master of Science Crop Breeding and Seed Science, and strengthen the capacity of the Plant Breeding Program in the Department of Plant Science of Ahmadu Bello University, in Zaria State of Nigeria, through updating of teaching and research facilities.
Project Period	December 2008 to December 2010
Main Contact Person	Dr. Mohammed F. Ishiyaku
Sub-Grant Amount	USD $ 363 390
Enhancing access to quality improved seeds for better livelihood of resource-poor farmers in North Western Nigeria	
Implementing Organisation	Manoma Seeds Limited
National Policy Direction	Institutional and marketing structures within the agricultural value chain/ Increase production of raw materials: Strengthening the value chain for the production of and distribution of improved seed varieties and small holder farmers produce to marketing centres. Nevertheless, Government's intervention is focus on state actors rather non-state (private sector) ones which is the focus of AGRA-PASS intervention.
AGRA Sub-Programme	Seed Production for Africa Initiative
Project Location	Funtua, Katsina State
Project Objective	Produce certified seeds of various crop varieties which will be disseminated to farmers at a reduced price in North Western Nigeria through a network of collaborators.
Project Period	
Main Contact Person	Mr. Amos Abba
Sub-Grant Amount	US$148,023
Community seed production to increase access to improved Seeds for small scale farmers in southern Borno State of Nigeria	
Implementing Organisation	Jirkur Seed Producers Cooperative Society
National Policy Direction	**Institutional and marketing structures within the agricultural value chain/ Increase production of raw materials:** Strengthening the value chain

	for the production of and distribution of improved seed varieties and small holder farmers produce to marketing centres. Nevertheless, Government's intervention is focus on state actors rather non-state (private sector) ones which is the focus of AGRA-PASS intervention.
AGRA Sub-Programme	Seed Production for Africa Initiative
Project Location	Biu, Borno State, Nigeria.
Project Objective	Strengthening the capacity of seed producers through a network of village seed associations in training, provision of foundation seeds, inputs, processing and storage facilities
Project Period	June 2008 to June 2010
Main Contact Person	Mr. Mohammed Wakawa
Sub-Grant Amount	US$172, 000
Breeding for high yielding stable drought tolerance and provision of quality seeds of rice for poor resource farmers in Nigeria:	
Implementing Organisation	Ebonyi State University in collaboration with National Cereal Research Institute (NCRI)
National Policy Direction	**Research and Development/Increase production of agricultural inputs:** The breeding of improved hybrids of rice seed varieties that feeds into the production process with the consequence of substituting the importation of rice, retention of foreign exchange and rural employment creation.
AGRA Sub-Programme	**Funds for the Improvement of and Adoption of Africa Crops**
Project Location	Abakaliki, Ebonyi State University
Project Objective	Developing a breed of rice variety which can withstanding stress, resistance to diseases and insect pest but performance with low application of external inputs (example fertilizer) within rainfed lowland and upland ecological zones
Project Period	2007 to 2010
Main Contact Person	Andrew Efisue (Plant breeder / geneticist)
Sub-Grant Amount	US$193, 270

Annex 2: Categories and numbers of respondents and data collection methods employed

Project	**Category and number of respondents**	**Data collection method**
Training of Plant Breeders and Seed Scientists **(Ahmadu Bello University)**	Project manager (1) Dean/Head of Dept (1) Beneficiary graduates (10)	Structured Interview Semi-structured key informant Structured Interview
Strengthening M.Sc. Programmes in Plant Breeding, Seed Production and Plant Pathology **(University of Ibadan)**	Project managers (1) Head of Dept of Agronomy (1) Beneficiary graduates (10)	Semi-structured, key informant interviews (guided dialogue) Semi-structured key informant Structured Interview
Breeding for High Yielding Stable Drought Tolerance and Provision of Quality Seeds of Rice to poor farmers **(Ebonyi State University)**	Project staff (including Head of Department but excluding Principal Investigator) (2) Participating farmers (3)	Semi-structured, key-informant interviews Semi-structured, key-informant interviews
Enhancing Access to Quality Improved Seeds for Better Livelihood of Resource-Poor Farmers in North Western Nigeria (Manoma Seeds Limited)	Executive Director (1) Out-growers (6) Agro dealers (20) Farmers (40)	Semi-structured, key-informant Structured interview Structured interview Structured interview
Community Seed Production to Increase Access to Improved Seeds for Small Scale Farmers in Southern Borno State of Nigeria **(Jirkur Seed Producers Co-op. Society)**	Chief Executive (1)	Structured, key informant interview

Annex 3: Summary of students of University of Ibadan and Ahmadu Bello University research findings

University of Ibadan		
Research Topic/Objective	**Summary of research problems**	**Summary research finding**
Topic 1: Heterotic Patterns of the Extra-Early Tropical Yellow Maize (Zea mays L.) Inbred lines under Striga Infestation and Drought in Nigeria. Objective: Classification of the 39 extra-early yellow-grained maize inbred lines under Striga infestation, drought and optimal growing conditions using line x tester analysis; Examine the discriminating ability of the three extra-early testers used; Examine the effect of research conditions/environments on heterotic patterns of the inbred lines; and Identify testcrosses with high yield performance and stability with tolerance/resistance to Striga and drought.	Limited knowledge on heterotic groups of extra-early maize inbred lines; Previous studies have looked at only one of the stress conditions (Striga and drought) but these stresses occur simultaneously in the savannah ecologies which have the potential for high maize production and productivity in Nigeria;	Classification of some of the extra-early maize inbred lines into heterotic groups under the three different research conditions (Striga, drought and optimal growing conditions) studied; Identify a good tester for the extra-early maize inbred lines which can be used to introgress genes for resistance/tolerance to Striga and drought into the lines; Identification of three hybrids which showed outstanding yield performance under Striga and drought for on-farm trial prior to their release to farmers in the region.
Topic 2: Botanic seed behaviour and meristem tolerance to cryopreservation in cassava (Manihot esculenta Crantz). Objective: Iinvestigating the amenability of cassava botanic seeds to cold storage, and the tolerance of cassava meristems to different cryogenic storage temperatures; and Facilitate the storage and wide-scale adoption of cryopreservation procedures for long-term conservation of the genetic resources of cassava in Africa.	Success in breeding often leads to genetic erosion which results from the incessant replacement of local landrace varieties with new improved cultivars.	Cassava botanic seeds were found to be orthodox, implying that seed storage can be implemented for cassava in order to allow for the maintenance of broad-based genetic diversity for breeding improved cultivars of cassava. Cassava apical meristems could tolerate the temperature of liquid nitrogen upon delayed thawing of cryopreserved meristems; Sub-zero temperatures such as -80 and -20oC were inimical to meristems; suggests that long-term maintenance of clonal germplasm of cassava is possible and becomes crucial if materials under in vitro storage are to be used directly as varieties by farmers.
Topic 3 Inheritance of Number of Days To Flowering in Maize (Zea Mays L.) of West and Central Africa Adaptation. Objective Investigating the genetics of earliness to flowering in maize inbred lines adapted to West and Central Africa.	Lack of understanding on development early maturing versions requires and the inheritance of maturity cycle.	plant breeding is the most appropriate strategies for developing early maturing versions of important maize varieties in the sub-region when these lines are used as source of genes for earliness.

Topic 4: Effects of Apical, Middle and Basal Vine Cuttings on Tuberous Root Yield of Sweetpotato (Ipomoea Batatas (L)Lam.) Objective To determine the effects of cuttings from different sections of the vines on tuberous yield of sweet potato; and Assessing Morphological characteristics of apical, middle and basal vine section.	Lack of information on conserving indigenous cultivars and accessions of sweet potato to ensure their availability when required for breeding and production purposes.	Enhancing soil fertility and healthy source of planting materials to be tested depends on location and seasonal condition; The apical vine section showed superior performance over middle and basal vine cuttings among 15 cultivars/accessions; High percentage survival, better root establishment and variation into marketable root sizes could serve as tool for decision making on income, profit margin, cost of production, evaluation, standard cost of sweet potato per kilogramme.
Topic 5 Vitro Screening of Experimental Maize Hybrids for Aspergillus flavus Contamination and Aflatoxin Production. Objective Assess aflatoxin production in maize hybrids bred for low aflatoxin accumulation at harvest; and Assess aflatoxin production in maize hybrids under in vitro conditions using artificial inoculation.	kernel and ear rot caused by Aspergillus spp are diseases of serious concern as a result of the mycotoxin specifically aflatoxins which they produce in infected maize grains.	aflatoxin resistant maize hybrids will provide potential new sources of resistance that can be used to introduce resistance into marketable corn hybrids in maize production; and improve export value of produced maize and save man and his livestock from the risk of effects of aflatoxin.
Topic 6: Screening for Resistance to Cowpea Aphid (Aphis Craccivora Koch) in Wild and Cultivated Cowpea (Vigna Unguiculata L. Walp.) Accessions. Objective: Accessinging the level of resistance to aphid in cowpea; and identify new sources of resistance of cowpea to aphid	aphid resistant varieties had been developed, resistance has recently broken down.	Cowpea is an important crop as a source of income and proteins for small-scale farmers especially in the West and Central Africa; Low cowpea yields is attributed to several biotic and abiotic factors. and TVNu 1158, a wild cowpea cross-compatible to cultivated cowpea was found to have high level of tolerance to aphid. The introgression of the tolerance in it will provide farmers with low cost method of controlling the pest.
Topic 7: Evaluation of Cowpea (Vigna unguiculata (L.) Walp.) germplasm for resistance to multiple virus infections. Objective The objective of this research was to identify sources of resistance to single and mixed virus infections by CMV and SBMV for use in cowpea varietal improvement.	Low cowpea yield due to abiotic and biotic factors.	With improved high yielding varieties available to farmers will improve food security, raising income levels and reducing poverty in cowpea growing areas.

Ahmadu Bello University		
Topic 1: Genetics of Resistance to Aspergillus Flavus in Groundnut (Arachis Hyogaea) Objective To determine the nature and mode of inheritance of resistance to Aspergillus flavus among four groundnut genotypes	Aspergillus flavus and aflatoxin contamination is a serious problem of groundnut production, consumption and marketing in most African countries,	The development of resistance varieties of groundnut will help in curbing the menace and improve the livelihoods of most farmers growing groundnut.
Topic 2: Genetic Analysis of progenies from diallel crosses among eight genotypes of different maturity period of Maize Objective Assessing the number of days to maturity and a yield performance of genotypes of maize from different maturity periods ; and how to determine and combining ability from the generated F1s' in order to come of with a better cross combination.		An improved hybrid will be produce, which are higher in yield and matured earlier than theirs' parents
Topic 3 Genetics of Thrips (Megalurothrips sjostedti) Resistance in Cowpea (Vigna unguiculata (L.) Walp.) Objective To elucidate the mode of inheritance of resistance to flower bud thrips in cowpea and to test the allelism between the resistance sources.		Resistant gene identified can be incorporated into susceptible cultivars to minimize the dependency of toxic chemicals to control thrips.
Topic 4 Inherirance of Grain and Fodder Yields and Yield Components in Cowpea (Vigna Unguiculata (L.) Walp). Objective To determine genetic basis of grain and fodder trait in cowpea To determine the mode of inheritance of fodder trait in cowpea; and To suggest breeding procedures that an aid selection of developing high varieties with high grain and fodder yield.		
Topic 5 Inheritance studies on some quantitative traits on CIMMYT maize lines.		

Topic 6 Genetic Analysis of progenies from diallel crosses among eight genotypes of different maturity period of Maize Objective Determining number of days to maturity and a yield performance of maize genotypes from different maturity periods and how to determine theirs' combining ability from the generated F1s' in order to come of with a better cross combination.	Long gestation period of genotypes of maize in Nigeria	An improved hybrid will be produce, which are higher in yield and matured earlier than theirs' parents.
Topic 7 Heterosis and Combining Ability for Agronomic and Malting Quality Traits in Some Sorghum Crosses(Sorghum Bicolor (L)Moench) Objective To generate hybrids of sorghum using A-Lines; To Evaluate a comparatives expression of Heterosis among the F1 Hybrids Generated; and To estimate the correlation between the malting quality and yield.		The hybrids generated are high yielding, This will help in commercial production of sorghum; The hybrids with good malting quality is recommended to the brewery industry for the production of alcoholic and non-alcoholic beverages.

Annex 4: Level of achievement of project results/outputs and outcomes

Objective 1: Train 10 M.Sc. (7 male and 3 female) in plant breeding, seed science and plant pathology.					
Results/Outputs			**Outcomes**		
Expected	**Achieved**		**Expected**	**Achieved**	
	University of Ibadan	**Ahmadu Bello University**		**University of Ibadan**	**Ahmadu Bello University**
10 agricultural professionals acquire theoretical competence in Plant Breeding and Seed Science by December 2009	14 students (10 sponsored by AGRA) acquired M.Sc. in Plant Breeding	10 students sponsored by AGRA acquired M.Sc. in Planting Breeding	Increased number of professional Plant Breeders trained with AGRA funding working in the agricultural sector in West Africa		
10 agricultural professionals acquire experience and know-how in conduct of Plant Breeding and Seed Science research and development by December 2009			Increased number of high yielding improved sorghum, maize cowpea millet rice seed varieties for small-holder farmers		
Objective 2. Improve the teaching, learning and research environment with appropriate facilities for plant breeding, seed science/production and plant pathology					
Access to learning materials by teachers and students improved	Number computer laboratory for access to planting breeding and crop science materials constructed		Improved teaching and learning environment within under the partnership with AGRA		
2.2 Learning and research facilities conducing environment put in place					
2.3 Staff capacity in the teaching and research in Planting Breeding and Crop Science improved.					
Curriculum for teaching and research in plant breeding and seed science improved					
Document results that provide solutions to problems confronting farmers					

Annex 5: Research areas of AGRA sponsored students

University of Ibadan				
S/N	**Name**	**Country**	**Crop**	**Research Project Topic and specialization**
1	Alexander Wireko KENA	Ghana	Yam	Optimization of cryopreservation techniques for yams (*Dioscorea* spp) and cassava (*Manihot esculentus*) Specialization: Plant Breeding
2	Abdou SOULEYMANE	Niger	Cowpea	Genetics of resistance to aphids (*Aphis crassivora*) in cowpea Specialization: Plant Breeding
3	Siaka DEMBELE	Burkina Faso	Cowpea	Evaluation of cowpea accessions for sources of resistance to multiple virus infection Specialization: Plant Breeding
4	Ijeoma Chinyere AKAOGU	Nigeria	Maize	Heterotic patterns of extra-early tropical maize yellow inbred lines under striga and drought Specialization: Plant Breeding
5	Adesike KOLAWOLE	Nigeria	Maize	Inheritance of time to flowering in maize of West and Central Africa adaptation Specialization: Plant Breeding
6	Mustapha Danjuma ISAH	Nigeria	Sweet potato	Effects of different planting materials on yield of sweet potato Specialization: Seed Production
7	Raufu Olabisi KOLAWOLE	Nigeria	Cassava	Screening of cassava genotypes for improved establishment ability Specialization: Seed Production
8	Muntala ABDULAI	Ghana	Tomatos	Molecular characterization and pathogenicity of root-knot nematodes on the growth, development and yield of four tomato varieties Specialization: Plant Pathology
9	Florence Tochi OBANI	Nigeria	Maize	*In vitro* screening of experimental maize hybrids for aflatoxin production and contamination Specialization: Plant Pathology
10	Oluwatosin Z. AREGBESOLA	Nigeria	Maize	Synergistic effects of aflasafe and resistant hybrids in aflatoxin reduction in maize Specialization: Plant Pathology
Ahmadu Bello University				
	BadiruEvillaOlabayi (F)	Nigeria	Sorghum	Estimation of heterosis for seed quality and other agronomic traits in sorghum (Sorghum bicolor (L) Moench). Specialization: Plant Breeding
	Richard Dormatey (M)	Ghana	Cowpea (Thrips)	Genetics of thrips (Magalurothripssjostedti) resistance in cowpea (Vignaunguiculata (L.) WALP.) Specialization: Plant Breeding
	HabibouMaïnassara (M)	Niger	Millet	Yield evaluation of hybrids and their parents in pearl millet Specialization: Plant Breeding
	Aminu Ibrahim	Nigeria	Maize	Genetic analysis from diallel crosses among eight genotypes of

	Kurawa (M)		(Drought tolerant)	different maturity periods of maize [*Zea mays L.*]. Specialization: Plant Breeding
	HassaneFodiBalkissa (F)	Niger	Cowpea	Inheritance of grain and fodder yield in two land races of cowpea Specialization: Plant Breeding
	Hajara Adam (F)	Nigeria	Maize	
	IsmailaAbubakar(M)	Nigeria	Rice (blast)	Genetic studies of blast *{Pyriculariaoryzae}* resistance in rice {*Oryzasativa*}. Specialization: Plant Breeding
	YaouWahamadou Aminou (M)	Niger	Sorghum	Characterization for Sorghum Midge Resistance (*Stenodiplosissorghicola*) in Niger Republic Specialization: Plant Breeding
	Mustapha ArzikaRimau (M)	Nigeria	Maize	Genetic Analysis of Resistance to Stem Borer (*Sesemiacalamistis* and *Eldanasaccharina*) in Maize (*Zea mays*) Specialization: Plant Breeding
	Deborah Bala (F)	Nigeria	Groundnut	Genetics of resistance to *Aspergillusflavus* in groundnut

Annex 6: Locations & Attendance of Training Workshops Organized by Manoma Seeds Ltd on the Use of Improved Seeds

Date of Training	State	Villages	Male Attendance	Female Attendance	Total
8/5/2009	Kano	Gwarzo	6	-	**6**
9/5/2009	Kano	Tudun wada	25	-	**25**
18/05/2009	Katsina	Dandume	19	2	**21**
19/05/2009	Katsina	Dike	34	6	**40**
21/05/2009	Jigawa	Ringim	18	-	**18**
22/05/2009	Jigawa	Hadejia	36	1	**37**
25/05/2009	Zamfara	Dankawa	40	2	**42**
26/05/2009	Zamfara	Tsafe	28	-	**28**
28/5/2009	Kaduna	Makarfi	24	-	**24**
10/2/2010	Katsina	Malumfashi	132	-	**132**
15/02/2010	Katsina	Goya	68	2	**70**
20/02/2010	Katsina	Tsiga	141	8	**149**
24/02/2010	Katsina	Danja	114	3	**117**
27/02/2010	Jigawa	Birnin Kudu	107	-	**107**
8/3/2010	Jigawa	Rimgim	89	1	**90**
13/03/2010	Kaduna	Anchau	54	3	**57**
17/03/2010	Kaduna	Kwasam	128	18	**146**
18/03/2010	Kaduna	Makarfi	110	15	**125**
232/03/2010	Kaduna	Dan alhaji	112	22	**134**
24/03/2010	Kano	Rano	91	2	**93**
27/03/2010	Kano	Garko	57	-	**57**
30/03/2010	Zamfara	Bukwiuni	78	-	**78**
2/4/2010	Zamfara	Gurbin zaki	60	-	**60**
6/4/2010	Kebbi	sakaba	46	2	**48**
Total	**6**	**15**	**1,666**	**87**	**1753**

Source: Manoma Seeds Ltd

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