Extension of Improved Rice Production Technologies to Rural Farmers – Nigeria

Implementing Institution: Michael Okpara University of Agriculture

Head: Professor Ikenna Onyido (Vice-chancellor)

Details of Institution:
Address: Umudike, PMB 7267, Umuahia, Abia State, Nigeria
Tel.: (+234) 082 440555
Fax: (+234) 082 440555
E-mail: vicechancellor@mouau.edu.ng
Website: www.mouau.edu.ng

Implementation Period: 2000 to 2004

Costs: The cost of phase 1 was approximately $2,150, which was provided by the International Institute of Tropical Agriculture (IITA) as part of the United States Agency for International Development (USAID)/IITA project, “Accelerated Dissemination of Improved Agricultural Technologies in Nigeria (ADIATN)”. The cost of phase 2 was approximately $3,220, which was provided by the Federal Ministry of Environment, Abuja, Nigeria.
SUMMARY

Farmers in Afikpo, Ebonyi State, Nigeria, traditionally grow local varieties of rice that are tall, mature at a late stage and have a low yield. To help to improve the yield of this staple crop, the Michael Okpara University of Agriculture has established a memorandum of understanding (MoU) with a group of farmers called Bountiful Harvest. Within the framework of the MoU, the university provides the farmers with technical assistance and, with funds provided by the International Institute of Tropical Agriculture (IITA) and the Federal Ministry of Environment, improved technologies for rice production.

A project was designed that involved training, field demonstrations and evaluation of the available choice of technologies by the farmers. The university multiplied and supplied seeds of improved rice varieties and fertilizers, while the farmers decided the dates and times of activities.

An initial training workshop focused on techniques for the production of improved rice varieties, soil and water management in rice production, and rice processing. The training emphasized that the farmers would make a larger profit by growing rice varieties with a high yield rather than the unimproved local varieties that are cultivated traditionally. How the water level in rice paddies can be controlled by bunding (the creation of barriers to prevent overflow), making it possible to grow short varieties that have high yields, was also explained to the farmers. Bunding controls the water level within the plots and helps to retain applied fertilizers. The use of improved processing techniques as a means to enhance product quality was also discussed. Subsequent training sessions were planned to precede specific farm operations, such as nursery establishment, transplanting, fertilizer application, weeding, scaring of birds and harvesting.

The first year of the project was used for training, field demonstrations, and evaluation of the improved production technology by the farmers. Demonstration sites were located on the farmers’ own farms. Immediately before harvesting, a field day was organized during which farmers compared the two improved varieties with the local variety. On the basis of this assessment, the farmers chose which varieties to grow the following year.

In the second year of the project, the farmers were supplied with the rice varieties of their choice as well as fertilizers. University staff visited the farmers at regular intervals during the growing season to offer technical assistance.

Most of the farmers in the group have since stopped growing the local varieties, their own experience having shown that the improved varieties give a higher yield than the local variety. The results of the project demonstrated that the life of the rural farmer is linked to his/her socio-cultural activities. For example, on “Eke market days”, people do not go to their farms; any farming intervention scheduled in the village on such days is likely to fail as the observance of such days is
enforced by local regulations. Such constraints must be recognized and respected if farmers are to show sufficient interest in the technologies being introduced to them.

**Background and Justification**

Nigeria has a population of about 150 million and rice has become a staple food that is eaten by most families on a daily basis. Rice is grown in virtually all States of the federation in either lowland or upland ecologies. However, the national average yield for traditional varieties of rice in the fields of small farmers is only about 2 tonnes per hectare compared with about 4 to 6 tonnes per hectare for improved varieties.

Southeastern Nigeria is characterized by a high population density and agricultural land is limited owing to competition from other non-agricultural needs, e.g., housing, road construction and other infrastructural development. A potentially viable option for increased food production in the region is agricultural intensification using improved crop varieties, improved practices for crop production, improved techniques for soil and water management, and agrochemical inputs.

Rural areas in southeastern Nigeria are populated by village communities whose livelihoods depend on subsistence farming. Owing to harsh economic conditions, declining productivity of natural resources and urbanization, many men seek employment in urban centres and the rural communities are now dominated by women and children. Agricultural activities have thus become the responsibility of women, who manage production, processing and distribution activities in many rural areas, including Afikpo, Ebonyi State.

Farmers in the Afikpo area traditionally grow unimproved varieties of rice. Their yields are usually low, keeping the farmers at a subsistence level of production. The topography of the area makes for wide valleys and deep swamps in which rice is typically grown. Traditionally, farmers in the region practice mixed cropping. In swamp fields, this is achieved by making mounds on which a mixture of crops is planted, rice being planted in the furrows between the mounds (fig. 1).

Good agricultural land that is suitable for rice production abounds in Nigeria, but the country depends largely on imports to meet its needs as local production is low. Improved technologies for rice production exist, but the majority of the farmers still use traditional

![Figure 1](image.png)

**Figure 1** | Traditional construction of mounds on which arable crops will be grown, separated by furrows planted with rice.
techniques. All the efforts and resources committed by research institutions to the development of new agricultural technologies will be wasted if these technologies are not adopted by farmers. The adoption of improved production technologies is particularly important for African agriculture in this era of globalized economies. To harness the rich agricultural potential of the area, to promote local rice production and to reduce imports of food crops that can be produced locally, improved technologies of rice production were extended (disseminated) to a group of farmers in Afikpo.

Experience has shown that, in many cases, the low rate of adoption of certain agricultural technologies is attributable to poverty. It was hypothesized that effective extension of a technology could be achieved by addressing the economic constraints of the farmers. In this project, this aspect was taken into consideration by providing all purchased inputs and leaving the proceeds of crop sales to the farmers. The aim of the project was to convince farmers that the improved technology was more profitable than traditional practices. Thus it was expected that, once convinced, farmers would adopt the new technologies and even invest part of their increased income in sustaining the practices.

The main issues involved included fashioning a strategy that reduced or eliminated the known constraints (those perceived by farmers as potentially having a negative effect on the livelihoods of their families) to the adoption of agrotechnologies and that took into consideration the socio-cultural factors (e.g., days when farm activities are permitted in the community) that significantly influence the lives of people in rural areas.

**Description**

The goal of the project was to increase rice production, reduce rural poverty and enhance the welfare of farmers. The specific objectives were to:

- introduce high-yielding and early-maturing varieties of rice to farmers; and
- train farmers in sustainable soil- and water-management practices and improved techniques in rice-production and rice-processing procedures that increase market-ability and maximize returns.

**Multiplication and Distribution of Rice Seeds and Provision of Training**

The first phase of the project, "Dissemination and multiplication of agricultural technologies in Nigeria", began in June 2000 with rice being specifically designated as the crop of interest. Following the approval of the project proposal by the International Institute of Tropical Agriculture (IITA), the research team from Michael Okpara University of Agriculture met and discussed the approaches that would achieve the twin mandates of rice multiplication and dissemination (extension) of improved technologies for rice production. Contact was made with the
National Seed Service (NSS), Umudike, Nigeria, from which seeds of improved varieties of rice were purchased.

The rice varieties selected for this project were Federal Agricultural Research Oryza (FARO) release numbers 44 and 52, generally referred to as FARO 44 and FARO 52. Unlike traditional varieties that are typically more than 1 metre tall, have a long growth and maturation period (five to six months) and low yield (1.5-2.0 tonnes per hectare), the improved varieties are shorter (less than 50 centimetres), are responsive to high doses of fertilizer, have a high yield (3.5-5 tonnes per hectare) and are short-duration crops that may provide three harvests per year. Before the release of the FARO series of varieties, care was taken to evaluate nutritional as well as agronomic characteristics and qualities to ensure that any new releases were improvements on existing varieties.

At the request of the research team, the National Cereals Research Institute (NCRI), Amakama Substation, approved the establishment of a multiplication farm in the team’s paddy field at Bende, Abia State. The seeds were multiplied for distribution to farmers in 2001.

At the planning stage, the research team agreed that a good strategy to encourage adoption of the technology would include training sessions, demonstration plots, evaluation of crop performance by farmers, the free supply of purchased inputs such as improved seeds and fertilizers, and soil testing and fertilizer advisory services.

Early in 2001, the team started to arrange meetings with farmers in Afikpo. This was done via the intermediary of Bountiful Harvest, a registered non-political and not-for-profit development organization that provides self-help support to village communities in Africa. Bountiful Harvest focuses on agricultural and economic development directed towards alleviating poverty, enhancing the conservation of natural resources and improving community health. The organization collaborates with local and international educational and research institutions that provide expertise in training and the development of locally designed projects to effect changes in resource management and improve food production and nutrition. The goal of Bountiful Harvest is to achieve sustainable self-reliance and its primary target populations are women, youth and children. In this project, all the farmers were members of Bountiful Harvest.

Meetings between staff at Michael Okpara University of Agriculture and representatives of Bountiful Harvest culminated in their agreeing on the date for a training workshop on improved techniques for the production of rice. The training workshop addressed the following:

- techniques for the production of improved rice varieties. This aspect of the training highlighted the benefits of improved varieties over unimproved ones. It also addressed aspects of crop husbandry, including nursery practices, transplanting techniques, weeding practices,
fertilizer application, scaring of birds and timely harvesting;

- soil and water management in rice production. This presentation addressed water management in the field production of rice, stressing the need to control water levels with bunds. Soil management practices, including land preparation and fertilizer application, were also discussed; and

- rice processing. This presentation stressed the need for proper procedures to ensure high-quality products and gave advice on how to improve the post-harvest quality of the rice.

Also in 2001, rice seeds multiplied the previous year and fertilizers were distributed to participating farmers. The farmers grew the seeds on their own farms and the research team paid regular visits to offer technical advice. Soil samples were collected from the farmers’ fields and subsequently analysed. As the project was coming to an end, the research team drew up another proposal to continue the project in light of the enthusiasm of the farmers. The continuation of the project was approved in late 2002.

Activities for 2003 included a field demonstration that started with nursery establishment while seed multiplication was conducted on-station at Bende on land made available by the National Cereals Research Institute. Working with the farmers, the research team established the nursery, cleared vegetation from the demonstration field, prepared the land, constructed bunding, transplanted the seedlings, weeded the plots, applied fertilizer and tended the crop to maturity. For the purposes of the demonstration, three varieties of rice were planted: FARO 44, FARO 52 and a local variety indicated as R.5 as a control. During land preparation, the research team convinced the participating farmers to plant in land plots instead of the traditional technique of planting in furrows between mounds (figs. 1 and 2). At the transplanting stage, a demonstration was made of the use of a marked rope to achieve the optimum plant population (fig. 2). Field visits were scheduled at fertilization, weeding and bird-scaring stages, and crop performance was observed. When the crop was ready for harvesting, a field day for farmers was organized. The programme for the day included a field evaluation of the performance of the different rice varieties, an assessment of the grain and seed produced, and sensory evaluation of the cooked rice (fig. 3 and table). At the end of the exercise, farmers were allowed to choose the varieties with which they would be supplied in the next cropping season (fig. 4).
In 2004, farmers were supplied with the rice varieties of their choice as well as fertilizers. They were also given recommendations for fertilizer application based on the soil analysis of the previous year. The research team was confident that, with training and demonstrations, the farmers would be better equipped to adopt the new practices. The research team paid regular visits to the farmers until the end of the project in 2004. At the formal meeting marking the end of the project, focused group discussions were held to assess the performance of the project. The discussions revealed that the farmers:

- were grateful for the improved rice varieties supplied and happy to have been made aware of their properties of high yield and early maturation;
- indicated that FARO 44 and FARO 52 were the only improved rice varieties that they had seen or known by name;
- confirmed the high yield of the improved seeds relative to that of the local varieties; and
- expressed their willingness to continue to grow the improved varieties because of the qualities that they had observed first-hand.

Thus the project achieved its objectives, namely, to introduce high-yielding and early-maturing varieties to the farmers, train and demonstrate improved techniques in rice production, multiply improved rice varieties, supply farmers with high-quality rice seeds and fertilizers,
and facilitate the adoption of improved technologies for rice production.

**Patenting and Commercialization**

Most of the farmers who participated in the project have continued to grow the improved varieties and have increased their income by selling their excess production.

**Partnerships**

Phase 1 of the project was funded by the United States Agency for International Development (USAID) and coordinated by IITA. Phase 2 of the project was funded by the Federal Ministry of Environment, Abuja.

The farmers who participated in this project were members of Bountiful Harvest. On the official register of the group, there were about 150 members from different villages. For the purposes of this project, 30 farmers were selected, two thirds of whom were women.

The farmers were provided with technical assistance by Michael Okpara University of Agriculture, Umudike.

**Replicability**

The relevance of this innovative experience is that it can be replicated in other areas in Africa where circumstances are similar, i.e., where improved varieties and suitable training can be used to provide a higher-yielding alternative to traditional growing practices and traditional varieties.

Training was held to impart knowledge and skills to the participants, who were largely illiterate and lacking substantially in knowledge of modern production techniques. The field demonstration was a skill-acquisition technique that showed the practical steps in rice-crop husbandry. Provision of purchased inputs (rice varieties, fertilizers) is important for resource-poor farmers who may not be able to afford improved technologies.

With these major constraints removed through training, field demonstrations, the free supply of purchased inputs and soil advisory services, it would be possible and practicable to replicate this experience, especially in areas where farmers are severely lacking in financial resources. In this bottom-up approach, the farmers themselves selected the varieties to grow after field and post-harvest evaluation of the different varieties and chose the technologies to adopt. This is a confidence-building approach to technology transfer.

The research team is also considering the publication of a monograph that will document the strategy adopted in this study. This will enable the approach to be placed in the public domain and for public perception to be evaluated.
POLICY IMPLICATIONS

Field experience in this project clearly showed that there are abundant natural resources for agricultural production that could be exploited in Afikpo but the cost of developing these resources is beyond the means of rural farmers. For example, the distance from some fields to the nearest motorable road may be up to seven kilometres. Construction of roads by the government would facilitate transport of farmers and their produce and improve accessibility. There is a good spread of agricultural development projects across the country, the staff of which serve as agricultural extension officers. However, the study showed that most of the crops in farmers’ fields in Afikpo are unimproved crop varieties. Therefore, there is a need to strengthen the agricultural development projects and make them more effective in extending improved agricultural technologies to rural areas.

IMPACT

At the beginning of the second phase of the project, it was discovered that most of the farmers had substantially replaced their local varieties with one of the improved varieties introduced to them. As of 2003, one of the farmers had completely replaced local varieties and planted his farm with more than two hectares of FARO 44. A planting spacing measuring 20 centimetres by 20 centimetres had been recommended, but by the end of the project, the farmers indicated that they had paid a higher rate for employing labourers to space crops more closely. That the farmers were still growing the improved varieties and that they were willing to pay a higher rate for labour are good indicators of the positive impact of the introduced technology.

During the course of the project, university staff developed a strong rapport with the farmers, who have provided testimonies to the higher yields and increased income obtained from growing the improved varieties. These are good reasons for the farmers to continue with the improved technologies for rice and an assurance that the impact of the introduced technology will be sustained. Among the special circumstances that made the experience successful is the determination of the research team to make contact with the farmers both as a group and individually. For example, when the research team insisted on collecting soil samples from farmers’ fields, the farmers maintained that it would not be possible because of the difficult terrain and the lack of good roads and they were surprised that the research team was prepared to trek several kilometres into their farmland to collect samples. Second, supplying these resource-poor farmers with high-quality seeds and fertilizers at no cost and leaving all proceeds at harvest for the farmer were very encouraging for the farmer and an assurance that the aim of the project was to improve the farmer’s welfare.
Lessons Learned

Accessibility to most of the farms was difficult but to ensure that the project succeeded, the research team had to follow the farmers, trekking long distances when the need arose. The research team learned that there were specific days when people go to their farms and days when they go to the market or engage in other socio-cultural activities. These schedules are rigidly followed such that farming activities fixed without consideration of these other commitments will fail. There was a realization that the research team first had to learn from the farmers before it could teach them and that to communicate effectively, it was necessary to understand local terminology. For example, in the study area, the local unit by which land area is measured is the “portion”: local people talk of one or more portions of land rather than hectares. Again, the local unit by which weight is measured for commodities such as rice, beans and garri (fermented cassava tubers) is “basin” rather than kilogramme.

Future Plans

The collaboration with Bountiful Harvest has been fruitful and will be continued if additional funds become available. For farmers who have larger tracts of land in the deep swamp areas, making bunds that can effectively check floods at the peak of the rainy season is a technical challenge that remains to be solved.

Publications


The outcome of this study was also presented by P. I. Okocha at the Nigerian Universities Research and Development Fair in Abuja, Nigeria, in December 2005 under the title “Extension of improved rice production technologies to farmers in Afikpo, Ebonyi State”.

Case Study Prepared by:

Damian O. Asawalam
Michael Okpara University of Agriculture, Umudike, PMB 7267, Umuahia, Abia State, Nigeria
Tel.: (+234) 803 744 6599 (mobile)
E-mail: aswaldo@yahoo.com
Project Participants:

P. E. Okorie, Michael Okpara
University of Agriculture, forester and environmentalist: Director of University Consultancy Services when the project started and involved in the planning and execution of the first phase of the project, serving as the team leader.

P. I. Okocha, Michael Okpara
University of Agriculture, rice breeder and agronomist: Involved in all stages of the planning and execution of the project and team leader for the second phase of the project.

D. O. Asawalam, Michael Okpara
University of Agriculture, soil scientist: Involved in developing the proposals for the two phases of the project and participated in the planning and execution of the project.