FARMERS' PARTICIPATION IN *EX-SITU* CONSERVATION OF INDIGENOUS FRUIT TREES IN SOUTHERN NIGERIA

Anegbeh, P. O., Tchoundjeu, Z., Anuforom, B. C., Ukafor, V. and Usoro, C.

ABSTRACT

Farmer Participatory Research (FPR) is a new approach, which the World Agro forestry Centre (ICRAF), International Institute of Tropical Agriculture (IITA), NGOs and farmers are using to effectively design and implement community-based conservation project in Nigeria prior to ex-situ conservation. Socioeconomic and market surveys were conducted and base-line data collected in seven communities. Results from seven pilot sites in Southern Nigeria indicate that community farmers readily adopted tree domestication, increasingly acquired skills, easily established community nurseries, enthusiastically identified and conserved economic fruit trees, including Irvingia gabonensis, Irvingia wombolu, Dacryodes edulis, Chrysophyllum albidum, Garcinia kola, in the rural communities. The participatory approach, which involves rural farmers direct involvement in decision making and in the development of suitable practices, is not only effective in reducing genetic loss, but also increases availability and yields of indigenous fruit trees (non-timber forest products).

Key words: farmers participation, ex-situ conservation, indigenous fruit trees

INTRODUCTION

Forest fruit trees are currently overexploited in their natural habitats, due to demographic increases, unsustainable farming systems, absence of livelihood option, intensive human pressure on forests, and poverty. The swiftly declining fruit trees pose threats not only to food security, but also to wildlife, environment, traditional medicine and

human beings. Indigenous fruit trees, which provide cheap sources of proteins, vitamins, oils, are also valued for their medicinal properties (Ayuk *et al.*, 1999). Various parts of the trees have been used in treating many ailments, such as skin disease (*Dacryodes edulis*), black coated tongue (*Chrysophyllum albidum*), cough and fibroid (*Garcinia kola*) etc. The leaves of the trees are also fed to livestock. Past research has shown that sustainable systems, such as participatory tree domestication, *in-situ* conservation, *ex-situ* conservation, enrichment planting, slash-and-mulch, are very effective in reducing genetic erosion (Castillo, 1995; Bawa and Seldler, 1998; Weber *et al.*, 2001). Conservation of plant germplasm is the safeguarding of plant genetic resources in the form of seeds, buds, and whole plant for present and future use in arboretum (Anegbeh *et al.*, 2002), field gene bank, seed bank etc.

Ex-Situ conservation is the process of protecting an endangered species of plant or animal by removing it from an unsafe or threatened habitat and placing it or part of it under the care of humans. *In-Situ* conservation means "on-site conservation", which is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators.

Current *et.al.*, (1995) reported that few of the sustainable practises are actually adopted by farmers, mainly because farmers do not realize the actual genetic loss, or project activities are not designed with the involvement of local communities, or programmes are either not suitable for the local conditions or not addressing the users' needs. An effective method for collecting and conserving their germplasm is by involving rural communities usually by participatory approach. Participation of rural farmers, in germplasm collection and conservation, has emerged as an appropriate approach to rural development.

As most acute poor households in Nigeria are concentrated in rural communities, and the livelihoods of these people are largely determined by the sustainable utilization of forest and natural resources, it means that a strong link exists between natural resources conservation and

sustainable livelihoods. The objective of the study was to develop appropriate technologies for multiplying commercially elite materials of *indigenous* fruit trees and enhancing germplasm conservation through participation of rural communities and other stakeholders. The results obtained would provide insight into the role of rural communities in conserving economic fruit trees (non-timber forest products).

METHODOLOGY

A participatory approach and socioeconomic surveys, which spanned from 1999 to 2000, from seven communities in Imo, Akwa Ibom, Oyo and Ogun States in Nigeria was used. Focus group discussion (FGD), key informant interviews, and direct observations were used to collect data (Nwagwu, 2003). The seven poor communities, which most need intervention, comprise Ilile, Umonu, Umoso (Latitude $05^0 18'75N$ Longitude $06^0 53'47E$), Ikpe, Ibiaku Ikot Edet (Latitude $05^0 09'19N$ Longitude $07^0 46'35E$). Others are Olubi/Mamu (Latitude $07^0 05'44N$ Longitude $03^0 54'64E$), and Ijawaya (Latitude $07^0 55'46N$ longitude $04^0 00'61E$) were visited and the proper coordinates in each community were determined using Global Positioning Systems (GPS).

Information was sought and obtained using questionnaire-interaction method and direct observation. Clear statement of targets and benefits to partners was given to participating farmers. The survey team consisted of two Scientists from ICRAF, two extension officers from ADP, two representatives of NGOs, four students of forestry and agricultural extension from Rivers State University of Science and Technology and University of Ibadan, and seven farmers' representatives. One of the students had command of Ibo language, one Annang language, and the others Yoruba language. Households were systematically visited and asked to present and discuss their knowledge and experience on non-timber forest products' losses, and socioeconomic constraints to fruit trees conservation. Innovative farmers, both men and women, took part in the study. The socioeconomic component and baseline data gathered were analyzed to prioritize fruit trees.

Results of the socioeconomic surveys were used to design and implement decentralized germplasm collection project activities, which features *ex-situ* conservation in seven rural communities. Participatory approach was used to design activities and to reduce conflicts. Participants, which were drawn from ICRAF, IITA, Universities, Private Sector, NGOs, ADP, Village Groups, Local Communities amended unsustainable farming systems in the communities and disseminated sustainable agro forestry technologies to the affected communities in response to their changing realities (users' needs). Market surveys, which focused on major markets in Southern Nigeria for the sale of the five fruit trees, were conducted.

A three-day practical training covering nursery development, germplasm collection, vegetative propagation, tree planting, germplasm conservation, and environmental awareness was organized for all farmers and stakeholders in order to build capacity for the farmers. Communication and extension guidelines were developed for the farmers.

The group engaged in vegetative propagation of the prioritized fruit and medicinal trees (setting of cuttings, marcots) and production of commercial seedlings. The improved planting materials were weaned in the nursery and shared among the participating farmers on the basis of their responsibilities.

RESULTS

Results of socioeconomic surveys of the study area showed that the average number of household was nine. Male-headed household represented 85% while female-headed household was 15%. In the seven communities, the major income generating activities were farming, palm oil processing, motor and motor bicycle operators, and petty trading. Social facilities like water and roads were provided by donor organization in 25% of the communities. There was no electricity supply in 70% of the communities.

The communities enthusiastically participated in prioritizing indigenous fruit trees and collecting and conserving germplasm of the farmers' prioritized fruit trees, mainly by vegetative propagation (Table 1). Nurseries were established in each of the communities. Of the five priority species, *Garcinia kola*, *Irvingia wombolu* and *Chrysophyllum albidum* showed drastic decline in their natural habitats when compared with *Dacryodes edulis* and *Irvingia gabonensis*.

The priority species, which were valued for their medicinal properties (Akubue, *et al.*, 1993; Ezedinma and Onyeka 2003), food (Leakey *et al.*, 2002), and income generation (Chopra, 1993), were established in rural communities. Duplicate accessions were established at IITA station Onne, Rivers State and National Centre for Genetic Resources and Biotechnology (NACGRAB) field, Ibadan, Oyo State.

Analysis of market structure and function showed that there were large variations in prices of the five fruit trees and considerable competition among local buyers in Southern Nigeria. The result provides update of fruit trees commercialization in Southern Nigeria.

DISCUSSION

The complete absence of *I. gabonensis* and *I. wombolu* in Akwa Ibom State communities suggests that domestication of these fruit trees is likely to be pursued with great interest. This was evident by the willingness of the communities to participate in germplasm collection and conservation. Although the focus of the study was on food trees, data obtained in the study indicate that the trees have some medicinal properties (Table 1), thus worthy of preservation (Adesina and Aina, 1990; Emebiri and Nwafor, 1990).

Dacryodes edulis was found in all the communities, indicating that farmers have domesticated the tree species in Nigeria (Leakey *et al.*, 2002). With the exception of *I. wombolu*, all the species were planted in home gardens in Imo State communities. In contrast, *I. gabonensis* and *I. wombolu* were found in crop fields at Ogun and Oyo States communities.

The participation of farmers in the study was comprehensive. This might be attributed to acute poverty prevailing in all the communities. In addition, the motivation of farmers encouragingly resulted in active/wide participation. The results suggest that innovative ideals of rural farmers could be used, as indigenous knowledge, for germplasm conservation. Farmer participation in germplasm conservation has had a remarkable success in adequately conserving indigenous fruit trees.

The establishment of the five priority species by farmers may be attributed to the development of locally affordable technology from indigenous/scientific knowledge, and the development of mutual understanding between farmers and research staff. The enhanced germplasm conservation in the selected communities was achieved by study on farmers' perceptions and attitudes for enabling environment, and promotion of public forums for transparency and accountability.

CONCLUSION

By taking advantage of over-exploited community resources and emphasizing on environmentally conscious strategies, the participating rural farmers desperately promoted sustainable utilization of fruit trees while effectively linking this to rural development. The farmers had deep commitment to conserving economic fruit trees. The community leaders strongly played a major role in ensuring the cooperation of the communities. Since increasing concentration of carbon dioxide (CO_2) in the atmosphere is responsible for global warming, conservation of fruit trees, which are natural sinks that use carbon dioxide (CO_2) during photosynthesis, would help to check the global warming.

To help conserve the fruit trees, the rural communities judiciously used their innovative ideals and creativities, while enhancing rural economic opportunity and sustainable livelihoods. The seven communities have a sense of hope now. Ideally, credit is given to the community leaders. They increasingly look forward to seeing a continuity of the project to help reduce poverty in the areas.

Further studies are needed to monitor and evaluate the germplasm established in the seven rural communities and research on sustainable utilization of wildlife.

Acknowledgement
The Authors thank the rural farmers for devoting their valuable time to collecting and conserving germplasm of indigenous fruit trees.

REFERENCES

Adesina, A. A. and Aina, J. O. (1990). Preservation of African Star Apple (*Chrysophyllum albidum*) by osmotic dehydration. *Trop. Sci.* 30: 249 253.

Akubue, P. I., Mittal, G. C. and Aguwa, C. N. (1993). Preliminary pharmacological study of some Nigerian Medical Plants. *Journal of Enthnopharmacology* 8 (1): 53-63.

Anegbeh, P. O., D. O. Ladipo., Z. Tchoundjeu., and P. D. Austin (2002). Contributions of Arboretum (*Ex Situ* Mechanism) to the Conservation of Natural Resources in Nigeria. *Journal of Tropical Forest Resources* 18 (1): 106-114.

Ayuk, E. T., Duguma, B., Franzel, S., Kengue, J., Mollet, M., Tiki Manga, T and Zekeng, P. (1999). Uses, Management and Economic Potential of *Dacryodes edulis* in the Humid Lowland of Cameroon. *Eco Bot* 53 (3): 292 301.

Bawa, K. S. and Seldler, R. (1998). Natural Forest Management and Conservation of Biodiversity in Tropical Forests. *Conservation Biology* 12: 46 55.

Castillo, R. O. (1995). Plant genetic resources in the Andes: impact,

conservation and management. *Crop Science* 35: 355-360.

Chopra, K. (1993). The value of Non-timber forest products: an estimation of Tropical Deciduous Forests in India. *Economic Botany* 47 (2): 351-368.

Current, D., Lutz, E. and Scherr, S. J. (1995). The costs and benefits of agro forestry to farmers. *World Bank Research Observer* 10: 151-180.

Emebiri, L. C. and Nwufo, M. I. (1990). Effect of fruit type, temperature and storage treatment on the biodeterioration of African Pear (*Dacryodes edulis*). *International Bioterior* 26: 42-50.

Ezedinma, C. I. and Onyeka, U. P. (2003). Forest Spices Market in Anambra State Nigeria. *International Journal of Agric. and Rural Development* 4: 110-119.

Leakey, R. R. B., Atangana, A. R., Kengni, E., Waruhiu, A. N., Usoro, C., Anegbeh, P. O. and Tchoundjeu, Z. (2002). Domestication of *Dacryodes edulis* in West and Central Africa: Characterisation of Genetic Variation. *Forest, Trees and Livelihoods* 12 (1 & 2): 57-71.

Nwagwu, J. U. (2003). Poverty Reduction in Rural Nigeria through targeting approach and legislations. *International J. of Agric. and Rural Development* 4: 124-130.

Weber, J. C., Sotelo Montes, C., Vidaurre, H., Dawson, I. K. and Simons, A. J. (2001). Participatory domestication of agro forestry trees: an example from the Peruvian Amazon. *Development in Practice* 11 (4): 425-433.

Table 1. Farmers' Prioritized Indigenous Fruit Trees in Southern Nigeria

ɔecies	Common names	Uses	Farmers preference traits
vingia ıbonensis Aubry-ecomte ex O' ɔrke) Bail. **vingeacea**	Bush mango (Ugiri or Ado)	Food/condiment, supplementary source of incomes, medicine, shade, windbreak, tool handles, worm expeller.	Dwarf tree, early maturing, disease resistance, big fruits and kernels.
vingia ɔmbolu 'ermoesen). *vingeacea*	Bush mango (Ogbono)	Food: has bitter pulp, kernel for draw-soup, windbreak, tool handles, fuel-wood/fire wood, and worm expeller.	Dwarf tree, early maturing, disease resistance, and big kernels.
acryodes dulis (G. Don) . J. Lam. *urseraceae*	African pear (Ube)	Food: sweet pulp, animal feed, source of incomes, cures tooth disease and ear trouble, fruit for hunting/trapping animal, seed used against stone in kidney.	Dwarf tree, early maturing, disease resistance, big fruit, sweet taste of fruit, oiliness.

Chrysophyllum albidum *(G. Don).* Sapontaceae	African star apple (Udara)	Food: sweet pulp, source of incomes, shade, windbreak, tool handles, cures frigidity in women, fever remedy, black-coated tongue, leave used to normalize excessive menstruation.	Dwarf tree, early maturing, disease resistance, big fruits, sweet taste of fruit.
Garcinia kola (Heckel). **Guttiferae**	Bitter cola (Akilu)	Medicinal nuts for coughs, fibroid, bitter stimulant, snake repellent, anti-cancer agent, aphrodisiac, remedy for worms, reduce blood sugar, improvement of liver.	Dwarf tree, early maturing, disease resistance, big nut, bitter taste of nut.