The rural farmer and plant genetic resources conservation: A case study in the Fanteakwa District in the Eastern Region of Ghana

S. O. BENNETT-LARTEY & E. ASIEDU-DARKO
CSIR-Plant Genetic Resources Research Institute, P. O. Box 7, Bunso, Ghana

ABSTRACT

The methods of conservation used by rural farmers were studied in the Fanteakwa District in the Eastern Region of Ghana. Ten rural communities were randomly selected, and10 rural farmers were interviewed in each community. Questions posed ranged from methods of conservation to traditional belief systems associated with conserving certain plants. It was observed at the end of the study that rural farmers are true conservers and their basically traditional methods of conservation are handed down to them from generation to generation. An example of these traditional methods is *ntute,* used to conserve cocoyam. However, most methods used by rural farmers are mostly effective on the short-term basis, according to scientists of the Plant Genetic Resources Research Institute (PGRRI), which has necessitated the need for long-term conservation methods. Also, it was established that some traditional belief systems associated with conservation had helped rural farmers to conserve certain plants. In all these, rural farmers have, in their own small ways, contributed to the sustainability of plants for a considerable period.

Original scientific paper. Received 16 Dec 05; revised 26 Aug 06.

RÉSUMÉ

BENNETT-LARTEY, S. O. & ASIEDU-DARKO, E.: *L'agriculteur rural et la conservation de resources génétiques de plante: étude de cas dans le district de Fanteakwa dans la Région de l'Est du Ghana.* Il a été établi que l'on ne peut pas parler de la conservation de plantes sans considérer les agriculteurs ruraux qui cultivaient les cultures sur une longue période de temps. L'étude cherche à savoir davantage de méthodes de conservation employées par les agriculteurs ruraux dans le district de Fanteakwa de la Région de l'Est du Ghana. Dix communautés rurales étaient sélectionnées au hasard dont dix agriculteurs ruraux étaient interviewés dans chaque communauté. Les questions formulées variaient de méthodes de conservation aux sytèmes de croyance traditionnelle liés à la conservation de certaines plantes. Il était observé à la fin de l'étude que les agriculteurs ruraux sont les conservateurs véritables et leurs méthodes de conservation sont fondamentalement traditionnelles qui se transmettent à eux de génération en génération. Un exemple de ces méthodes traditionnelles est *ntute* qui est employé pour conserver le taro. Toutefois la plupart de méthodes employées par les agriculteurs ruraux sont surtout efficaces à court terme selon les scientifiques de l' Institut pour la Recherche de Resources Génétiques de Plante qui a nécessité le besoin pour les méthodes de conservation à long terme. De plus, il était établi que vraiment les agriculteurs ruraux ont quelques sytèmes de croyance traditionnelle liés à la conservation qui leur ont aidé de conserver certaines plantes. En tout, ces agriculteurs ruraux, à leurs manières, ont contribué à la durabilité des plantes sur une période de longtemps.

Introduction

Plant conservation is a deliberate attempt to conserve plants so that generation upon generation will have access to the plants and use them. Rural farmers have been able to conserve plants for a long period using their own indigenous methods. This traditional knowledge is unrecorded, but it is passed down from generation to generation by word of mouth. Traditional knowledge is the totality of all knowledge and processes, whether explicit or implicit, used in managing socio-economic and ecological facets

of life (Mugabe, 1999). It is, therefore, an undeniable fact that one cannot talk about plant genetic resources conservation without considering the activities of farmers.

Farmers have managed plant genetic resources for as long as they have cultivated crops. Most farmers continually improve the genetic characteristics of their crops by selecting seed for the next season from the best of plants (Geneflow, 1992). Also, over the years, African farmers have come up with several solutions to the problem of how to safely store their harvest for use as food and to ensure that adequate seed is available for the next planting season. The *Ganawuri* people of Nigeria use the *rumbu* to conserve cereal, while the *Moru* people of southern Sudan use the *kiro* (Geneflow, 1994.)

Women play an immense role in plant genetic resources conservation (Bennett-Lartey & Akromah, 1996). They have been observed to maintain the landraces of food crops under subsistence agriculture; thus, enhancing the chances of natural out-crossing *in situ* among subspecies and cultivars. Women have contributed greatly to preserving seed and other propagules. The practices of dusting seeds with wood ash and hanging fruits and cobs over fire-place are meant to prolong the storability and maintain viability of plants such as cowpea (*Vigna unguiculata*), maize (*Zea mays)*, pepper (*Capsicum* spp.), eggplant (*Solanum gilo*), and lima beans (*Phaseolus lunatus)* from one harvest season to the next planting season. Women also store root and tuber crops in the ground to prolong their storage life.

Also, among the *kayapo* Indians of Brazil's Xingu River basin, women, particularly the female chiefs known as *minire-nhon-benadjwyra,* are often the only *kayapos* who know where the war gardens (places where most plants are conserved) are (Geneflow, 1994).

Farmers contribute to conserving plants through Home Gardens.It is defined as a multi-species, multi-storied, and multi-purpose garden sited close to the homestead, occurring to one side of it or partially surrounding it (Bennett-Lartey *et al.,* 2001). It is also called the backyard garden (Owusu *et al.,* 1994). Home Gardens are also *in situ* conservation sites for indigenous varieties of some crops. They are also sites for domesticating wild varieties of some species; for example, the wild yam species known in Ghana as "Ahabayere", *Dioscorea* sp. (Bennett-Lartey *et al*., 2001).

The knowledge of these farmers concerning plant conservation, if properly documented, can assist scientists in the field of plant conservation. In a survey by the International Rice Research Institute (IRRI) (assisted by the Swiss Development Cooperation) with the objective of finding more about on-farm conservation, increasingly recognised as a valuable conservation method for plants and animals, it was observed that farmers are true conservers of diversity and not just users. Also, the contribution of farmers to plant genetic resources conservation would be better appreciated if scientists and farmers collaborate; that is, a blend of the traditional and modern sciences.

Another survey by the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) on farmers' conservation activities within India patchwork of rural and urban communities showed that modern science is only just beginning to appreciate the power of indigenous wisdom. But as more of such studies are conducted, small-scale farmers everywhere will be able to benefit from a combination of the old and new sciences (Geneflow, 2002).

The objective of the study was to investigate the plant genetic resources conservation practices of rural farmers, and to attempt to measure the effectiveness of these methods.

Materials and methods

The study focused on rural farmers in the Fanteakwa District in the Eastern Region of Ghana. The sample frame consisted of male and female farmers between the ages 30 and 60. The age group was chosen because the study targeted

farmers who were expected to have more experience in farming. The Fanteakwa District was randomly selected from several districts close to the Plant Genetic Resources Research Institute (PGRRI). Ten villages in the district were randomly selected from several rural communities. In each village, 10 farmers were randomly selected and interviewed. The rural communities randomly selected were Akrumso, Bepoase, Dome, Ehiamankyene, Juaso, Nkankama, Nsuapemso, Nsutam, Obooho, and Pimpimso (Fig. 1). In all, 100 farmers were interviewed using pre-tested questionnaires administered to the farmers by the researcher, because most farmers could neither read nor write.

The study adopted purposive and accidental methods of sampling to collect data. The purposive method was used because the study focused on rural farmers who were between the ages 30 and 60. The researcher visited the selected villages, moved from house to house (i.e., the third or fifth house, depending on the size of the village), and interviewed farmers who fell within the parameters of the study. The accidental method was used because the researcher interviewed any person he came across in the selected villages who fell within the parameters of the study.

The researcher visited the farms and homes of the farmers to assess some material evidence of conservation.

Also, scientists of the PGRRI were interviewed using a tape recorder. Questions asked ranged from the practice of conservation, methods used in conserving plants, reasons for conservation, and loss of plants to some traditional belief systems associated with conserving certain plants.

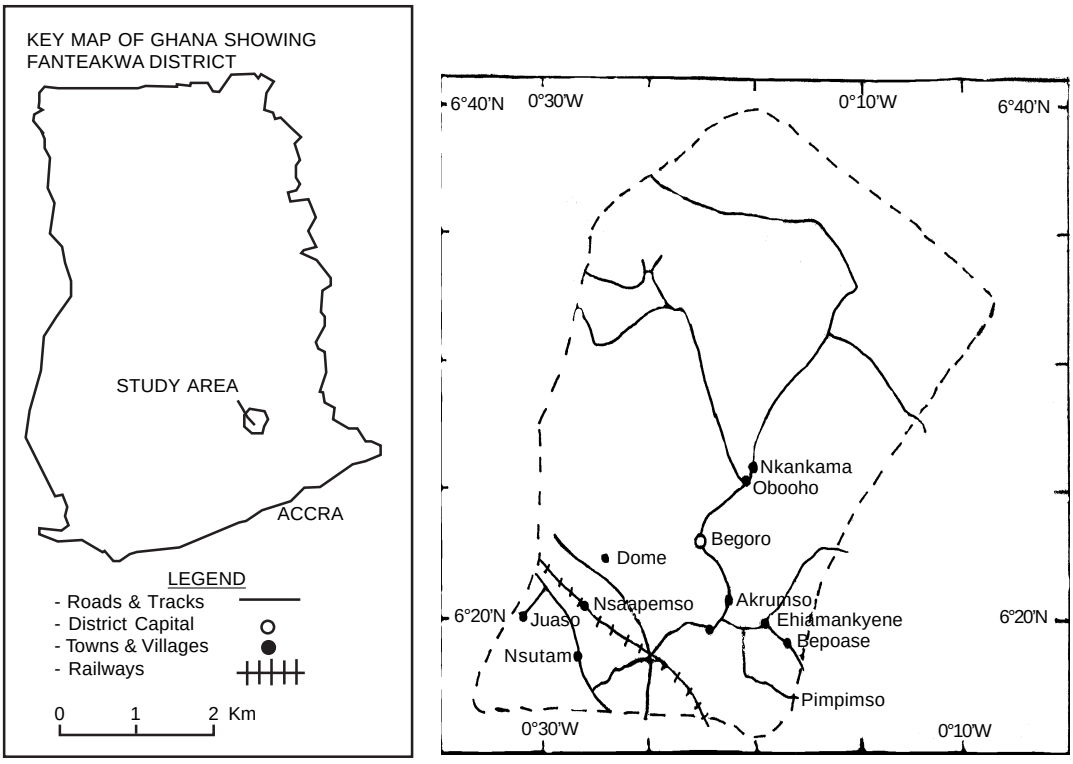

Fig. 1. Map of study area - Fanteakwa District.

Results and discussion

Almost all the farmers interviewed practised conservation. Crops cultivated by the farmers included cereals (maize, *Zea mays),* vegetables (pepper, *Capsicum* spp.; garden egg, *Solanum gilo;* and tomato, *Lycopersicum esculentum*), and roots and tubers (cocoyam, *Xanthosoma sagittifolium;* cassava, *Manihot esculenta;* and yam, *Dioscorea* spp.). Most farmers cultivated two or more crops at the same time (mixed farming). The methods of conservation were not different from one community to another. The farmers conserved all the crops under cultivation and had their own unique methods of conservation.

Two methods were used in conserving maize. In the first method, after harvesting the maize from the field, the best ones were selected, tied together and hung above the cooking fire in the kitchen. As the women cook, the heat and smoke from the fire expel any pests in the grain and keep away new pests. The heat also reduces the moisture content; thus, preventing microbial or fungal growth (Geneflow, 1994). With the second method, some of the best grains were mixed with ash and a little water. The grains were then dried for some time and put in a pot, bottle or gourd and tightly covered. The ash protects the grain from insect infestation. After every 6 months, the contents were emptied, dried for some time, and re-packaged until needed for planting.

Regarding vegetables, farmers used two methods. Mature fruits (pepper and garden eggs) were collected and pierced through with a stick and hung above the cooking fire; the heat and smoke protect the seeds from insect attack. When it was time for planting, the dried fruits were removed and the seeds nursed. With the second method, the vegetables were either pounded in a small mortar or soaked in water (garden eggs and tomatoes). The seeds were extracted, dried and wrapped in a paper or put in a bottle or a rag, and kept in a secure place. For okro, the fruits were allowed to dry well on the plant before harvesting, and the seeds extracted. The seeds were stored in a bottle and well corked.

Rural farmers interviewed used a method known as 'mpo' (which is known as 'milking') to conserve yam, depending on the type (Bennett-Lartey *et al*., 2003). The types of yam best suited for 'mpo', according to the farmers, were 'bayere pa' *(Dioscorea rotundata)* and 'kookoase bayere' *(Dioscorea praehensilis)*. For the 'mpo' method, the farmers dug around the yam to expose it. They then decapitated it, leaving the head and roots in the soil. The tuber was removed from the mound and the remaining head and roots were covered with soil. The head sprouted again to yield small tubers which were used as "seeds" for planting. Yams were also cut into setts, dried and kept in a dry, cool place till planting season (Bennett-Lartey *et al.*, 2003). This method was used to conserve *D. alata, D. dumetorum, D. praehensilis, D. cayenensis,* and *D. rotundata*. Cocoyam (*Xanthosoma sagittifolium*) was conserved using a method known as 'ntute' in Twi; a traditional method in which after harvesting, the cocoyam and corms were put in holes and covered. When it was time for planting, the corms were removed, cut into pieces and planted.

Responding farmers indicated that for cassava, the sticks were put in a dry, cool place under a tree and against the tree. They made sure that the sticks were few centimetres inside the soil with the buds pointing up.

The main reason for conserving these crops was that they were handed over to them by their parents or relatives who cultivated them over a considerable period; so posterity would not forgive them if they lose the crops. The above assertion of the farmers confirmed the fact that the acquisition of the traditional methods of conservation were basically handed down from generation to generation. Although farmers had these methods of conservation, there were still some problems because some admitted that they had lost some of their crops. Those mentioned by the farmers were a type of yam locally known as 'nkani' *(Dioscorea cayenensis*), a type of pepper locally known as 'nhyirawa' (*Capsicum annuum),* and a type of maize locally known as 'anwona'

maize (*Zea mays*). Farmers cited some means through which the crops were lost as bushfire, drought, genetic erosion through improper storage, and infertility of the soil.

Some farmers interviewed still hold on to traditional belief systems. They believe that after extracting the seeds from okro and pepper, the waste products should not be dumped on the refuse dump, but rather on a footpath so that as people trample on them, the crop will never get lost no matter the situation. They also believe that a type of garden eggs locally known as 'atropo' *(Solanum macrocarpon)* grows well in home gardens because its continuous existence and survival depend on hearing people talking. This notion encourages them to always plant the garden egg in the home garden for conservation.

One significant thing that came out of the study was the kitchens in the various communities. Apart from using the kitchen to prepare food, it also served as a place for most conservation activities in the home. From the perspective of scientists of the PGRRI, the methods used by farmers are effective only for the short-term because the prevailing temperatures in the tropics are usually high and not conducive to long-term conservation. They also argued that regenerating the plants every year without ensuring the purity of the species for a long time leads to the loss of genetic identity of the species. This situation leads to genetic drift, which literally means some genes of the plants are eroded. On the way forward, according to the scientists, there should be a seed inspectorate unit for most crops cultivated in the country to make sure good seeds are always available to farmers.

The findings of this study strongly recommend a strong collaboration between scientists and farmers to improve the methods of conservation used by farmers to meet the demands of long-term conservation.

The need for further studies on long-term conservation is emphasised because most methods used are on short-term basis only.

Conclusion

The study has indicated that greater attention should be paid to conserving the nation's indigenous plant genetic resources by scientists, governments, non-governmental organisations, and all stakeholders to help protect the genetic resources of Ghana, a valuable national heritage.

Acknowledgement

The authors are grateful to farmers in the villages of the Fanteakwa District in the Eastern Region of Ghana who provided most of the information for this work. They are also very grateful to Rev. F. K. Ayensu of PGRRI, Seed Store Section, for his support; and also to all scientists of the Institute who were interviewed in this study.

REFERENCES

Ajay, V. (2002) *Scientists rediscover secrets of traditional seeds conservation*. Geneflow. IPGRI, Rome.

Anon. (1992) *Farmers do it all the time*. Geneflow. IPGRI, Rome.

Anon. (1994) *On farm storage solution.* Geneflow. IPGRI, Rome.

Anon. (1994) *Secret gardens of the Kayapo*. Geneflow. IPGRI, Rome.

Bennett-Lartey, S. O. & Akromah, R. (1996) *The resources conservation in Ghana*. Plant Genetic Resources Newsletter No. 106,43.

Bennett-Lartey, S. O., Ayernor, G. S., Markwei, C. M., Asante, I. K., Abbiw, D. K., Boateng, S. K., Anchirinah, V. M. & Ekpe, P. (2001) Contribution of Home Garden to *in situ* conservation of plant genetic resources in farming systems in Ghana. In *Proceedings of 2nd International Home Gardens Workshop: Contribution of Home Gardens to* in situ *conservation of plant genetic resources in farming systems* (ed. J. W. Watson and P. B. Eyzaguire), 17-19 July 2001, Witzernhausen, Federal Republic of Germany. International Plant Genetic Resources Institute, Rome, Italy.

Bennett-Lartey, S. O., Markwei, C. M., Vodouhe, R. S. & Eyzaguire, P. (2003) Ethnobotanical studies on plantain *(Musa* sp.) and yams *(Dioscorea* spp.) in some Home Gardens in the East Akim and New Juabeng districts of the Eastern Region of

Ghana. *Ghana Journal of Horticulture* **2,** 113-120.

Mugabe, J. (1999) *International property protection and traditional knowledge: An exploration in international policy discourse.* African Centre for Technology Studies (ACTS) Press, Nairobi, Kenya.

Owusu, J. G. K., Quashie-Sam, S. J., Nkyi, K. A. & Oppong, S. K. (1994) *Indigenous African food crops and useful plants: Their preparation for food and home gardens in Ghana.* UNU/INRA, Natural Survey Series No. 131.