

6 Promoting traditional trees and food plants in Kenya

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Genetic resources of local crops and trees play an important role in subsistence farming in Kenya. However, the colonial legacy continues to under-rate and undermine these resources. In a broad attempt to reverse these trends, Kenya Energy and Environment Organizations (KENGO) has been promoting the conservation and use of traditional trees and food crops in Kenya by supporting the practical activities of its member groups, through raising public awareness on the value of indigenous knowledge about traditional plants, and through joint research activities with national institutions.

With their country's population close to 25 million and with an annual increase of 4 per cent, Kenyans today are increasingly aware of the problems they face in order to feed themselves, to produce sufficient fuelwood for domestic needs, and to sustain biological diversity for the provision of fodder, fruits, dyes, tannins, gums, resins, and medicines. Only 17–20 per cent of the country's total land area is suitable for agricultural production and it is from this land that about 90 per cent of the population depends for a living.

It has been estimated that there are about 8,000–9,000 species of plants in Kenya. Two thousand of these are trees and shrubs, of which 5 per cent are considered endangered while about 8 per cent are rare. Up to about one fifth of all the herbaceous plant species may be endangered. Policies

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and programmes must be developed for the conservation of biodiversity and genetic resources if medical, agricultural and technological advances are to be made. The magnitude of the task is great; the continued stability of the country's environment and habitat depends largely on these resources. This is now being slowly realized by policy makers, scientists and environmentalists.

At the local level, rural communities are faced with serious depletion of biological diversity upon which they rely so much. Conservation efforts have been seriously constrained by lack of technical, moral and financial support. Where rural communities are sensitized, and awareness of the importance of biodiversity conservation is high, the infrastructure to initiate and maintain conservation projects is often missing. Many externally led programmes often fail both to involve the communities in planning and to identify them as the intended beneficiaries of the initiatives; even more often, such programmes have institutionalized academic objectives which over-ride the communities' conservation needs and priorities. Many efforts fail to understand that these communities are the custodians of biodiversity and that they know its value and potential. It is a prerequisite for successful conservation policies that communities be involved in all decisions which have a bearing on biological resources, from project formulation to planning and implementation.

Kenya's germplasm heritage

East Africa is geographically and ecologically diverse with ecosystems ranging from deserts to tropical rainforests. The lowland areas are predominantly arid, within which pockets of humid environments have formed from highlands, wetlands and the Rift Valley. Ecologically, this has created a strong diversity of habitats. One area with a high species diversity is Kakamega Forest in Western Kenya, the easternmost relict of the Guineo-Congolese tropical rainforests; others include the forests of the Mau escarpment, Mount Kenya and Aberdare, and the coastal forests. Of the total land area of 570,000 square kilometres, only about 4 per cent is under forest. The remaining indigenous forests might be considered for *in situ* conservation, although current pressures will make this objective hard to achieve.

The Abyssinian centre of diversity, in its broad sense,

stretches to cover much of the country, and many of our traditional crops could be considered to belong to this Vavilov centre. This is exemplified by the wide distribution of many wild relatives of cultivated plants, including coffee, sorghum, millet, *Vigna*, sesame, lablab (hyacinth bean), and others.

Pre-colonial Kenya was characterized by a rich biological diversity found in the vast indigenous forests which sprawled the country and was relatively undisturbed due to low population densities. The diversity of primitive cultivars, landraces and wild species gave rise to thousands of plants being used as sources of local food. These food plants, which became a part of folk culture, included wild fruits, annuals and perennials, potherbs, roots and tubers, legumes, vegetables, aquatic weeds and partially domesticated crops of all types. The list of edible plants and local crops used by all the ethnic groups in Kenya probably goes into the hundreds, although no comprehensive list has been compiled for the whole country. All these crops are highly adapted to their environments and have developed disease resistance through co-evolution with their pests and pathogens. They require minimal inputs of labour or management. It has been verified that some of them are often superior in taste and/or nutritional quality to the introduced varieties.

The country's arid and semi-arid lands have much to offer in terms of plant resources, with possibilities of wider cultivation and commercial exploitation. The commercial use of gum arabica from *Acacia senegal* and collection of myrrh incense or resins from *Commiphora* spp. could contribute greatly to the national economy. The potential is some way from realization, and the marketing of these commodities is left largely unorganized. Properly used, this genetic resource base could lessen Kenya's dependence on food aid and make its mark on the country's economy through increased exports.

The colonial legacy

The status of the country's biological diversity and genetic resources changed dramatically through colonialism. The introduction of exotic forest species brought on the clearing of massive areas of indigenous forests to grow uniform monocultures of forest plantations, mainly to produce timber for

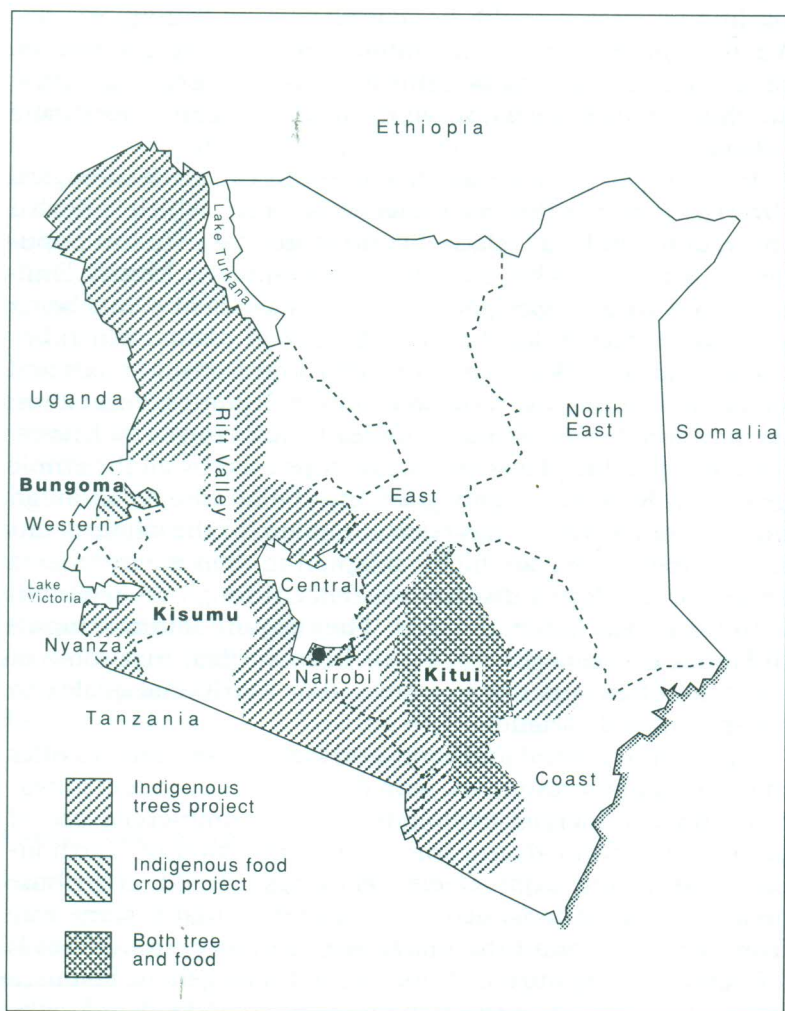


Figure 3. Map of Kenya showing provinces and the areas of operation of KENGO projects. The Indigenous Trees Project is operated in a large part of the country, including the arid areas of the north-west; the semi-arid areas of the Rift Valley, Eastern and Coastal provinces and the medium production lands of South Nyanza. The Indigenous Food Crops Project is focused on two regions: the relatively high production areas of Western Kenya (Bungoma and Kisumu Districts) and the semi-arid Kitui District.

export to the colonial power. These few fast-growing species of such genera as pine, eucalyptus and cypress have a uniform and narrow genetic base. This practice, now well entrenched, for a long time led to near total neglect of conservation and research on local species; more recently, the problem has been compounded by expanding populations which continue to open up indigenous forests for cash-crop and subsistence agriculture.

The breakdown and fragmentation of natural habitats, with massive loss of biodiversity and wild relatives of cultivated crops, are consequences of these combined factors. As this loss occurred before any inventory was done we do not know what we have lost, but we do know that the potential of these resources to address current agricultural, technological or medical problems will never be realized. The continuing over-exploitation of some other species of economic importance poses a threat to their existence and to their genetic diversity, for example African ebony, which the handicraft trade has exploited to near extinction due to demand from the tourist industry, and Camphor wood and African velvet.

A further serious blow to genetic resources has been the introduction of new crops which undermine traditional diets, themselves already threatened by the erosion of ethnic cultures and traditions. The colonialists' condemnation of traditional food crops, which were for a long time seen as inferior, primitive or marginal, led to their abandonment, particularly by so-called educated communities. The greatest loss of Kenyan genetic resources may, however, be attributed to the impact of the Green Revolution, which has seemingly increased food production with its introduction of new, improved or hybrid cultivars in food and cash crops. The Kenya National Food Policy of 1984 stated clearly that the objective of food crops research will be to continue the search for more productive varieties, with the emphasis of breeding programmes being on continuous yield increases. Though absolute food yields may have risen initially, when hybrid and other 'miracle' seeds were used by farmers their genetic uniformity made them highly vulnerable to pests and diseases. In addition, they require high levels of costly chemical inputs such as fertilizers and pesticides, and farmers have to purchase seeds every season.

There has been a heavy reliance on imported germplasm in the country's plant-breeding programmes and only token

utilization of the local varieties, which may confer such important characteristics as environmental adaptability and disease resistance. Landraces, which have taken generations to develop and are well adapted to local conditions and environmental stresses, have been or are being rapidly replaced or wiped out by 'improved' cultivars. The pros and cons of increased exports through a cash-crop economy *vis-à-vis* the potential accrued benefit of conservation of genetic resources and its contribution to food production call for a serious evaluation, particularly at this time when real prices of exports are falling in international markets.

The country is faced with severe erosion of valuable genes nurtured and carried over from generation to generation in different seed varieties and sustained as part of peoples' cultural heritage. Though widely and generally neglected by commercial sectors, unique food crops are still used in mainly rural and peasant communities, where women know the nutritional needs of their families and the nutritive and medicinal qualities of the crops.

KENGO's approach

KENGO is a coalition of women's groups, farmers' organizations and other local NGOs involved in environmental conservation, wood-energy use and community development. It was founded in 1981 following the UN Conference on New and Renewable Energy held in Nairobi, and its secretariat provides technical and material support to member NGOs. For seven years now, KENGO's National Resources Programme, through the Seeds and Genetic Resources Project, has been promoting the conservation and utilization of indigenous plants for their economic usefulness as food and sources of several other rural requirements such as fibres, dyes, fuelwood, fodder and medicines.

The programme dates back to 1982 when KENGO realized that the genetic diversity of indigenous plants was threatened with depletion due to the introduction of exotic species. Its initial objective was to sensitize both the decision makers and the general public to the need to conserve these vital resources and to promote their sustainable use at the community level. An ethnobotanical data collection of indigenous trees in arid and semi-arid lands was launched. Eight districts have so far been covered, resulting in the collection

of 120 specimens of economically important indigenous trees. Data were collected through interviews with elderly people, who provided a wealth of information on medicinal, fuelwood, agroforestry, fodder, food and sociocultural uses of these trees. These have now been compiled and will be published soon in the form of a *Resource Book of Indigenous Trees of the Arid and Semi-Arid Areas of Kenya*.

The promotional and publicity campaigns on conservatives of indigenous plants were well received at both popular and official levels and led to an explosion of interest and requests for seed. People wanted more information on the uses and potential uses of indigenous plants, which species should be used where, how to get hold of seed, how to handle it, and so on. KENGO found that the lack of availability of seed and of the technical know-how on propagation (vegetative or seed) of indigenous plants were major constraints to conservation efforts. The programme therefore initiated the Seeds and Genetic Resources Project with the objectives to identify *in situ* seed resources, to process and distribute indigenous trees and food plant seeds, to carry out simple and repeatable propagation techniques, and to develop curriculum and educational materials for training in seed collection and handling. A vital component of the project is to raise awareness and promote institutional linkages in all aspects of seeds and genetic resources work. This is done through exhibits, seminars, workshops, publications and travelling expeditions. One expedition on threatened habitats in Kenya led to a controversial debate on whether or not to drain an important wetland area, the Yala swamp.

An early product of the project was the publication of *A Pocket Directory of Trees and Seeds in Kenya*, which comprises of short profiles of common trees in Kenya and their seed sources. Other publications include a status report of *Seeds and Genetic Resources in Kenya*, a report of proceedings of *National Expedition on Genetic Resources and Habitats* and an easy-to-read booklet on *How to collect, handle and store seeds* targeted at community-based afforestation programmes. Publications are distributed through KENGO's national membership structure, during community, local and national workshops, and as part of the extension packages used by the KENGO field extension programme which provides technical and material assistance to grassroots organizations carrying out afforestation and conservation projects.

The project continues to procure and distribute seeds, and to organize specialized and non-specialized training courses in seed collection and handling. So far, about 700kg of indigenous plants seeds have been obtained and distributed to 400 destinations including schools, local and foreign NGOs, government ministries, individual farmers and research institutions. Forty seed collectors have been trained in theoretical and practical aspects of the job. They now form the backbone of KENGO's seed collection and distribution network.

An important turning point in the project was the incorporation of a pilot research and conservation component. The research and *ex situ* conservation of economically important indigenous trees is a joint undertaking between KENGO and the Jomo Kenyatta University College of Agriculture, which donated 15 acres of land for the project activities. As part of the joint work, seed viability tests, pre-sowing treatments and propagation trials have been conducted on 35 species. Field genebanks have been set up for the *ex situ* conservation of economically important indigenous forest and fruit trees. In all, 2,900 specimens of 86 species have been conserved in the project site. KENGO and the university have undertaken joint research on nursery management and the monitoring of tree growth performances to identify the conditions for faster growth.

In the course of its conservation efforts, KENGO realized the potential of indigenous plants to diversify the food base and provide better nutrition at a community level. This gave rise to the Indigenous Fruits and Vegetables Development Project, which currently encompasses all traditional food crops. It aims to encourage the conservation of indigenous fruits and vegetables through increased use at the community level.

Several botanical surveys to collect samples of fruits and vegetables have been conducted, resulting in a collection of 66 fruit samples and 35 vegetable samples from areas where diversity of these food plants is still high, mainly in Eastern and Western Kenya. The fruits and vegetables are assessed for nutritional quality through collaboration with the Kenya Industrial Research Institute and the Crop Science and Food Science and Technology Department of Nairobi University. Very encouraging results have been achieved. Some indigenous fruits and vegetables such as *Adansonia digitata*

(baobab) and *Gynandropsis gynandra* have proved to contain higher nutritional qualities than common introduced fruit and vegetable species such as kale and cabbage. Agronomic trials and seed bulking of a few priority indigenous vegetables have begun, with the objective of distributing the seeds to farmers for wider-scale trials.

Sample products have already been developed from several indigenous fruits and vegetables. Fruits can be used to make juices, jams, chutneys and food flavours; vegetables can be dried, powdered or precooked to form infant foods. The objective is to interest food industries to incorporate these samples in their finished products. Plans are under way to carry out feasibility studies for community-based processing units. Combined with demand from industries, this initiative may go a long way in encouraging farmers to grow more indigenous foodstuffs as marketing channels will be available, enabling the farmer to get some much-needed income as an incentive for conservation.

The initiatives supported by KENGO through its Natural Resources Programme include both those of individual farmers and those of grassroots NGOs. One such initiative has been made by Mrs Mwongela Muimi of Kitui district in Eastern Kenya. On a 18-hectare farm, she has conserved more than 15 different economically important species. From afar, the steep slopes of the hill appear to be nothing but dense thicket. At closer proximity the bush reveals the most mouth watering native fruits: *matote*, *ngala*, *ngomoa*, and *tamarind*. These types of fruits are becoming more and more difficult to acquire in the district due to clearing of indigenous vegetation for agricultural use and other purposes.

Mrs Muimi claims that the indigenous fruits do not need any special management and that they are not easily attacked by diseases. Their diversity allows her family to benefit throughout the year as the fruits ripen at different times. KENGO has taken samples from her farm for nutritional analysis and the results have shown that some, such as tamarind, have exceptionally high nutritional quality. This information encourages and supports her in her efforts to conserve the indigenous fruits instead of clearing the bushes to plant less-adapted and more disease-prone exotic fruit species.

The programme supports not only individual farmers but

also community-based grassroots NGOs, for example the Olembo women's group which farms near the shores of Lake Victoria. The group is re-introducing traditional trees, fruits and vegetables into its farming systems and taking advantage of the many benefits which these local plants provide. The Ober tree (*Albizia coriaria*), for example, provides wood for timber and fuel, leaves for covering ripening bananas and for the children to play with, and the bark can be cooked up to make a medicine which is good for children's ailments. Vegetables have multiple uses too. 'Spider Weed' (*Gynandropsis gynandra*), or 'Dek' in the local Luo language, makes a nutritive vegetable meal used widely for treating protein and vitamin deficiencies; extracts are used to relieve aching eyes. Other traditional vegetables such as 'Dodo' (*Amaranthus*), 'Atipe' (*Asystecia schimperi*), and 'Mitoo' (*Corchorus olitorius*), are used to add flavour and improve the nutritive value of staple foods like *ugali*, the typical maize meal.

Nyambara, another woman's group, lies in a sugar-belt located in western Kenya. Comprised of 40 members, the group's conservation initiatives stemmed from the grassroots after people realized that their natural resources were seriously depleted and it was only with difficulty that they could obtain the plants they needed as sources of firewood, fodder, medicines, dyes and tannins. These plants are badly depleted due to encroachment of indigenous forests for sugarcane production and other socio-economic infrastructures. In 1986 the group registered as a member of KENGO, which provided indigenous tree seeds and other multipurpose species for seedling production in the group nursery. Over the years, KENGO has also provided material assistance such as wheelbarrows, watering cans and fencing wire.

The indigenous plant seedlings produced are shared among the members and grown along the sugarcane plantations. These plants include fruit, fuelwood, fodder and medicinal species. The group produces 15,000–20,000 seedlings annually and a survival rate of 60 per cent is normally recorded. Some members have been trained by KENGO on several aspects of environmental conservation, including seed collection and handling, afforestation and wood-energy conservation.

The group's conservation activities have now been recognized by the surrounding community. The demand for seedlings has increased and the group is now selling them at

nominal prices for income generation, an activity which has become self-sustainable. The group collects its own seeds locally, produces seedlings and sells them to the immediate community. Depending on the demand it collects seeds of trees it thinks are needed most by the community. KENGO no longer provides material assistance to the group but continues to provide technical advice on conservation matters.

Lessons from KENGO's experience

The work of KENGO and its member groups has helped to restore confidence in indigenous knowledge and the value of traditional trees and food crops. Their experience has shown that the popular belief that indigenous trees are slow growing is not entirely true. With proper management some local species can grow as fast as some popular exotic species; nor are indigenous trees difficult to propagate. Most of them can be regenerated through seed. Nutritional analyses have also shown that indigenous fruits and vegetables are not inferior in either nutritional or agronomic quality compared with introduced species. However, agricultural trials and genetic improvement are necessary in order to increase fruit and vegetable yields.

Further to all this, it has been clearly demonstrated that farm communities can be charged with conservation responsibilities especially if conservation objectives can be harmonized with short-term needs of the farmer. Creation of awareness is an important tool for enhancement of conservation objectives.

There are, however, major constraints to face. The erosion of cultural and traditional values has had a negative impact on the conservation and continued utilization of indigenous plants. These food plants have long been associated with poverty and backwardness, which makes their re-introduction difficult, unless conservation efforts are closely linked with public education and awareness campaigns. Conflicting messages from government, development agencies and NGO extension workers on emphasis and priorities for both conservation and farm productivity often confuse farmers and can exacerbate the problem.

For example, while the Ministry of Environment and Natural Resources advises farmers to plant trees in agroforestry schemes to promote self-sufficiency in fodder and fuelwood,

the Ministry of Agriculture discourages tree planting on farmland claiming that it introduces new crop pests. Similarly, the Ministry of Environment and Natural Resources conflicts with KENGO on the relative value of indigenous and exotic species, the agriculture people stressing the high yields of exotics. There are also some differences between NGOs. For example the Greenbelt Movement encourages tree planting by giving money to farmers for every tree planted. KENGO believes that this approach has shortcomings since, after receiving the money, the farmers may no longer attach any importance to the tree. Instead, KENGO emphasizes the raising of awareness of the value of the trees, including their long-term and indirect benefits. Attempts to resolve these conflicts are now being made through increased technical collaboration and dialogue facilitated by the District Development Committee, made up of representatives from the major development agencies in each district as well as ministry officials.

The question of economic returns resurfaces frequently at the community level. Farmers will tend to give priority to crops which will give them good returns in terms of their family's daily needs. Marketing channels for most indigenous food plants have not yet been established, though a few popular ones are now emerging in local and urban markets.

Although conservation is something that has always been a concern to legal authorities, the current legal framework on natural resources is underdeveloped, and this presents additional constraints for community-level projects. Much legislation is based on the early colonial laws which laid emphasis on habitat protection *per se* to the total exclusion of *ex situ* conservation and of conservation through utilization. Although modifications to the law have been made, they remain inadequate. A major development has been in the area of seed legislation and management of plant varieties, which saw the establishment of the Seeds and Plant Varieties Act in 1972. The act formed a legal and institutional framework for the regulation of seed trade and plant breeding. Among other things, it was supposed to confer power to regulate transaction in seeds, establish an index of names of varieties and grant proprietary rights to breeders. Worth noting is the fact that there is no regulation on collection and export of species; likewise no legal machinery exists to control the introduction of new species and hybrid seeds.

Although there are several legal provisions which are supposed to provide direction and control of genetic resources in the country, their introduction has been fragmentary. There is no legal framework for the control, co-ordination or conservation of genetic resources *ex situ*, and although there are genebank facilities and activities, their operations take place in a legal vacuum.

The need for a broader approach

It is important to formulate and develop a national policy on the conservation and management of plant genetic resources since the current fragments of policy are truncated, conflicting and not legally binding. In particular there is a need to build an enabling form of legislation which will encompass all aspects of research, conservation, utilization, management, and local and international trade in genetic resources and technological innovations which might emerge from the new biotechnologies. At the same time, the need to raise awareness on the importance of national germplasm conservation remains. Progress has been made among scientists, policy makers and rural communities, but much remains to be done.

The scope of genetic resources activities in Kenya is great and points to scientific challenges to address the many development problems which could be tackled effectively by rational and sustainable use of plant genetic resources in the country. Agricultural research attempts to address the question of food security by fostering production for self-sufficiency. There is a need to boost the development and use of novel or 'poor man's' crops and the use of local land-races and primitive cultivars in plant-breeding programmes; these may go a long way towards the achievement of the National Food Policy goals. A national bio-database with efficient data acquisition, storage and retrieval systems and facilities is an important consideration. It should be introduced together with a national biological survey and inventories in the country's major centres of diversity. The data may become a management tool for facilitating further the conservation, development and rational use of plant genetic resources. Conservation of genetic resources must essentially employ diverse strategies in order to overcome the shortcomings of any one method. The current genebank approach

is not likely to focus on the poor peoples' crops as they are not considered of national importance and may be uneconomical to store.

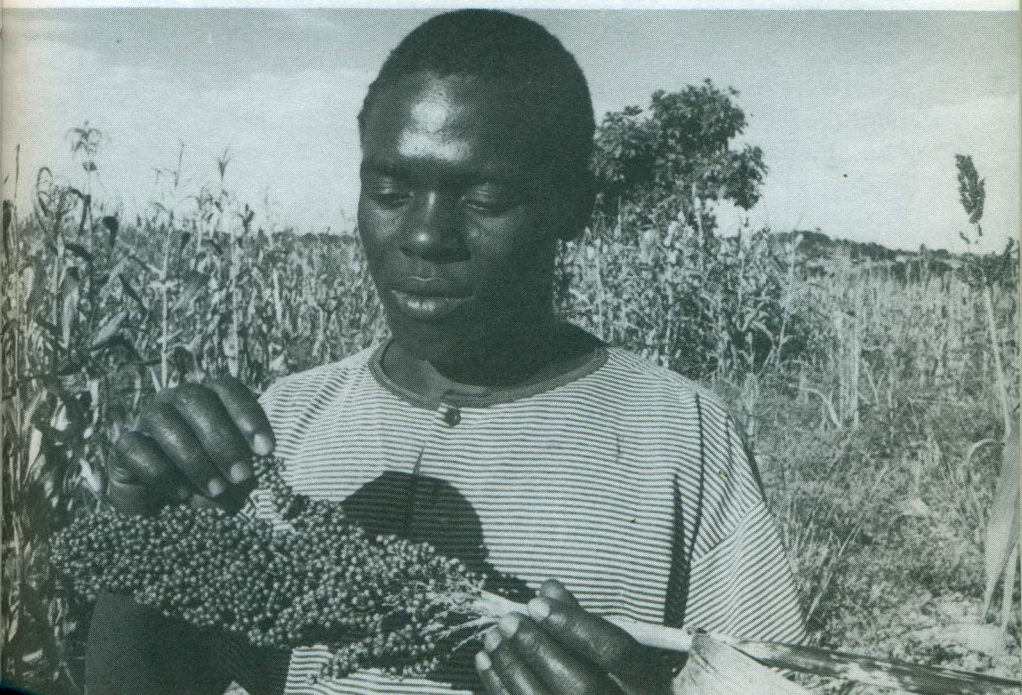
Conservation efforts stemming from the community level have the goal of conserving the genetic resources base through the continued use of the communities' priority crops. Their efforts are not always recognized or rewarded; though very important to particular communities, these genetic resources are not likely to have immediate economic significance at either the national or international levels and are far removed from commercial forces. While their survival largely depends on community conservation initiatives, this could be aided and encouraged by a coherent national policy as outlined above.

The involvement of local communities in conservation of biodiversity and genetic resources may result in greater effectiveness, because it encourages local people's sense of responsibility in resource management. Such involvement will depend on the value of the material and its contribution to immediate local needs, such as food, fodder and medicines. It is the rural communities which know which plants need to be conserved as they are the first to feel the impact of loss when these plants become rare. They can often identify threatened plants which may easily escape the eyes of the scientists. They have depository information on the range of plants available in their immediate environment. After all, they are the custodians of these vital resources.



Women constitute a large proportion of farmers in Zimbabwe. Here, one of ENDA's farmers' groups is discussing their programme and planning to hold a field day. Farmers' groups decide on the types of crops to be grown and the selection of farmers to carry out the studies.

A farmer inspecting the sorghum varieties during a field day. Field days are held at least once a year and they provide important feedback to the project from a large number of local farmers.





Women farmers at a landrace conservation and enhancement farm at Ataye, Southeast Shewa, Ethiopia, displaying their selections of sorghum. Farmers select for improved characteristics such as pest and disease resistance, earliness and nutritional and cooking qualities.

Trainees at a regional workshop organized by the Plant Genetic Resources Centre observing local farmers select sorghum landraces at their conservation farms at Ataye, Shewa.

