

# **CONSERVATION AND UTILIZATION OF PLANT GENETIC RESOURCES IN AFRICA**

## **A Profile of Policy, Legislative and Institutional Measures**

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## African Centre for Technology Studies (ACTS)

The African Centre for Technology Studies (ACTS) is an independent international institution established in 1988 to conduct research and provide training on technology and environmental policy. The Centre's activities focus on the implementation of the recommendations of the United Nations Conference on Environment and Development (UNCED) and the related conventions on biological diversity and climate change.

Most of the ACTS research results are presented in national and regional seminars, and international conferences. The Centre works closely with universities, government departments, non-governmental organizations, private sector and other international agencies, including United Nations bodies. Some of ACTS research and training activities have resulted in detailed policy processes that have led to legislation and administrative reforms at national level.

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## Introduction

The overall goal of this study is to develop a profile of plant genetic resources conservation and utilization policies, laws and institutions in Africa. The study is based on 48 country reports prepared for the International Technical Conference on Plant Genetic Resources and recent research conducted by the African Centre for Technology Studies (ACTS). It reviews and analyzes the adequacy of existing policy and legal instruments as well as institutional arrangements for plant genetic resources conservation and utilization in Africa.

The review of the conservation and utilization of various plant genetic resources is stimulated by a number of factors. *First* is the role of plant genetic resources in Africa's economic recovery and long-term socio-political security. African economies are delicately founded on the use of natural resources in general and plant genetic resources in particular. These economies—based a narrow range of activities—are, to a large measure, built around agricultural production and export of raw material (e.g., timber and other forest products). *Second*, for many decades now, Africa has been a cheap source of plant genetic material for industrial change in Europe, Japan and the United States of America. The region has contributed significantly to the enhancement of agriculture and production of pharmaceutical products in the industrialized economies. However, local people—the main custodians of plant genetic resources—have not benefited (at least in a fair and equitable manner) from the flow of genetic resources to the advanced economies. In fact, often they have had to pay high prices for products developed from the resources. This system—which was established on the principles of common heritage and unregulated access—has been a source of disincentives for local conservation and sustainable use of plant genetic resources.

*Third*, the entry into force of the Convention on Biological Diversity has changed—and indeed considerably—the nature of international policy and politics on conservation, utilization and exchange of plant genetic resources. Not only has it displaced the common heritage and unregulated access regimes but has generated a new and fairly strong legal basis for regulating the global flow of genetic resources and ensuring that source countries (and local people in these countries) benefit from the use of the resources.<sup>1</sup>

*Lastly*, advances in new technologies, particularly biotechnology and information technology, have generated new opportunities and challenges for genetic resources conservation and utilization in Africa. Biotechnology has made it easy to collect and conserve genetic resources. The technology is also expanding the scope of genetic resources utilization.

The above factors have wide-ranging implications for genetic resources conservation and utilization in Africa. Countries of the region should institute and implement policies and laws that are based on an adequate appreciation of these factors.

This study shows that most of the existing plant genetic resources conservation and utilization regimes in sub-Saharan Africa are not capable of responding to new and emerging regional and global political and techno-economic changes. In addition, most countries of the region lack appropriate institutional capacities and arrangements to promote the conservation and sustainable use of plant genetic resources.

The first section of the paper provides an overview of the status and socioeconomic contributions of plant genetic resources in sub-Saharan Africa. The second section discusses *in situ* conservation programmes as well as the various policy and institutional measures that a number of African countries have put in place to conserve plant genetic resources. It is argued that most of the existing programmes and institutional arrangements are founded on sectoral approaches that do not allow the countries to harness the relevant knowledge and expertise and direct these to *in situ* conservation.

The third section of the paper focuses on *ex situ* conservation regimes in the region. It discusses the various policies, laws and institutional arrangements that have been established by sub-Saharan African countries to conserve and regulate the use of plant genetic resources in *ex situ* facilities.

The fourth section examines the nature and roles of regional and international organizations and agreements in promoting the conservation of plant genetic resources in Africa. It focuses on the need for international actors such as the International Plant Genetic Resources Institute (IPGRI) to play a major role in building capacities required by these countries to formulate and implement systematic and long-term policies and laws to promote the conservation and sustainable use of plant genetic resources.

The remaining sections of the paper discuss new opportunities that the Convention on Biological Diversity has generated. They focus on three issues emerging from the Convention. The first is the creation and/or mobilization of technological capabilities to conserve and sustainably use plant genetic resources. The second is the need for African countries to upgrade their existing policies and laws to be able to regulate access to their genetic resources and to derive benefits from international trade in these resources. The last is the need for countries to strengthen their capacities to draw financial resources from the Global Environment Facility (GEF)—the interim financial mechanism for the Convention on Biological Diversity—and other international sources, particularly bilateral donors.

## **1. Status and utilization of plant genetic resources**

### **Trends and socio-economic contributions of plant genetic resources**

Africa is endowed with a rich plant genetic resources base. For example, it is estimated that tropical and sub-tropical Africa has 40,000-45,000 higher plant species.<sup>2</sup> South Africa alone has an estimated 20,000 indigenous plant species and possesses more than

eight per cent of the world's vascular plants. Kenya has at least 8,000 species of plants while Cameroon has more than 15,000. Malawi's forests occupy some 3.6 million hectares of land area, which is 38 per cent of the total and 97 per cent of which are covered by indigenous species. The continent as a whole holds at least 25 per cent of the global pool of plant genetic resources and has contributed significantly to the world's trade in genetic material. Its national economies are also heavily dependent on the use of plant genetic resources in agriculture, industry and other sectors. Furthermore, there is an increasing global interest in the region's plant genetic capital, particularly by pharmaceutical companies of the industrialized countries.<sup>3</sup>

**Table 1:** Status of plant genetic resources in key ecosystems

Source: WCMC (1992), *Global Biodiversity: Status of the Earth's Living Resources*

Note: Figures refer to the number of vascular plant species (if known) estimated to occur in the area.

\* denotes number of vascular plants so far recorded.

The abundance of plant genetic resources in Africa is largely associated with its ecological variability and diversity. Most of the region enjoys a tropical climate favourable to the evolution of unique plant genetic resources. Indeed, most of Africa has great climatic and ecological variations that largely contribute to the diversity of plant genetic resources. Ecological diversity, to a significant degree, determines the distribution of plants and the nature of economic activities undertaken in different parts of the region.

Africa's economies are heavily dependent on the availability and use of certain biological resources. Agriculture, which is the main economic activity for most African countries, accounts for 30 per cent of the Gross Domestic Product (GDP) and employs more than 60 per cent of the region's rural population. The region's agricultural productivity and diversity of production systems depend to a large extent on the presence of a wide variety of plant genetic resources and ecosystems.

Forests are a major source of energy for the region's rural population. Africa's rural people depend on forests as the source of woodfuel. In Kenya, for example, more than 16 million tonnes of woodfuel were consumed in 1990, mainly by rural households.<sup>4</sup> Forested areas also contribute to the regulation of the climatic variations and rainfall that are crucial for agricultural production. These areas also provide various social, ecological and cultural benefits to society. In Nigeria, Cameroon, the Democratic Republic of the Congo (DRC) and a number of other African countries, the sector

provides employment to about ten per cent of the rural population. In terms of foreign exchange earnings, the forest sector also makes substantial contributions. For example, Sudan earns an average of US\$50 million from exports of gum.

In southern Africa, over 380 indigenous plant species are a source of fruits, spinaches and beer for several million rural households. Fuelwood, fencing and building materials account for the highest volume of plant material used annually in the country.

Africa's plant genetic resources are also a source of cultural development. Plants and their genetic material play specific and major roles in the cultural evolution of many African societies. In fact, the complexity and diversity of traditional socioeconomic systems can also be measured in terms of the range, or diversity, of both plant and animal genetic resources utilized by local communities in different parts of the world. Local people utilize a wide range of genetic resources in their socioeconomic activities. For example, the Sukuma of Tanzania use more than 300 species of plants. They have accumulated a wide knowledge base and skills for identifying, characterizing and conserving the plants. Moreover, they keep different kinds and breeds of livestock on their farms. This not only ensures diversity in their economic activities but also diversity of genetic resources available in their socioeconomic systems. Recent ethnobotanical surveys demonstrate that the Turkana living in the arid areas of Northern Kenya utilize more than 53 species of wild plants as food.<sup>5</sup> This is contrary to the established views that the Turkana are essentially pastoralists whose socioeconomic systems are entirely dependent on livestock genetic resources. On the whole, it demonstrates that local people have developed systems that utilize a diverse range of genetic resources.

However, despite its genetic capital, Africa is still the poorest region of the world, having experienced rapid economic decline over the past three decades or so. Most countries of the region have registered marginal economic growth and per capita incomes have fallen considerably. For example, economic growth slipped considerably. In 1970, sub-Saharan Africa's annual growth of real per capita GDP was estimated at 3.2 per cent while South Asia's was 1.2 per cent. By 1989 the trend had been reversed with Africa registering 2.2 per cent and South Asia averaging 3.2 per cent.<sup>6</sup> In addition, a number of agricultural economies (such as Kenya, Tanzania and Zimbabwe) of the region have in the recent past experienced serious food insecurity. Industrial growth has been quite marginal and some countries have seen their industrial structures collapse.<sup>7</sup> These economic problems have been associated with environmental degradation, particularly the loss of plant genetic resources. Habitat destruction, loss of species and genes, and associated disruption of local socio-cultural systems are major problems in most of Africa.

Plant genetic resources are being lost at rapid rates in the region. The rate of habitat destruction in Africa has increased considerably over the past two decades. Between 1981 and 1990, Africa lost at least 51,000 sq km of forests per year with the highest rate of deforestation occurring in Central Africa. Between 1980 and 1995 the rate of deforestation in Kenya was 5,000 hectares per year amounting to loss of at least US\$ 0.8

million per year in revenue.<sup>8</sup>

## **Threats to plant genetic resources**

The causes of plant genetic resources loss in Africa are many and complex. Plant genetic resources are degraded and lost through such activities as large-scale clearing of forests, wetlands, over-harvesting of plants and animals, air pollution, and the conversion of wild lands to urban and/or industrial uses. The resources are also lost as a result of social and economic changes. The growing human population without accompanying economic growth and development places increasing demands on natural resources and ecosystems. More than 60 per cent of Africa's population is found in the high potential areas. This population lacks access to appropriate technologies to conserve and sustainably use plant genetic resources. This is exacerbated by the fact that most of these rural people live in absolute poverty and are directly dependent on fragile ecological systems. A *second* cause of plant genetic resources loss in Africa is inappropriate land tenure regimes which discourage rural farmers and pastoralists from making long-term investments in plant genetic resources conservation and sustainable use.

The *third* underlying cause of plant genetic resources loss and degradation is economic policy and market failure concerning wild plants and natural resources in general. Current policies and market activities fail to reflect the economic value of plant genetic resources and particularly the socio economic values of wild plants used in rural economies.

Other causes of plant genetic resources degradation include settlement and industrialization policies to promote the conversion of ecosystems into urban centres and industrial estates. Demands to service debt forces African governments to encourage the production of commodities that generate foreign currency. Through this process, plant genetic resources are destroyed and lost irreversibly.

## **2. *In situ* conservation of plant genetic resources**

### ***In situ* conservation systems: An overview**

To address plant genetic resources degradation and loss, most African countries have put in place a wide range of technical, policy, legislative and institutional measures. The countries have also established both *in situ* and *ex situ* conservation programmes.

*In situ* conservation—conservation in the original natural habitat—is the most established form of plant genetic resources conservation in Africa. Countries of the region have devoted significant amounts of their land area and other resources to the conservation of biological diversity in protected areas: mainly national parks and



reserves. Other forms of *in situ* conservation are home gardens and unprotected public and private uncultivated lands. Protected areas account for about 5.8 per cent of southern Africa's terrestrial area. Most countries of the region deploy these approaches to conserve plant genetic resources.

There are a wide range of administrative, policy and legislative measures ranging from strict control prohibiting harvesting of biological resources (national parks) to flexible systems of regulated access to and use of the resources (reserves). The philosophy underlying the creation and management of protected areas is that of preservation of certain mega species of animals for touristic purposes. Wildlife and forest laws have been put in place to alienate households and communities from their lands and biological resources as well as to restrict them from accessing and exploiting the resources in the designated areas.

Although most African countries have established national programmes and institutional regimes for conserving plant genetic resources *in situ*, they differ in their technological capabilities to deploy different techniques to undertake *in situ* conservation. They also have different priorities in terms of species of concern and coverage. While a few countries—notably South Africa, Zambia and Cameroon—are beginning to emphasize the creation of protected areas to specifically conserve endemic plant species, others have not placed plant genetic resources conservation concerns as a priority in the establishment of such areas.

In Zambia, the Department of Forests, has established two reserves in the Province of Sesheke for conserving teak trees used for industrial and medicinal purposes. This project was initiated with the support of the United Nations Food and Agriculture Organization (FAO) and the United Nations Environment Programme (UNEP)<sup>9</sup> The two reserves, Malavwe and Kataba Reserves, cover an area of about 36 hectares. Under the project technological activities such as seed collection and propagation, and the establishment of clonal strands are undertaken as part of conservation. Through assistance from the International Development Research Centre (IDRC), a National Forest Seed Centre was established. The main activities of the Centre are to collect forest seeds, propagate them and ensure that they are disseminated to national forest stations in the country.

In Cameroon, the emphasis is on the conservation of forest flora through the protection of vast areas of forest. In the last 25 years several national parks have been established in the northern, southern and central parts of the country. The parks are protected from extractive activities, such as poaching and deforestation, by fencing and policing.

The restrictive protected areas management regimes are, however, being slowly replaced with new approaches that aim at reconciling local people's development needs with national conservation imperatives. Indeed, in a number of African countries, new protected areas policies and laws that promote coexistence of local people and wildlife have been or are being instituted. Uganda and Kenya recently revised their wildlife and

forest policies and laws to create a basis for community participation in conservation. These policies and laws could reorientate the efforts of public conservation agencies away from preservation approaches and create incentives for local people to support conservation.

Despite these national efforts, conservation under protected areas has a number of limitations. One of the main limitations is that they do not protect or preserve all threatened species of plants. It is estimated that only about 50 per cent or less of threatened species of plants are represented in national protected areas. The practice is to establish protected areas to preserve large species of animals and some forests while the actual process of creating them is rarely built on sound scientific information on the nature of the plant species, and the ecosystem as a whole, to be conserved.

Conservation of plant genetic resources under national protected areas systems has another limitation; namely, this system does not protect ecosystems from ecological changes such as drought and climate change. Scientific evidence is being generated to demonstrate the impacts of climate change and other ecological changes on plant genetic resources.<sup>10</sup> Climate change, through the concentration of carbon dioxide in the atmosphere, is likely to affect species evolution and survival. The increasing levels of carbon dioxide in the atmosphere will, likely, alter the growth patterns of plants in an irreversible way. It may, for example, result in frequent and long spells of drought which may cause extinction of some plant species even in the protected areas.

Other problems affecting conservation through national protected areas are related to low levels of funding for establishing physical boundaries, lack of equipment for monitoring ecological changes in the protected areas, limited availability of personnel in crucial scientific areas such as taxonomy, conflicts in land-use systems and policies, lack of scientific information on the nature of all species in parks and reserves, and lack of strong science and technology-based institutional set-ups for managing protected areas.<sup>11</sup> These factors limit the technological capabilities of countries to manage protected areas for plant genetic resources conservation. Likewise, science-based research is not effectively undertaken in most national protected areas. In Africa, for example, while considerable ecological studies have been carried out in many national parks and reserves, relatively few research activities have been conducted in areas such as pathology and captive breeding. In some countries, for example Uganda and Tanzania, infrastructure for scientific research in national parks and reserves is underdeveloped.<sup>12</sup>

In most African countries the institutional and legal regimes for developing and managing protected areas are characterized by jurisdictional and technical inadequacies. In Zimbabwe, for example, a number of institutions have been created to work on various aspects of plant genetic resources conservation under protected areas. However, they are often locked in conflicts regarding jurisdictional mandates and sectoral administrative authority.<sup>13</sup> A similar situation is found in Kenya and Uganda. In the case

of Kenya, the conflicts are mainly between the Kenya Wildlife Service (KWS) and local county councils responsible for national reserves. These institutional conflicts and inadequacies are often a result of poor coordination and management.

## **Policy and legislative measures**

A wide range of explicit and implicit legal and policy measures have been established to promote *in situ* plant genetic resources conservation in Africa. These measures are not obtained in any one national policy document or as one piece of legislation. They are found in various national development plans, sessional papers, presidential and ministerial statements, national conservation strategies and national environmental plans. Indeed, in most African countries (Ethiopia and South Africa are exceptions), policy and legal measures for plant genetic resources conservation are scattered in various official documents.

Ethiopia has a detailed and specific policy regime on the conservation and utilization of plant genetic resources. The policy is founded on the premise that the conservation and use of plant genetic resources are the foundation of the country's socioeconomic development. Its major objectives are: to ensure that the country's plant genetic resources are preserved, developed, managed and sustainably used; to promote the integration programmes for plant genetic resources conservation and development into national and regional development strategies and plans; to promote the creation and strengthening of national scientific capacities to explore, collect, assess, study, introduce, improve, manage and sustainably use biological resources; to encourage the participation and support of local communities in plant genetic resources conservation and development, and ensure that farmers/communities share the benefits accruing from the utilization of indigenous germplasm; and to recognize, foster and augment traditional methods and knowledge of local communities relevant to the conservation and sustainable use of plant genetic resources. The policy identifies three conservation systems: *ex situ*, *in situ* and community-based conservation.

Other countries continue to manage plant genetic resources *in situ* using wildlife and forest policies and laws. The nature of the measures and the extent of their application vary from country to country. However, there are major similarities in the approach and content of policies and laws developed and applied by the countries.

### ***Wildlife and forest regimes***

All the African countries surveyed have specific wildlife and forest policies and laws to promote the protection, management and use of wildlife and forest resources. These measures also contain either implicit or explicit provisions on conservation, ownership and utilization of plant genetic resources. For example, Kenya has the Wildlife Conservation and Management Act (amended in 1989) which restricts public access to

and exploitation of wildlife resources. The Act provides for state ownership of wildlife resources, including plants, in protected areas. Individuals and/or institutions have no right to extract plants or parts thereof protected by law without consent of the authority in charge of wildlife. This legislation has been used to preserve animals in protected areas. Its application as an instrument for plant genetic resources conservation has not been put into effect.

The Zimbabwe Parks and Wild Life Act of 1975, deals with the conservation and utilization of wildlife in general. It contains, however, specific provisions to promote the protection of indigenous plants. Under the law a permit is required to enable any individual or individuals to collect a protected indigenous plant and/or parts thereof for, *inter alia*, export, cultivation and propagation, and for scientific purposes. The Parks and Wild Life Amendment Act, 1985 enables the Minister to prohibit persons from collecting any indigenous plants whether on alienated or unalienated land, within the area specified in the notice. Such restrictions on private land can be brought about in the interests of preservation, conservation, propagation or control of indigenous plants in Zimbabwe. This is a typical piece of legislation which the state could use to control illegal access to plant genetic resources.

Ethiopia's wildlife management policy (amended 1992) explicitly recognizes the use of protected areas to conserve plant genetic resources. It adopts a broader definition of wildlife (plant and animals as well as their ecosystems). Other countries have similar policies on wildlife. The implementation of these has, however, been fragmented because of various institutional incapacities.<sup>14</sup>

Apart from wildlife policies and laws, the countries have instituted forest regimes (policies and laws) whose overall goal is to promote *in situ* conservation of forests and forest genetic resources. The content of these regimes vary from country to country. However, most of them embody certain provisions controlling illegal access to public forests, mainly on public lands. In Uganda, for example, the Forest Act provides that individuals are not to enter a forest reserve for purposes of extracting any forest resource or undertaking activities that may cause damage to the forest ecosystem. Permission to enter forest reserves is granted by the Chief Forest Protection Officer.<sup>15</sup> Similar legal measures are found in Tanzania, Kenya, Cameroon, and the other African countries.

Wildlife and forest resources in most African countries are not under private ownership. They are essentially public assets that are held by the state in trust for the public. Public ownership gives the government a considerable degree of discretion to prohibit or restrict access and activities by third parties into areas set aside for protection purposes. The state also has police powers to regulate human activities in the public interest which may include regulatory measures for the conservation of both areas and species. Police powers can be utilized by governments to limit the rights of land owners to trade in and use genetic resources on their lands.

In Kenya, the Forest Act of 1942 (amended in 1982) has provisions that regulate access to forests and forest genetic resources. No person shall, subject to a licence from

the Chief Conservator, fell, cut, take, burn, injure or remove any forest produce.<sup>16</sup> It is also an offence to capture or kill any animal, set or be in possession of any trap, snare, gin or net or dig any pit, for the purpose of catching any animal, or use or be in possession of any poison or poisoned weapon.<sup>17</sup> Once a forest area has been declared closed, no person shall enter any part thereof.<sup>18</sup> Prohibition of access to forest produce is further regulated through stringent rules of evidence. Any person found within a forest area or in the vicinity of a forest and who has in his possession any forest produce, may be required by a police officer or a senior game warden to give an account of the manner in which he became possessed thereof. Any person who fails to give a satisfactory account may be arrested and taken before a magistrate.<sup>19</sup> A forest officer, police officer or a senior game warden may seize and detain any forest produce in respect of which there is reason to believe that an offence has been committed under the Forest Act.<sup>20</sup> This law, as is the case in most other countries, was enacted to preserve forests for the benefit of the colonial regimes.

### *National environmental policies and plans*

A majority of the countries surveyed possess national environmental policies and plans. These contain policy statements on the conservation and utilization of plant genetic resources. For example, Uganda's National Environmental Action Plan (NEAP) contains explicit policy provisions on conservation of plant genetic resources. It states that the Government of Uganda through the National Environment Authority and the Uganda Wildlife Authority will institute measures that ensure effective management of the country's wildlife. Tanzania's National Environmental Action Plan (NEAP), adopted in 1994, also recommends the expansion of the country's *in situ* conservation network.

### *Land use regulation*

Another important set of instruments for plant genetic resources conservation and utilization is land use policy and law. The majority of African countries have created regimes that regulate uses to which land may be put. Some of these measures are contained in specific land use policy and law as in the case of Tanzania or are in agricultural laws as in the case of Kenya, Ethiopia, Cameroon, Nigeria, and many other African countries. A common land use control approach is that of restricting felling of forests and taking of specified species of plants from specified areas.

### *Other in situ conservation regimes*

*In situ* conservation of plant genetic resources can also be undertaken using implicit laws such as the antiquities and monuments laws, grass and fires laws, trade restricting laws, plant protection law, pollution control laws, etc. A number of countries are adopting policies and legislation that provide incentives and disincentives to influence *in situ* conservation of plant genetic resources and biodiversity in general. Such measures include the provision of subsidies to farmers to maintain natural habitats on their land, and granting of land tax credits for the preservation of unique species of plants on

private land. Examples of African countries that have articulated these incentive-based measures in their regimes include South Africa and Kenya. South Africa's white paper on biodiversity contains policy statements, that if translated into action, would provide a range of incentives for conservation of plant genetic resources on private land. Kenya's environmental policy regime also provides economic incentives for *in situ* conservation of biodiversity in general and plant genetic resources in particular.<sup>21</sup>

### **3. *Ex situ* conservation measures**

#### **Nature of *ex situ* conservation systems**

*Ex situ* conservation of plant genetic resources is another important approach practiced in most African countries. It involves conserving components of plant genetic resources (for example seeds) outside their natural habitats. *Ex situ* conservation takes different forms including gene banks and botanic gardens. In the past two decades many African countries have established national gene banks and botanic gardens. There are, however, less than 35 national gene banks.

Most of the national gene banks are involved in the preservation of germplasm of cultivated crop species.<sup>22</sup> Some of the techniques applied in national gene banking include cryopreservation and tissue culture. Most national gene banks have mainly two categories of germplasm collections: active and base collections. Active collections are essentially working collections that are yearly supplied to national breeding stations. The main objective of maintaining them at national gene banks is for purposes of evaluation and enhancement. The active collections are tested for variability and viability before being distributed to national breeding stations. On the other hand, base collections are stored for long periods. Cryogenic techniques are sometimes used in the storage of base collections.

The most technically established gene banks are found in Ethiopia, South Africa, Kenya and the Southern Africa Development Community (SADC) gene bank. These are involved in the preservation of germplasm of cultivated crop species.<sup>23</sup> However, national gene banks in most of Africa have narrow coverage and accession storage capacities. In many cases, less than 25 per cent of the accessions stored at the gene banks have been tested for viability.<sup>24</sup> The incapacity of the gene banks to undertaking frequent testing is, *inter alia*, a result of the low priority that is accorded to *ex situ* conservation activities.

In general, gene banks in Africa face a wide range of problems associated with limited human and financial resources, inappropriate institutional arrangements, and poor national infrastructure. An assessment undertaken by the International Board of Plant Genetic Resources (IBPGR)—now called the International Plant Genetic Resources Institute (IPGRI)—in the mid-1980s, showed that most national gene banks

were underfunded and understaffed in crucial scientific areas. IPGRI has been involved in strengthening national capacities for gene banking in Ethiopia, Kenya and a number of other African countries. Since the early 1980s it has assisted a number of African countries to establish national gene banks. For example, it has provided conservation equipment to Botswana, Burundi, Ethiopia, Ghana, Kenya, Tanzania, the DRC, Zambia and other countries in Africa.<sup>25</sup>

Apart from gene banking, botanic gardens are another important *ex situ* conservation system in Africa. There are about 85 botanic gardens in the region. These are involved in identification and classification (taxonomy) of plant species, propagation of plants, and frequent genetic sampling.

Most of the national botanic gardens experience a number of problems including: lack of adequate space, lack of adequate technically competent staff, declining budgets, and absence of supportive national policies and laws.

## **Overview of *ex situ* policy and legal measures**

With the exception of Ethiopia, none of the African countries has developed a specific policy on plant genetic resources in general and *ex situ* conservation of the resources in particular. The countries' efforts to conserve and utilize the resources under *ex situ* systems are not guided by specific national policies and laws. However, there are various regimes that contain policies and laws that could be applied to promote conservation of the resources and regulate their utilization. These regimes include: plant variety protection legislation, national science and technology policies, trade regulations, quarantine laws, and national environmental policies and plans.

### *Quarantine regulations*

Most countries have national quarantine laws to regulate importation and prevent spread of diseases and pests in plants. These laws contain provisions which could be invoked to promote *ex situ* conservation and sustainable use of plant genetic resources. For example, in many African countries, a person or firm importing plants or parts thereof is expected to obtain a permit from the relevant authority certifying that imported material is disease and pest free. Under this legislative arrangement the relevant authority may prohibit or restrict the exportation and importation of any (or specified) plants or parts thereof.

### *Trade and related regulations*

All the African countries surveyed have various regulations aimed at governing trade in various goods and services. Some of these trade regulations contain provisions that may be applied to regulate export and/or import of plant genetic resources. Agricultural trade

and marketing policies of Uganda, for example, provide that no person and/or institution shall export seeds of several agricultural crops, e.g., coffee, without a permit from a recognized authority of the Ministry of Agriculture. Custom administration at all borders of the country are required by law to inspect all goods being taken out of the country and control the export of seeds without permits. In order to obtain a permit for export of certain agricultural seeds, the exporter must provide information such as the country to which the seeds are to be exported, the volume of export, and must also obtain certification that the seeds are disease and pest free as required by quarantine regulations. The Uganda agricultural trade and marketing policies do not however contain provisions aimed at promoting *ex situ* conservation of plant genetic resources as such. They are more relevant in regulating the utilization of the resources.

### *Plant variety protection regimes*

One of the most frequently used regimes for protecting plant varieties developed through plant breeding are the plant variety protection laws. At least 25 of the countries surveyed have plant variety protection laws which aim at protecting the rights of plant breeders. These laws have been instituted under the 1961 UPOV Convention which confers in Article 5 rights to plant breeders. In Kenya, the regime requires prior authorization of the plant breeder for: production, commercial marketing of the reproductive or vegetative propagating material, the offering for sale of such material; the marketing of such material; the repeated use of the protected variety for the commercial production of another variety; and the commercial use of ornamental plants or parts thereof as propagating material in the production of ornamental plants or cut flowers. This legal provisions can be invoked to regulate unsustainable use of plant genetic resources.

Most other African countries have plant variety protection laws similar to the Kenyan one. The laws contain provisions requiring disclosure of information on the nature and uses of seeds and the possible environmental impacts of the new varieties. They regulate the sale of seeds which are deleterious and prevent the sale of seeds which have not been tested for purity and germination or which are of a variety which has not been subjected to trials.

Plant variety protection regimes offer opportunities in which farmers can be compensated for their breeding efforts. The regimes are mainly concerned with agricultural products. However, even for a comparatively advanced field, compared to genetic resources in the wild, the issue of trade and pricing remains complex. Examined in a historical sense, however, the advancement made for such regimes reveal a path which could be followed especially for potentially useful wild genetic resources. Indeed, there is a connection between cultivated crops and some wild genetic strains.



*National environmental policies, plans and strategies*

Other policy and legislative instruments for *ex situ* conservation of plant genetic resources include national environmental policies, NEAPs, national environmental laws, national conservation strategies, and in some cases, national biodiversity strategies and action plans. Most of the countries surveyed possess some of these instruments. In fact, 60 per cent of countries have NEAPs and/or national conservation strategies that contain policies aimed at promoting *ex situ* plant genetic resources conservation.

## **4. Institutional arrangements**

The African countries have created a wide range of institutions to oversee the management of plant genetic resources. These institutions can generally be categorized into two: *in situ* and *ex situ* conservation institutions. *In situ* conservation institutions are of different kinds including national parks and reserves departments, ministries of tourism and wildlife, and forest departments. On the other hand, in most of the countries there are three main *ex situ* conservation kinds of institutions. These are national gene banks (often within ministries of agriculture), national botanic centres/institutes, and national museums. We have addressed the nature and problems of the two conservation systems in the above sections.

Of the two broad categories of conservation institutions, *ex situ* oriented organizations are less established in most of the countries. Despite the commendable efforts by IPGRI to upgrade gene-banking capacities in the region, it should be noted that the human capital base and the technological infrastructure for most national gene banks are poor. African *ex situ* facilities generally lack adequate personnel, particularly in new and emerging areas of conservation and genetic resources utilization. In most instances the scientific divisions of gene banks have only one or two staff members. This raises uncertainty in terms of continuity and retention of institutional memory in case any of the personnel from the division leave the organizations. Though the shortage of local personnel competent in various areas of gene banking has been recognized in most countries, there are no organized government-sponsored programmes to address the inadequacies.

Generally, the current institutional arrangements for plant genetic resources are largely centralized and fragmented. *In situ* conservation responsibilities and resources are vested in the central government institutions, but many local government institutions which could engage in the management of *in situ* plant genetic resources, lack legislative authority and are often marginalized in national plant genetic resources planning processes. In some cases where local authorities are responsible for nature reserves, they are increasingly under threat from central government parks departments. Their technical competence and legal authority are being eroded. They also suffer from inadequate financial resources and technical infrastructure to manage plant genetic resources in the national reserves.

In addition to the above factors, there are serious institutional conflicts that make it difficult for the countries to engage in effective conservation programmes. African governments have numerous agencies with overlapping mandates and are poorly coordinated. For example, forest departments do not articulate with wildlife agencies while gene banks are not effectively linked to the private sector and universities.

## **5. Local initiatives to manage plant genetic resources**

Local communities and households in different parts of Africa, which have accumulated a broad technological knowledge base, conserve and sustainably use plant genetic resources. They deploy different and unique technological systems to conserve and use plants and their genetic components. These systems include home gardens, seed banks and sacred groves. The home gardens are mainly small plots of land within the homestead on which several species, sometimes up to 100 or more, of plants are domesticated. Many local and traditional communities in Africa conserve rare medicinal plants in home gardens. They select and conserve specific species of plants whose medicinal values and properties they know. They domesticate these in small gardens normally at the back of their homesteads.

Apart from home gardens, seed banking is another established local conservation system. In Ethiopia, for example, the Tigray communities' efforts specifically address these problems: the loss of traditional seeds (genetic resources) and the traditional knowledge for selection and conservation. With financial support from some non-governmental organizations (NGOs), the Tigray farmers have established a community seed bank that currently holds seeds of a wide range of traditional crops. The seeds are selected by the local farmers based on specific cultural, technological and ecological criteria. The farmers select seeds on the basis of:

- better crop stand: that is, sample seeds are selected from fields with high-yields and high quality seeds;
- plant vigor: that is, they select seeds from plants that show traits of resistance against disease and pests; and
- seeds on which cultural knowledge has been accumulated by the communities.

However, the farmers are also interested in new seeds and knowledge. Moreover, they stress the importance of transmitting the selection skills to new generations. This ensures that technological knowledge and skills for genetic resource conservation are retained in the community. Institutional memory is sustained through generations of social change.

The seeds selected by the Tigray farmers are stored under special containers that are moisture-free or have low moisture content. The seeds are then invested in the custody of local women who frequently check the seeds to ensure that they are viable and free

from pest infection. The women occasionally sun-dry the seeds. They also grow samples of the seeds in home gardens to ensure that the stored seeds retain their regenerative potential.

One important feature of the Tigray form of institutional organization is that it facilitates easy sharing or exchange of seeds among the farmers and even outside communities. One channel of seed exchange is “the practice of offering a portion of the best selected seeds as gifts to the poor in connection with the St. Mary celebration in the Orthodox church. Because these are considered blessed seeds the poor will take some home and plant them.”<sup>26</sup>

Another conservation approach that is prevalent in local African communities is on-farm conservation. Local farmers have devised ways of selecting plants with specific genetic traits they require and propagating these on their farms. Many of these efforts are supported by a number of NGOs. For example, in Zimbabwe the Environment and Development Action (ENDA) is working with local farmers to select, multiply and conserve traditional varieties of sorghum and millet.<sup>27</sup> It has developed a system of documenting ethnobotanical information on local farming systems and conservation of plant species. ENDA also offers technical support for seed banking. It is also a source of financial support to seed banking activities of the communities since it has the institutional background for soliciting funds from international donors. ENDA has developed decentralized seed multiplication and storage systems in different parts of Zimbabwe.

In Kenya, the Kenya Energy and Environment Organizations (KENGO) has been working with various local communities to promote the preservation and utilization of traditional technological knowledge and local skills in genetic resource conservation. In the 1980s KENGO developed the Seeds and Genetic Resources Project to enhance conservation of indigenous genetic resources at local community level. The initial activities under the project involved education of both policy makers and the general public on the need to conserve genetic resources. Under the project an ethnobotanical database on indigenous trees growing in arid and semi-arid areas of Kenya has been developed.

Some other non-governmental organizations in different countries are involved in activities of promoting the conservation of ethnobotanical information. Ethnobotanical conservation, the preservation of indigenous knowledge about plant species, is increasingly being recognized as crucial for sustainable management of plant genetic resources.<sup>28</sup> The documentation of this knowledge system is useful for future conservation activities. Ethnobotanical knowledge is useful in identification and classification of plants.

Despite the local efforts of genetic resource conservation in different countries, a number of techno-economic, policy, and institutional limitations characterize local conservation programmes and activities. First, local knowledge on conservation is increasingly being eroded as a result of the introduction of exotic genetic resources into

the local socioeconomic systems.<sup>29</sup> In some countries national policies and public institutions do not favour the propagation and conservation of indigenous genetic resources and the associated technological knowledge base.<sup>30</sup> There are no national policy and legal regimes that clearly articulate and promote local technological efforts of biodiversity conservation. Furthermore, in most countries the established economic policies promote cultivation of exotic germplasm and do not support local conservation efforts.<sup>31</sup>

Secondly, in many instances, local communities in developing economies lack adequate economic resources to invest in conservation of a wide range of genetic resources through the application of their technological skills and knowledge. Furthermore, they do not have resources to invest in procuring equipment for seed cleaning and preservation.<sup>32</sup> There are no defined economic incentives to local communities to promote their efforts in conservation. Credit and loan facilities provided to farmers always demand that they cultivate cash crops, most of which are exotic, meant for international markets.<sup>33</sup> It is generally difficult for local farmers without considerable collateral to have access to credit. Local farmers are sometimes forced to abandon their traditional crops and to adopt the cultivation of exotic cash crops in order to acquire money for economic needs such as school fees, clothing and other household amenities. National economic policies in these cases are largely established on market-based approaches which treat indigenous crops as valueless.

## 6. Regional and international cooperation

There are a number of regional and international plant genetic resources conservation initiatives in Africa. In the area of *in situ* conservation, regional efforts include the Serengeti-Ngorongoro-Maasai Mara (biosphere) region between Tanzania and Kenya. The area covers about 2.3 million hectares and is protected from human exploitative activities. This protected area is under the UNESCO programme on networks of biospheres. Other regional protected areas include the Equatorial West Forests, and the Forest Zone of Cameroon, Chad and Ghana.

In the domain of *ex situ* conservation, regional efforts include the establishment of regional gene banks. The most notable example is the SADC's Plant Genetic Resources Centre (SPGRC) based in Zambia which was established with financial and technical assistance from Nordic countries through a special technical assistance programme under the Nordic gene bank. SPGRC is a network which serves the ten SADC countries and provides long-term storage of the countries' plant accessions.

Another major regional *ex situ* effort is the International Livestock Centre for Africa (ILCA) and IPGRI programme on *in vitro* culture of forage crops. The programme was established in 1986 and has been instrumental in conserving germplasm of forage crops from more than five African countries. The forage germplasm collection at ILCA in Addis Ababa, Ethiopia has about 10,000 accessions of grasses and legumes. There are

efforts to broaden the range of techniques applied including the development of virus indexing techniques to be applied in detecting germplasm infected with virus.

The International Institute of Tropical Agriculture (IITA) located in Ibadan, Nigeria set up the Genetic Resources Unit in 1975. The Institute's conservation activities are focused on food crops of Africa such as cowpea (*Vigna unguiculata*), yam (*Dioscorea* spp.), cassava (*Manihot esculenta*), banana (*Musa* spp.), and rice (*Oryza glaberrima*). IITA has devoted resources to collecting, classifying and conserving plant germplasm. The germplasm is stored at low temperatures for considerable periods of time. Some of the germplasm is distributed to national plant breeding stations in the region.<sup>34</sup>

Regional efforts have also focused on the formulation or establishment of conventions on various aspects of biodiversity in general. A notable example is the African Convention on the Conservation of Nature and Natural Resources established in 1968. This Convention covers plant genetic resources and recognizes the role of scientific and technological knowledge in conserving the resources. The Convention has been ratified by 29 African countries. Its focus is on *in situ* conservation. There is, however, no evidence that the convention is being implemented to promote the conservation of plant genetic resources and nature in general. It lacks a strong institutional mechanism to oversee its enforcement. Its implementation falls within the activities of the Organization of African Unity (OAU). The OAU is, however, more of a political organization that devotes a lot of its resources to political issues of the region but less to activities on conservation.

Apart from the regional initiatives, international support for plant genetic resources conservation in Africa has grown considerably in the past 20 years or so. The main international player is IPGRI with an extensive network of *ex situ* conservation projects. As noted earlier, its efforts are in building national *ex situ* plant genetic resources conservation capacities. It has assisted a number of African countries to establish national gene banks. It also houses a growing repository of scientific and technical information on collecting, documenting, characterizing and conserving plant germplasm. It is involved in training of personnel for national gene banks and provision of equipment. The Institute has an agreement with a number of national institutions to hold, on behalf of the international community, base collections of some crops. Most of its efforts have focused on cultivated crops although there is now increasing attention on *ex situ* management of wild species. IPGRI has established an integrated conservation programme that is based on the complementarity of *ex situ* and *in situ* conservation systems.<sup>35</sup> It is also actively involved in research on identifying new scientific techniques for germplasm conservation. The main research areas include pathology, techniques to sample and characterize germplasm, *in vitro* conservation, analysis of genetic variation and seed physiology.<sup>36</sup>

FAO established a Global Information and Early Warning System on Plant Genetic Resources (PGR/GIS) in the 1980s. The purpose of the PGR/GIS is to collect, document and disseminate data on the status of plant genetic resources in Africa and other regions.

It is also meant to facilitate the exchange of information on plant genetic resources and technologies for conservation. The organization has also been instrumental in stimulating international discussions on issues of plant genetic resources ownership and control. It established an International Undertaking on Plant Genetic Resources “to ensure that plant genetic resources, especially species of present or future economic and social importance, will be explored, collected, preserved, evaluated and made available without restriction, for plant breeding and other scientific purposes.”<sup>37</sup>

Other international efforts include activities of the Worldwide Fund for Nature, the World Conservation Union (IUCN), the World Conservation Monitoring Centre (WCMC), UNEP, and the Wildlife Conservation International (WCI). Of these, the IUCN has a long history of working on protected areas. It has established a specific commission to guide the coordination of national programmes on protected areas. The Commission on National Parks and Protected Areas is largely involved in offering scientific and technical guidance to national institutions involved in activities of managing protected areas. Other activities include identification and documentation of species and ecosystems that are being threatened and so require protection. Most of these activities support plant genetic resources conservation in Africa.

IUCN also manages the Botanical Gardens Conservation Secretariat which maintains more than 20,000 species of plants. Its main functions include: monitoring and coordinating botanical gardens conservation activities worldwide; providing training on botanical garden conservation; and organizing an International Botanical Gardens Conservation Congress every three years. The Secretariat has developed a computerized database on species maintained in most botanical gardens worldwide and is a source of technical expertise and scientific information to national botanic gardens in Africa.

Another international initiative is the Man and Biosphere Programme managed by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The programme was launched in 1971 and has a number of projects in Africa. It focuses on the “conservation of natural areas and the genetic material they contain.”<sup>38</sup> It specifically deals with research and field assessments to identify habitats where species are threatened, as well as needs in training and building capacity for scientific research.

The Royal Botanical Gardens at Kew in the United Kingdom has been collecting and storing seeds of wild plants from different African countries since the 1950s. Over the years it has accumulated germplasm samples from over 25 African countries. Its activities also include offering technical assistance to national botanical gardens. It has offered training courses to personnel from many national botanical gardens.

Recent international programmes supporting plant genetic resources conservation in Africa include the Global Environment Facility (GEF)’s activities in East Africa to strengthen biodiversity management generally, projects in southern Africa on national and regional biodiversity planning and others.

## **7. New opportunities and challenges**

## **The Convention on Biological Diversity: An overview**

The Convention on Biological Diversity which came into force in December 1993 aims at promoting:

the conservation of biodiversity, the sustainable utilization of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies and by appropriate funding.

The Convention is a legally binding instrument of international environmental policy and law that has been ratified by most African countries. It creates new opportunities for establishing new regimes to promote conservation and sustainable utilization of plant genetic resources in Africa. However, the extent to which African countries are able to tap the opportunities is largely dependent on, *inter alia*, their level of understanding of the various provisions of the Convention and their subsequent participation in formulation of international and regional programmes to implement it. It is also dependent on how well they mobilize and enhance their capacities to formulate and implement relevant policies and laws for conservation and sustainable use of the resources.

The Convention was negotiated while most of Africa was undergoing major political and economic changes. South Africa was preoccupied with managing the transition from apartheid to a new form of governance. Other African countries such as Kenya, Tanzania and Zambia were embroiled in national political reforms associated with reintroduction of multiparty democracy—from monoparty forms of governance. These countries were also under severe pressure from the Bretton Woods institutions—the World Bank and the International Monetary Fund (IMF)—to institute structural adjustment and stabilization policies to remove major economic distortions in their systems and create a strong basis for servicing international debt. On the whole, these countries had most of their attention directed to the political and economic reforms to the extent that their participation in the negotiation and development of the Convention was fairly limited and disorganized. The countries were not able to mobilize and direct the best expertise to the negotiation process.

Another factor was the low level of relevant policy information and knowledge that governments had access to. For most of the major issues covered during the negotiation and contained in the Convention, African countries had a fairly weak information base. They were not well prepared to negotiate on issues such as technology development and transfer; access to genetic resources and sharing of benefits arising out of the utilization of these resources; the nature of financial resources and mechanisms to promote conservation; *ex situ* plant genetic resources; indigenous knowledge and rights; and intellectual property rights protection.

The Convention articulates the principle of national sovereignty over natural

resources but also stresses the fact that the conservation of such resources is a common concern of humankind. In this respect, every party to the Convention has an obligation to safeguard these resources. The Convention provides an international legal framework that may strengthen the power of African countries to conserve their plant genetic resources as well as negotiate for and derive benefits from use of such resources. They are also able to tap new and additional financial resources that may be generated through facilities such as the GEF, established to promote the implementation of the Convention and other related environmental agreements. However, it will be up to individual nations to put in place appropriate policy, legislative and institutional measures to achieve these benefits. From a conservation standpoint, unless these countries do see such benefits from these resources, the political will to conserve plants and their genetic material will not be easily forthcoming.

There are many provisions of the Convention which should be of concern to African countries. These include: national biodiversity planning (Article 6); identification and monitoring (Article 7); enhancing *in situ* and *ex situ* conservation systems (Articles 8 and 9); indigenous and local knowledge, rights and innovations (Article 8j and 10(c)); incentives for conservation and sustainable use of biodiversity (Article 11); research and training (Article 12); environmental impact assessment (Article 14); access to genetic resources and sharing of benefits arising from the use of these resources (Article 15); access to and transfer of technology (Article 16); handling of biotechnology and distribution of its benefits (Articles 8g and Article 19); and financial resources and mechanisms (Articles 20 and 21).

Article 6 of the Convention calls on Contracting Parties to develop national strategies and action plans aimed at integrating biodiversity management into sectoral policies and programmes. The Parties are also required to review and adapt existing strategies, which reflect, the provisions of the Convention. This Article requires countries to review their existing sectoral plans and policies to identify how and areas where to integrate the objectives of the Convention. The strategies, action plans and/or programmes should explicitly outline plant genetic resources conservation priorities and articulate specific action to address conflicts between conservation and development needs.

It should be noted that the process of developing national strategies, action plans and/or programmes largely involves policy analysis. For countries to formulate realistic strategies, action plans and programmes, they require specific policy analysis expertise and must organize their institutions in such a manner as to obtain convergence and synergy. This is the challenge for African countries. Most of these countries lack expertise and appropriate institutional arrangements for developing the strategies, action plans and programmes. If these countries are to fulfill their obligations they will need to enhance the capacities of a good number of policy-makers to be able to deal with the requirements of Article 6 and other articles of the Convention.

The need to formulate specific policy and institutional measures for implementing the



Convention is crucial in African countries which have weak economies and where a significant percentage of the world's biodiversity is. The countries face problems of scarce financial and human resources to invest in biodiversity management. Under frequent conditions of economic instability, it is difficult for the countries to invest their human resources and sustain institutions for biodiversity conservation. Furthermore, the countries are implementing structural adjustment policies promoted by the World Bank and the IMF. These policies involve reduction of government expenditure, and privatization of certain public enterprises. Some of these measures are likely to have impacts on the abilities of the countries to engage in plant genetic resources management. It is therefore critical to sequence and manage these reforms in a such manner that they do not erode the existing capabilities of national and local institutions.

### **Bioprospecting, local knowledge and rights (Articles 8j, 10c and 15)**

Before the Convention came into force the world's plant genetic resources were treated as a common heritage of humankind and were open to access without restrictions. They could be collected and utilized freely by interested persons and institutions, particularly from the developed countries. African countries were opposed to the principle of common heritage to genetic resources. They debated against a regime that allowed the developed countries to freely or cheaply obtain genetic resources, or to patent products arising from the genetic material and sell these patented products at high prices to the developing country where the material was collected. The countries argued for sovereign rights over genetic resources. The debate, mainly between the developed and developing countries, on ownership of genetic resources was partly resolved through the negotiations for the Convention on Biological Diversity. Articles 3 and 15 of the Convention deal with national sovereign rights over genetic resources and access to genetic resources respectively.

Article 15 deals with issues of national rights and obligations regarding access to genetic resources. The Article requires Parties to put in place measures that facilitate access to genetic resources for environmentally-sound uses. It requires Contracting Parties to institute measures that strike a balance between national rights to determine access and obligations to facilitate access by other parties on mutually agreed terms. The mutual agreement by parties involved in the access arrangement is based on what we may term transparency which requires the party seeking access to obtain prior consent of the one that holds or owns the genetic resource. The Convention makes provision for the sharing of benefits derived from genetic resources with the country of origin, or the country providing such resources if acquired in accordance with the Convention.

In order to effectively enforce the provisions on sovereign rights and access to genetic resources, countries are required to formulate policy, legal and institutional measures. A few countries such as the Philippines and the Andean Pact group of countries have

initiated processes of formulating national regimes to enable them to implement Article 15 on access to genetic resources. The Philippines has adopted a specific legal regime for regulating access to genetic resources. However, most countries do not have new regimes to regulate access to genetic resources or have not initiated processes to establish such regimes. African countries have to undertake major efforts to formulate national legal measures and establish suitable institutional arrangements for regulating access to genetic resources. These countries need to mobilize various forms of expertise and create new capacities to be able to effectively implement the access to genetic resources provisions.

## **Constraints to the development of policy and legislative measures**

The above assessment has provided a clear indication of the inadequacy of existing plant genetic resources policies and laws of African countries. As also noted earlier, there are various national efforts to reform existing regimes and institute measures that conform with the provisions of the Convention and other international arrangements. These efforts however suffer from a wide range of constraints including the following:

1. Absence of critical mass of expertise in plant genetic resources policy and laws. Most African countries suffer from deficiency of policy analysis expertise in environmental issues generally and plant genetic resources in particular, though empirical evidence for this has not been established. Rudimentary assessments by ACTS show that some African countries such as Tanzania, Cameroon, Congo and Botswana do not have any persons trained in and/or to work on plant genetic resources policy issues.
2. In addition to the lack of policy analysis expertise in the countries, the formulation of appropriate regimes is also constrained by institutional rigidities that make it difficult to mobilize limited international experiences and expertise and apply them for/in the formulation of plant genetic resources policy and laws. Policy-making and enactment of laws are often the preserve of few institutions and in some cases individuals. In cases where plant genetic resources are not of interest to these individual and/or institutions, appropriate policies and laws are never instituted.
3. Another major constraint to the establishment of plant genetic resources policy and legislation is the insufficient political attention given to plant genetic resources. Very often political attention is accorded various development issues—e.g., health, education, industry—without careful recognition of the main source of national development of the countries. This is very much so in economic planning which is established on traditional theory and concerns. Plant genetic resources and natural resources generally are left to the development planning process because of the limited political constituency that they have.
4. The formulation and implementation of appropriate plant genetic resources policies

and legislation in most of the African countries are constrained by the lack of adequate financial resources for policy analysis and research on the various aspects. Most countries have very limited allocations to research generally and policy research in particular.

The above and other factors have indeed constrained the formulation and subsequent implementation of plant genetic resources policy and legislation in many countries. If the countries are to establish systematic policies and laws to address the problems of genetic resources loss as well as meet the requirements of the Convention on Biological Diversity, they need to create policy, institutional and political measures that address the above constraints.

A first step in plant genetic resources conservation is policy development—changing policies that often deny the allocation of human and financial resources and institutional attention to genetic resources. The following section makes recommendations to address the above constraints and other limitations associated with plant genetic resources in Africa.

## **8. Emerging policy and institutional recommendations**

### **Policy innovations**

This assessment has shown that while most African countries have established a variety of policy, legislative and institutional measures to promote conservation and utilization of plant genetic resources, many of these are outdated and largely inadequate to address emerging conservation and development priorities as well as tap new technological opportunities. In order for the African countries to benefit from the Convention on Biological Diversity and other international regimes, they should undertake major reforms of the existing conservation and related policies and laws. The first challenge for these countries is to start depositing the three objectives of the Convention on Biological Diversity into their conservation policies, laws and plans. Such efforts should be guided by development priorities at all levels of governance.

A major responsibility for the countries relates to the integration of plant genetic resources conservation and utilization concerns into national development plans and policies. This could be extended to pronouncing conservation imperatives in other regimes such as science and technology policies and ensure that imperatives of scientific research and technological capability building for plant genetic resources conservation and utilization are clearly reflected in the policy. In other words, plant genetic resources conservation and utilization issues should be provided more space and attention in national science and technology policy.

The policy reforms should go beyond the mere integration of plant genetic resources issues into existing regimes. They should involve a reorientation of public policies to encompass the entire spectrum of biodiversity instead of focusing on a few species in

isolation. In the case of gene banking, conservation imperatives should cover wild species; and in the area of wildlife conservation the focus should be broadened to cover habitat and all species of plants irrespective of their perceived current socioeconomic values.

In addition, policy reforms and formulation's major efforts should be invested in planning for training in key areas of plant genetic resources conservation and utilization. Areas, including biotechnology and plant taxonomy, need to be given urgent recognition and supported through specific bilateral arrangements or through deliberate initiatives of the governments and specific institutions of conservation. The training should be complemented by incentives and institutional environments that promote efficient and effective utilization of the trained personnel. This not only generates local technological expertise and indigenous technological capabilities, it promotes experimentation and technological learning for the conservation and sustainable utilization of plant genetic resources. Training should lead to the build-up of human capital or manpower to undertake scientific research and routines of conservation (exploration, taxonomic studies, characterization, etc.).

The build-up of local scientific and technical manpower through training should also be complimented by other deliberate measures that enhance the procurement or acquisition of new technological knowledge for plant genetic conservation and sustainable utilization. Such measures include building national information databases and linking these to international ones; deliberate efforts to acquire and efficiently utilize scientific publications; and use of workshops and conferences as a means of technology search and acquisition.

This study has also suggested that the African countries should use the Convention on Biological Diversity as a spring-board to instituting specific national conservation and sustainable use policies, laws and plans. There are many options available to the countries. These range from establishing new, comprehensive and long-term plant genetic resources policies to integrating specific plant genetic resources issues and concerns into national biodiversity strategies, action plans and programmes to be formulated as a requirement of Article 6 of the Convention. Countries must decide, based on their own national circumstances, which approach to take.

## **Institutional change and strengthening**

Another major challenge for plant genetic resources conservation and sustainable utilization in Africa relates to the formation and development of plant genetic resources institutions as well as the integration of conservation concerns into all development and political institutions. To achieve this, major institutional reforms and innovations will have to be undertaken.

The processes of institutional change and development need to focus on specific issues and/or problems of current organizational rigidities and should generate new and long-lasting solutions and institutional synergy. These will largely involve creative and

adaptive changes of organizational structures and the harmonization of the various conservation activities currently being conducted by different and isolated institutions. This would ensure easy coordination of activities, sharing of technological knowledge and skills and in general, create room for institutional synergy. Institutional changes and reforms should be accompanied by major and deliberate efforts of capacity building.

Institutional change is one of the most important policy recommendations of this study. It is based on the premise that accumulation of national capabilities to conserve and utilize plant genetic resources does not occur in an institutional vacuum.

The institutional changes will need to be accompanied by various innovations in public policy. Institutions draw their legitimacy and authority from public policy and national legislation. If public policy does not acknowledge the roles of specific institutions for conservation, and support them, it is difficult to envisage long-term accumulation and utilization of capabilities in these institutions. Some of the existing policies are amicable to long-term institutional capacity building. Policy reforms will therefore need to be undertaken in order to ensure that policies in place conform to the imperatives of establishing suitable institutional structures for plant genetic resources conservation. Because of the fragmentary and rigid institutional structures in most of Africa, a large pool of scientific and technical human capital scattered in a wide number of conservation institutions is not being efficiently utilized. Institutions have been created without much recognition of the overall national development and conservation priorities. Stand-alone institutions are unlikely to effectively accumulate and utilize technological capabilities to conserve and sustainably utilize plant genetic resources. Thus, various forms of institutional partnerships will need to be established among national institutions for research and conservation. The partnerships should also be extended to international institutions within and outside the countries.

Specific institutional reforms include granting more legal authority and autonomy to *ex situ* conservation institutions in many African countries, raising national budgets and finances for plant genetic resources institutions, and creating national gene banks in those countries where none or inadequate ones exist. This study has noted that in many countries the government funding to plant genetic resources activities (conservation and research) is considerably low. It is imperative that national, bilateral and multilateral funding to the activities is increased significantly to meet national needs and priorities.

## **Capacity development in plant genetic resources policy and law**

In order to formulate and effectively implement national plant genetic resources policies and legislation, countries require capacities drawn from a wide range of disciplines. For example, countries need specialists with skills in the legal and policy aspects as well as scientific and technical issues including land tenure, intellectual property rights, and local communities' role and rights. In short, countries need minimum and critical ca-

capacity to engage in a relatively knowledge-intensive process of formulating policy and national legislation, and developing the institutions and mechanisms to implement them. Most African countries, however, do not possess all this expertise. Without adequate capacity, there is a danger that policies, laws and plans will be established merely in writing—they will neither be applied nor enforced.

The creation, mobilization and utilization of expertise to formulate and oversee the implementation of national plant genetic resources policies and laws will require considerable international support to the countries. This support is not merely in terms of providing financial resources to the countries but largely in identification of the best expertise and creation of appropriate institutional space to utilize it. This is a task that bilateral and multilateral donors as well as international organizations such as IPGRI, FAO, UNEP and the Convention's subsidiary bodies and financing mechanism should confront.

Capacity building in plant genetic resources policy and law may, for instance, take the form of short, focused training courses for government officials and NGO staff. IPGRI could establish a regional training course on plant genetic resources policy and law for African policy-makers. This could be done in collaboration with various institutions such as ACTS, UNEP, FAO and others. One of the areas that such a course should focus on is the formulation of national access and benefit sharing legislation. Many other regional and international institutions have the potential to develop and run such courses. IPGRI could also take the lead in mobilizing regional and national institutions to develop such training courses. It could also play a key role in securing funding for them from a range of donor agencies.

## Conclusion

This study examined the nature of plant genetic resources conservation regimes in Africa. It has also assessed the adequacy of current efforts and outlined regional and international efforts to conserve plant genetic resources. The study has shown that while the countries have established a wide range of *in situ* conservation regimes—policies, laws and institutions—they lack strong *ex situ* arrangements. A majority of the countries do not have explicit plant genetic resources policies and laws, their *ex situ* conservation institutions are underfunded and understaffed, and they also experience institutional conflicts which erode national opportunities to conserve and sustainably utilize the resources.

The study has examined regional and international opportunities available to African countries to conserve and sustainably utilize their genetic resources. It has argued that the Convention on Biological Diversity has generated new opportunities which the countries could tap to integrate plant genetic resources issues and concerns into national policies and laws. The opportunities also include the formulation of legislation to

regulate illegal access to the region's genetic resources and ensure that benefits arising from the commercial utilization of the resources are shared with stakeholders at all levels.

To address the various inadequacies obtained in the countries, this study has processed three areas of focus. The first is the formulation of specific plant genetic resources policies and laws as well as the integration of plant genetic resources conservation and sustainable use imperatives in existing policies, plans and laws. The second is reform of existing institutions—including strengthening legal authority and autonomy of *ex situ* conservation organizations—and the creation of institutional arrangements that bring synergy and technological learning. The third task relates to the creation and/or mobilization of expertise to formulate new policies and laws and/or undertake review of existing ones. The study has proposed the establishment of a regional training programme on plant genetic resources policy and law. Such a programme could form the basis of developing critical minimum capacities to address plant genetic resources policy and legal issues in the countries.

## Notes

1. See Juma, 1989.
2. WCMC, 1992, p. 66.
- 3.
4. Republic of Kenya, 1993.
5. Morgan, 1981, Vol. 35, No. 1, pp. 96–130.
6. World Bank, 1990; and 1997.
7. See
8. Mugabe, et al. 1997.
9. Mubita, 1986.
10. See for example, McNeely, et al. 1990, p. 66-68; Western, 1991, p. 87–96.
11. WCMC. 1992; Chapman & Hall, 1989 and Reid and Miller, 1989.
12. Olindo, 1992; pp. 2.23–2.24
13. Personal communication with Steiner, IUCN, Harare, Zimbabwe, May 1992.
14. See Mugabe and Clark, 1998.
15. Opio-Odongo, 1997, forthcoming.
16. Section 8 (1) of the Forest Act, Cap 385 of the Laws of Kenya.
17. Section 8 (1) vii of the Forest Act, Cap 385 of the Laws of Kenya.
18. Section 8 (v) of the Forest Act, Cap 385 of the Laws of Kenya.
19. Section 11 (b) of the Forest Act, Cap 385 of the Laws of Kenya.
20. Section 11 (d) of the Forest Act, Cap 385 of the Laws of Kenya.
21. See Mugabe and Clark, 1998 for details.
22. McNeely, et al. 1990, p. 62.
23. *Ibid.*
24. Mugabe and Clark, 1998.
25. Reid et al. 1991.
26. *Ibid.* p.17.
27. Interviews at ENDA, Harare, May 1992.
28. Schultes, 1991, Vol.7, nos. 1&2, 1991, pp. 69–72.
29. Shiva, 1993.
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## **Annex**

### **List of some of the countries covered under the assessment**

Angola	Mauritius
Benin	Mozambique
Bowtsana	Nigeria
Bukina Faso	Nambia
Burundi	Rwanda
Cameroon	Seychelles
Cote de Voir	Senegal
Congo	
Djibouti	
Ethiopia	
Eritrea	
The Gambia	
Ghana	
Gabon	
Kenya	
Lesotho	
Madagascar	
Malawi	