

**Agricultural Biodiversity Initiative for Africa:  
Improving African lives through agricultural biodiversity R&D and Policy  
BACKGROUND TECHNICAL DOCUMENT**

**A. Introduction**

Agricultural biodiversity, or agrobiodiversity, includes all the varied components of biological resources of relevance to food and agriculture: the variety and variability of animals, plants and micro-organisms at the genetic, species and ecosystem levels which are necessary for production and for sustaining key functions of the agro-ecosystem, its structure and processes (UNEP/CBD/SBSTTA/5/10). These are the components of biological diversity that are required for sustaining regulatory functions, resource structure and ecological processes of agro-ecosystems that result in the production of all the goods and services for food and agriculture. Wild species within agricultural landscapes also constitute elements of agrobiodiversity and contribute to the ecosystem services produced in agro-ecosystems. Biological diversity of animals and plants for food production constitutes a basic asset for the survival of humanity, particularly people living in poor or marginal areas where production is particularly difficult. Agricultural biodiversity also serves as a necessary basis for research and development particularly formal breeding work. Apart from the biological dimension, agricultural biodiversity has a prominent social dimension because the status and evolution of ecosystems and genetic resources are influenced by human intervention.

**B. The importance of agricultural biodiversity**

Over the last ten years the importance of maintaining agricultural biodiversity has been increasingly recognized by international agencies and in international agreements. In decision V/5, the Conference of the Parties to the Convention on Biological Diversity (CBD) adopted a programme of work on agricultural biodiversity. The same meeting expressed its concern at the lack of an adequate knowledge base in many key areas of agrobiodiversity. The adoption of the Global Plan of Action on Plant Genetic Resources for Food and Agriculture and the entry into force of the International Treaty on Plant Genetic Resources for Food and Agriculture have also been important in focusing attention on the need for more work on the key issues of maintaining and using agrobiodiversity. The adoption of a programme of work on agricultural biodiversity by the Global Environment Facility has seen significant funding released for work in a number of countries.

In Africa, this increasing recognition of the importance of agricultural biodiversity is of critical importance because of its relevance for attaining food security. The loss of agricultural biodiversity and associated local knowledge constitute a threat in many poor African communities where food insecurity is rampant. Crop and tree diversity (both within and between species variation) are important to farmers for risk avoidance, product diversification, income generation, and adaptation to changing environmental conditions. Apart from plant resources, livestock and fish diversity has been shown to have similar functions and provide benefits to many farming and aquatic systems. Soil organisms contribute a wide range of essential services to the sustainable functioning of agro-ecosystems through nutrient cycling, regulation of the dynamics of soil carbon sequestration, effects on soil physical structure and water regimes, and influence on plant life (e.g. nitrogen fixation and the interactions in the soil of pests, predators and other organisms). Pollinators are essential for seed and fruit production and their number and diversity can profoundly affect crop production levels. However, knowledge is still limited on the interactions and synergies among these different systems (crop, livestock, and aquatic) and their associated

biodiversity (e.g., soil organisms, pollinators) that sustain the functions and productive capacity of the agroecosystems for sustainable agricultural and human well-being.

The biodiversity maintained by farmers is not only of benefit to them but also to society as a whole, because of its role in maintaining ecosystem services such as erosion or disease control. Different sectors of society perceive these values in distinct ways. The farmer depends on the services with a direct agricultural production function such as nutrient cycles for livelihood. Neighbouring communities benefit from disease control and water quality regulation. The global community benefit from greenhouse gas regulation and preservation of biodiversity resources.

### **C. Agrobiodiversity challenges facing Africa**

A fundamental challenge for Africa over the next 10 to 25 years is to increase food production and improve the livelihoods of small-scale farmers. This has to be done in an ecologically sustainable manner that does not increase vulnerability and land degradation but still improves profit margins and livelihoods of poor farmers and small scale producers. This will require effective use of agricultural biodiversity and productivity in agricultural and aquatic systems. Whilst countries in the north have followed an agricultural development path in which diversity has been simplified and ultimately replaced by human-made, and largely non-renewable inputs, an alternative agricultural development path in which natural diversity is exploited and knowledgeably used to increase productivity, resilience and sustainability seems to be the desirable and appropriate approach in Africa. Such a path would have the obvious advantages for Africa's small-scale farmers, particularly in providing a wide range of foodstuffs available locally, enhancing dietary diversity and thus increasing the consumption of healthy diets.

However, there remain substantial and significant knowledge constraints to realizing the value and importance of improved maintenance and increased use of agricultural biodiversity by small-scale farmers in Africa.

#### ***Stemming the loss of diversity***

Diversity found in Africa's agricultural biodiversity resources is in danger of being lost not only in *in-situ* conditions but also in poorly stored and maintained *ex-situ* collections. The loss of natural biodiversity is mostly man-made and result from, among others factors, alteration and loss of natural habitats, introduction of alien species and over-harvesting. The replacement of local varieties by newly bred 'improved' or exotic varieties also contributes to the neglect and potential loss of diversity in genetic resources, reduces farmer livelihood options and, without continuing ex situ conservation poses a risk to future plant breeding work. The genetic erosion of associated with domestic livestock breeds is particularly dramatic and the effect of overgrazing is another dimension of major importance with its substantial damage to agricultural production systems, production capacity and ecosystem service provision. **Research is needed on the mechanisms and policies needed to support the maintenance of agrobiodiversity** that will promote institutional evolution capable of conserving agricultural biodiversity, nationally and in communities, for use in meeting food security needs. Equally important is to find ways of maintaining the traditional knowledge associated with the maintenance and use of this agrobiodiversity.

#### ***Maintenance and use of diversity in traditional farming systems***

The diversity of plant and animal species maintained in traditional African farming systems over many centuries and the indigenous knowledge associated with managing these resources constitute key assets of the rural poor. The management and use of these assets, and the

practices that maintain pollinators and associated below ground diversity, provide the natural capital of their livelihood strategies. In marginal and difficult farming conditions these materials are especially important. In these circumstances, diversity management can become a central part of the livelihood management strategies of farmers and pastoralists, particularly communities in stress-prone production areas. The use of native fodder crops and trees benefits both livestock production and crop production and puts less pressure on surrounding areas. There is much potential to explore conservation and organic agricultural production options. **Research is needed to better understand the livelihood strategies that can promote sustainable food and agricultural production, empower local communities and provide greater food security for rural communities.**

### ***Biodiversity decline and increasing production***

Historically, a decline in biodiversity in agroecosystems has been associated with agricultural intensification and development activities, and these trends continue. The consequences of such a decline for small-scale farmers in Africa can be devastating because loss of biodiversity could lead to a substantial decrease in the resilience (the capacity to absorb shocks while maintaining function) of farmers' agroecosystems and consequently increase in farmers' vulnerability. When change occurs, resilience provides the components for renewal and reorganization. When ecosystem loses its resilience, adaptation to change is not possible and therefore, change inevitably has potentially disastrous consequences. Inability to cope with risks, stresses and shocks, substantially undermines livelihoods of small-scale farmers. **We need to examine how principles underlying tested intensification paradigms and development policies, such as the green revolution, can be applied in Africa without threat to the diversity of biological resources and ecosystem resilience.** A particular need is to identify those win-win scenarios where different levels of intensification can occur in association with or through improved use of agrobiodiversity

### ***Addressing knowledge gaps on the functions and roles of agrobiodiversity***

There are substantial knowledge gaps regarding the different roles of biodiversity in agricultural (farming, pastoral, forest, aquatic) systems. While there are many clear demonstrations that a specific component of agricultural biodiversity contributes to ecosystem health and production in a given location, we lack a rigorous, systems analysis of the value and contribution of different aspects of diversity to production and ecosystem health in different agroecology or production systems. We need to examine how general principles linking diversity, stability and resilience apply in functioning agricultural ecosystems. We also need to determine how different biodiversity components (ecosystem, species and within species diversity) and management practices can be combined to secure optimum ecosystem and livelihood benefits. Knowledge is particularly limited in areas such as economics and diversity analysis, the nature and distribution of below ground diversity, and the role of interactions between different components (soil/plant/animal/management practices etc) and the interaction of on-farm diversity with diversity in wider ecosystems. Tools for effective monitoring of long term changes in diversity in the different components are also limited.

### ***Biodiversity management practices***

There are essentially no tested, generic, biodiversity management practices for different types of agroecosystems that optimize returns to farmers. There is a need to translate increased knowledge about agricultural biodiversity into effective management and even development practices. Farmers manage and affect the nature and distribution of agricultural biodiversity through their existing practices. The existing practices are constantly under pressure for

change due to increasing human population and the demand for increased agricultural production. In contrast to “natural” ecosystem management, there has been almost no work that allows the effects to be determined of different management practices on agricultural diversity or that leads to the identification of management practices that can achieve specific diversity objectives. Management practices of this kind are likely to be found at different scales from farm field to region or country depending on the aspect under consideration. Soil management changes may be quite local while the patterns of distribution of crop varieties or of non-cultivated diversity may be most important at a landscape level. There is the need to identify and package together available elements or known principles for the management of agricultural biodiversity for the benefit of farmers, for testing under integrated agricultural research for development (IAR4D) schemes similar to FARA’s SSA Challenge Programme.

#### ***Policy and institutional actions to stimulate improved biodiversity management***

Effective policy and institutional incentives that facilitate adoption of improved biodiversity management practices (or maintenance of already sustainable practices) by farmers are lacking. There is an urgent need to translate knowledge into clearly articulated messages for policymakers. This includes messages about (i) the different roles fulfilled by biodiversity in agricultural systems, (ii) the value of this biodiversity for different groups in society and (iii) the types of policy and institutional instruments that will ensure equitable cost sharing when farmers’ management of biodiversity in tropical countries creates benefits for society at large.

#### **D. Programmatic approaches to meeting challenges**

The conservation, enhancement and use of agrobiodiversity are central to the achievement of sustainable agricultural production. Since agriculture production is the source of livelihood for the majority of Africans, particularly those living in the rural communities, it is important to focus on agricultural practices that improve the livelihoods of poor farmers while promoting adaptability of agriculture to cope with the challenges of climate change, resource degradation and newly emerging diseases. The effective conservation and use of the indigenous agrobiodiversity resources are hence critical to the attainment of sustainable agricultural production of food and fibre to meet the needs of the African people. To realize the benefits that accrue from Africa’s agrobiodiversity resources, there is the need to develop the whole range of well-linked and impact-oriented research and development activities, focusing primarily on the needs of poor farmers and promoting food security.

We now outline selected programme research areas as a preliminary basis for discussion by the FARA Stakeholders’ meeting and, where suitable, for development into a programme of work for an Agricultural Biodiversity Initiative for Africa. These are areas where a number of FARA stakeholders already have relevant experience which complements that of relevant international institutions such as Bioversity International.

The recently formed Platform for Agrobiodiversity Research (based in Nairobi and Rome) has also identified some key areas for collaboration among those working in different areas of Agrobiodiversity. The Platform will provide a framework for further discussion of major agrobiodiversity issues and for identification of key research areas and entry points for new initiatives (see attached Report of the First International Stakeholder Meeting of the Platform for Agrobiodiversity Research).

#### ***Managing agricultural biodiversity for improved livelihoods and better nutrition for the poor.***

The way in which diversity can be optimally used to improve income and well being as part of improving livelihoods, especially among the rural poor requires integrated, multidisciplinary

nary research programmes focused on the different production systems and situations that are found throughout the continent. The diversity of crops, livestock and other elements of the production system are key assets of the rural poor central to their livelihood strategies. The challenge of the work will be to identify ways to optimize the returns from diversity in terms of income and well-being. This will require work on quantifying the benefits and links between agrobiodiversity, human wellbeing and ecosystem health and addressing problems loss of agrobiodiversity and associated local knowledge and management practices.

Critical research issues include: deployment of pro-poor traits of local biodiversity to provide better nutritional and income options for the poor; strengthening the capacity of rural institutions to maximize use of diversity to enhance livelihood options; and educational methods for community based monitoring of biodiversity and conservation.

Outputs specific to this area could include:

- Nutritional and health benefits of agricultural and forest biodiversity assessed, demonstrated and valued.
- New agricultural and forest biodiversity-based income options identified, developed and validated with an emphasis on marginalized groups
- Cultural, aesthetic and recreation values of agricultural and forest biodiversity demonstrated and promoted.

### ***Managing agrobiodiversity for more sustainable production***

Improved sustainability and productivity in agricultural production systems throughout Africa are central to sustainable development and poverty reduction. This requires the development of “sustainable intensification” strategies, the improved deployment of diversity to support ecosystem resilience and production stability and the use of adaptability to secure production under climate change.

Critical research issues include how and what diversity to deploy to maintain resilience, improve productivity and maintain ecosystem service functions, mobilizing adaptability to secure stability in the face of climate change, understanding and embedding the full value of ecosystem services within agricultural improvement strategies and securing adequate returns to farmers for the provision of these services.

Outputs are likely to include:

- Greater understanding of and support to the use of genetic diversity to maintain and improve productivity, resilience and resistance in production systems.
- Knowledge products and practices that give value to the use of diversity in production systems to maintain and improve ecosystem services.

It will be crucial that the work includes crop, livestock, agroforestry, soil and associated agricultural biodiversity (pollinators, etc.) dimensions

### ***Conserving and promoting the use of diversity in commodity crops of special importance to the poor.***

Numerous poor communities in African countries depend for their livelihoods on producing commodity crops (e.g. banana and plantain, coconut, oil palm). However, conventional research has been mainly for the benefit of consumers in industrialised countries, and of large-scale producers and processors. Due to neglect, genetic diversity is threatened by market forces (traditional varieties), epidemic diseases (crops and wild relatives), and habitat loss (wild relatives). It is, therefore, critical to understand, conserve and make available to

users the genepool of three crops widely grown as source of livelihood by the poor (e.g. banana and plantain, coconut, oil palm). We need to pay special attention to identifying traits of value to the poor (including resistance to pests, diseases and abiotic stresses; nutritional qualities; and characters that enhance value in local processing...) and helping breeders to make optimum use of this diversity of genetic resources in producing varieties that will meet the needs and aspirations of the poor. FARA and constituent SROs and their NARS have an important opportunity to establish a niche for advocating and promoting 'pro-poor' commodity crop research agenda, based on helping smallholders and their communities to derive maximum benefit from effective management of biodiversity (of their crops and in their production systems).

Expected outputs are likely to include:

- Genetic diversity of pro-poor commodity crops (coconut, banana and plantain, oil palm etc.) effectively conserved, better characterised, traits useful to the poor are identified, the functioning of genes controlling these traits understood, and related information is made available to users
- Breeding materials, genes and supporting technologies are made available to breeders and new varieties evaluated by researchers and farmers.
- Biodiversity-based approaches for sustainably increasing the productivity of commodity crop-based systems are validated (at pilot level) and their wider adoption promoted
- Models for adding value to the diversity of commodity crops and using this diversity to improve livelihoods at community level are validated and their adoption promoted (local processing, empowering producers and their communities, market-friendly market links...).
- Capacity of national systems to undertake agroecological research and mobilize their commodity sectors for pro-poor development is strengthened.

### ***Enhancing the conservation and use of crop and livestock diversity***

International and regional developments are currently providing new impetus to conservation efforts for crops and livestock and can help ensure that the diversity needed for African agriculture by current and future generations is safely conserved and effectively used.

Key research issues include the development of effective regional conservation strategies, improving efficiency, representativeness and cost-effectiveness of conservation efforts and developing improving ways of meeting users' (researchers, breeders, farmers and communities) needs.

Outputs will need to include:

- Improved ex-situ conservation strategies, methods and techniques
- Strategies for screening, characterization, multiplication, and evaluation of accessions for traits of importance.
- Improved access to information about materials and to the materials themselves by user communities
- Sustainably increased capacity of NARS scientists and technicians in key genebanks.
- Processes to increase use of genebank collections by breeders and other users (e.g. through collections targeted to use and through development of use oriented strategies by genebanks).

### ***Conservation and Sustainable Use of Important Wild Species***

Many wild species of both plants and animals are central to livelihood strategies of the rural

poor and are important for sustainable productivity improvement. This is especially so for example for many important forestry species and for crop wild relatives.

The ways in which this diversity can best be maintained and sustainably used pose many unanswered questions where the “natural” conservation community and agricultural community need to come together and work hand in hand. FARA can act as an important element in this process. Key research questions include determining and managing sustainable use, determining how to conserve important useful species and populations within an ecosystem management framework focused often on other demands such as tourism, identifying priority species.

Outputs could include:

- Values and benefits of intra-specific diversity promoted.
- Analysis of conservation status and needs for priority wild species.
- Analysis of threats and opportunities associated with climate change for wild species.
- Contributions to regional and national policy processes related to conservation and use of useful wild diversity.

### ***Mainstreaming agrobiodiversity***

African educational institutions and networks have a critical role to play in mainstreaming agrobiodiversity through the development of individual and institutional capacity for research and development to conserve, manage and effectively use agricultural biodiversity for food and agriculture.

#### ***1. Supporting and back-stopping African initiatives and networks to enhance education for food and agriculture***

Africa-driven change in higher education, to mainstream agrobiodiversity, can occur through:

- strategic links with FARA’s BASIC, by strongly focussing on using outcomes of research for teaching and learning in areas of biodiversity conservation and the management of biodiversity for food and agriculture;
- addressing sub-regional needs in partnership with university networks such as RUFORUM, ANAFE and EAPGRTC in Eastern and Southern Africa;
- status and needs assessments of agrobiodiversity education, to identify needs for curricula review;
- development of curricula incorporating intra-specific diversity in agrobiodiversity training programmes, including forestry and conservation and use of crop wild relatives.
- providing opportunities for thesis research, to address knowledge gaps in biodiversity management in Sub Saharan Africa;
- enhancing the links between universities and genebanks;
- providing training, including e-Learning, for appropriate stakeholders (extension agents, lecturers, policymakers etc.).

#### ***2. Strengthening NARS capacities to carry out biodiversity research and to manage ex-situ and in-situ conservation.***

Identify and work with partners in agrobiodiversity research and development to:

- offer training opportunities for working professionals in NARS and genebanks, in partnership with African centres of excellence;
- develop learning materials and tools to enhance quality management of genebanks;

- facilitate and support regional and regional crop-based PGR networks;
- provide access to research outputs on agricultural biodiversity, through traditional media, and through open and distance learning;
- offer opportunities to sharpen skills through hands-on, field research on knowledge gaps in agricultural biodiversity management; etc

### **3. *Enhancing African capacities to formulate and implement policies on biodiversity conservation and use, including national PGR programmes.***

Working closely with policy makers and policy implementation entities in African nations to:

- provide analysis, opinion and information on global PGR policy processes;
- facilitates multi-disciplinary dialogue with policy makers and stakeholders;
- facilitate training in legal and policy frameworks for managing ABD; etc.

### **4. *Contributing to multi-stakeholder research on-farm to document, analyse and share local knowledge and innovation on agro-biodiversity conservation and management.***

In selected location, NARS and partners such as Bioversity International could plan and implement collaborative, research:

- supporting and facilitating collaborative, multi-disciplinary research on-farms to understand complex processes that influence the conservation and use of genetic resources;
- developing instructional materials that synthesize and transform research results for specific target groups; e.g. research on how Sahelian farmers to manage their genetic resources.
- supporting new regional initiatives for collaborative multi-partner research, such as the Challenge programme for Sub-Saharan Africa. etc.

Key outputs from this are likely to include:

- Diffusion and sharing of knowledge products.
- Capacity building for effective use of knowledge products.
- Public awareness of benefits of agrobiodiversity to create support for conservation and use.
- Application and adoption of knowledge products by change agents (extension agents, farmer organizations, NGOs etc.).

### **5. *Other topics***

There are a number of other areas where research is urgently needed to ensure that agrobiodiversity makes its full contribution to sustainable development. Important aspects not discussed above which need to be considered further include dealing with land degradation, the interface between cultivated and non-cultivated diversity management, diversity rich approaches to biofuels, livestock production and overgrazing. These should be the subject of further discussions which might be undertaken as part of the work of the Platform for Agrobiodiversity Research.

## **E. Strategic Considerations by FARA**

Policy advocacy, public awareness and capacity development at all levels constitute key cross-cutting issues that should be considered by stakeholders, with the view to developing appropriate strategies. The large range of possible programmatic areas of intervention to giving greater visibility to the value of agrobiodiversity to Africans and meeting challenges in their effective conservation and use require strategic decisions by FARA that seek to answer the following.

1. What are strategic programmatic areas in which niche roles can be defined for FARA as apex body for research in Africa and technical arm of AU/NEPAD in the implementation of CAADP? For example, would FARA focus on development and advocacy of framework for systematic implementation of agrobiodiversity agenda, similar to FAAP, and seek to galvanize political and donor support for such a framework? Are there programmatic areas that provide opportunities for FARA to try out agrobiodiversity conservation and use strategies in IAR4D?
2. Need to clarify, based on the principle of subsidiarity, what the specific areas of intervention and roles of the SROs (ASARECA, CORAF/WECARD, SADC-SPGRC) and the constituent NARS. What would be FARA's strategic engagement to influence research agenda of the SROs and constituent NARS and help them move forward on programmatic areas for which these institutions are best placed to implement?
3. Development of strategic linkages with international institutions (e.g. Bioversity International) and initiatives (e.g. Platform for Agrobiodiversity Research ) working on agricultural biodiversity research and development.
4. Defining a policy and advocacy role for FARA. FARA has an important opportunity to focus attention of regional RandD and political institutions (e.g. regional economic groupings) on the need to take concerted action to conserve and promote wide use of the diverse agrobiodiversity resource endowments for the benefit of the people. Specifically to provide advice to African governments on promoting and focusing international attention on agricultural biodiversity because of its importance to meeting challenges such as food security, poverty, effects of climatic change on agriculture etc. on the continent and the potential for Africa's agrobiodiversity resources to contribute to the global food basket as well as contributing to dealing with risks to agricultural production worldwide for crops where Africa contains important centres of diversity.

#### Participants to be Targeted in Follow-up Multi-Stakeholder Meeting

1. International multilateral institutions: FAO, IFAD, UNDP, World Bank, African Development Bank etc.
2. Africa regional and sub-regional economic organizations: AU (Agriculture and Rural Economy, Science and Technology), NEPAD (Agriculture, Science and Technology), SADC, COMESA, ECOWAS, CEMAC etc.
3. Sub-regional research organizations: ASARECA, SADC-FANR, CORAF/WECARD, institutions in North Africa.
4. International institutions and initiatives working on agricultural biodiversity: Bioversity International, other relevant CG Centres, Agrobiodiversity Platform etc.