

Keynote Paper: Strategic Repositioning of Agrobiodiversity in the Horticulture Sector for Sustainable Development in Africa

Professor Abukutsa Mary Oyiela Onyango¹

Citation: **CTA and FARA. 2011.** *Agricultural Innovations for Sustainable Development. Contributions from the Finalists of the 2009/2010 Africa-wide Women and Young Professionals in Science Competitions.* Accra, Ghana : s.n., 2011. pp. 8-16.

9789988837324.

Keywords: Africa, agricultural biodiversity, horticulture, repositioning, sustainable development

Abstract

The year 2010 was declared the International Year of Biodiversity by the United Nations to celebrate the diversity of plants and animals. Horticultural biodiversity that used to form an integral part of African diets should have been part of this celebration. However, with the introduction of exotic temperate crops, indigenous green vegetables lost popularity in Africa and started to be regarded as ‘weeds’ and ‘poor man’s food’. With over 50% of the African population living below the poverty line, resulting in malnutrition and poor health, there is a need for a paradigm shift in food production patterns to harness the nutrition and economic potential of indigenous vegetables and fruits. Since the mid-1990s, Africans have seen an increase in diet-related ailments such as cardiovascular disease, diabetes and anaemia. Indigenous vegetables and fruits are micronutrient-rich, and could prove a powerful weapon in the fight against poverty and malnutrition as they are suited to local conditions. However, a number of factors have conspired against sustainable production and use of these indigenous crops, including negative perceptions, poor-quality seed, lack of technical packages, poor marketing, and high perishability, which have affected their strategic repositioning in the horticulture sector. Strategies that could be used to raise the status of agrobiodiversity include advocacy, capacity-building, development of dissemination materials, conservation, sustainable seed-supply systems, identifying potential markets, and development of acceptable products. In the future, there needs to be a focus on the development of good agricultural practices, efficient seed-delivery systems, breeding, conservation, commercialisation, processing, value addition and product development. Agrobiodiversity has a crucial part to play in revolutionising the horticultural sector for food security, nutrition, income and sustainable development in Africa. It is therefore time to strategically reposition agrobiodiversity in the horticultural sector and restore its lost glory.

INTRODUCTION

Background

Agrobiodiversity is shorthand for ‘agricultural biological diversity’. It embraces all components of biodiversity of relevance to food and agriculture. Agrobiodiversity has three levels: all cultivated and domesticated animal and plant species and their wild relatives that contribute to maintaining the key functions of agriculture; components of ecosystems (agro-ecosystems), such as bees for pollination or beneficial organisms to control pests; and managed stocks of wild animals and plants (FAO, 1999). Agrobiodiversity is the diversity of

¹ Department of Horticulture, Jomo Kenyatta University of Agriculture & Technology, PO Box 62000, 00200 Nairobi, Kenya

animals and plants that underpins agriculture, and is the result of the interaction between the environment, genetic resources, and management systems and practices used by culturally diverse peoples. It encompasses the variety and variability of animals, plants and micro-organisms that are necessary for sustaining the key functions of agro-ecosystems, including the structure and processes for, and in support of, food production and food security (FAO, 1999). The formal definition of agrobiodiversity is the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries (FAO, 1999). It comprises the diversity of genetic resources and species used for food, feed, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production and those in the wider environment that support agro-ecosystems.

There is an urgent need to exploit this diversity in food security, nutrition and economic development. The year 2010 was declared by the United Nations as International Year of Biodiversity. Agrobiodiversity is critical to human survival, but is significantly undervalued. There is a need to strategically reposition relevant agrobiodiversity in the horticulture sector. Horticulture is a rich and colourful discipline and sector that includes pomology (fruits), floriculture (flowers), ornamental horticulture and olericulture (vegetables) (Peter and Abraham, 2007). Indigenous horticultural plants must be repositioned in the horticulture sector for their full potential to be exploited (Abukutsa, 2010). Horticulture has grown to become the most vibrant foreign-exchange earner and employer in several African countries, yet the indigenous horticultural crops have not been exploited for existing export markets (HCDA, 2008). In Kenya, for example, in 2008 about 20% of horticultural produce was exported, and horticulture exports were valued at KES 74 billion (€740 million), of which 30–40% was from vegetables, but none of these were African indigenous vegetables (HCDA, 2008). Nearly half of the world's population live on less than \$2 a day, and half the population in Africa live on less than \$1 a day. Most malnourished and poor people are in Africa, and poverty is normally manifested in hunger, malnutrition and poor health (AICAD, 2003; Burke and Lobell, 2010). About 5.6 million people are food insecure in Kenya and 50% of under fives are malnourished, yet Africa is endowed with agricultural biodiversity (Schippers, 2002; Abukutsa, 2010). Repositioning involves changing the identity of a product, relative to the identity of competing products, in the collective mind of the target market. Strategic repositioning is seeking to exploit opportunities or deliberately influence audiences of significance without controlling them (Abukutsa, 2010).

Objectives

The objectives of this paper are to:

- discuss the position and current status of agrobiodiversity in the horticulture sector;
- explain major strategies for repositioning agrobiodiversity in the horticulture sector;
- discuss the role of agrobiodiversity and the significance of its repositioning in the horticulture sector.

POSITION AND CURRENT STATUS OF AGROBIODIVERSITY IN THE HORTICULTURE SECTOR

In the horticulture sector, agrobiodiversity is largely marginalised and most indigenous vegetables have been positioned as 'weeds', as reflected in their former names. For example, spiderplant (*Cleome gynandra*) was called 'spiderweed'; vegetable amaranths (*Amaranthus* species) were referred to as 'pigweed' and 'black jack'; 'obnoxious weed' (*Bidens pilosa*) is a delicacy in Zambia (Abukutsa-Onyango, 2009a).

Optimal production and utilisation of agrobiodiversity has been faced with several challenges, including neglect and stigmatisation, being referred to as ‘weeds’, ‘poor man’s crops’ and ‘orphan crops’; inadequate awareness of the value and potential of agrobiodiversity; lack of quality seed and of technical agronomic and utilisation packages; and poor marketing strategies, leading to low yields, production and consumption (Abukutsa-Onyango, 2009a).

African indigenous vegetables (AIVs) with nutritional and economic potential in Kenya, the East African region and Sub-Saharan Africa in general have been identified through a series of household, baseline and market surveys in various countries (Abukutsa, 2010). The identified AIVs include: pumpkin (*Cucurbita moschata*), jute mallow (*Corchorus olitorius*), cowpea (*Vigna unguiculata* – landraces used for their leaves), slenderleaf (*Crotalaria ochroleuca*), spiderplant (*Cleome gynandra*), vegetable amaranths (*Amaranthus blitum*), African nightshade (*Solanum scabrum*) and African kale (*Brassica carinata*).

Germplasm collection, evaluation and characterisation has been conducted for some promising indigenous horticultural crops. Morphological and molecular characterisation of some AIVs has been carried out. Inter- and intraspecific variations have been observed in African vegetable nightshade (*S. scabrum*): pronounced different ploidy levels (diploid, tetraploid and hexaploid) (Mwai *et al.*, 2007). Seed bulking, processing and agronomic investigations have been conducted on various indigenous fruits and vegetables, from which dissemination materials have been developed (Abukutsa-Onyango, 2009a).

STRATEGIC REPOSITIONING OF AGROBIODIVERSITY IN THE HORTICULTURE SECTOR

One key to successful strategic repositioning of a technology or commodity is recognising that success involves innovative change and requires advocacy, capacity-building and marketing. This should involve as many players as possible in the value chain. In repositioning AIVs in the horticultural sector, the following strategies are vital: advocacy and promotion; capacity-building; a sustainable seed-supply system; conservation; marketing; and provision of technical information (Abukutsa, 2010).

Advocacy and Promotion Strategy

Advocacy and promotion are powerful tools in repositioning a commodity. This strategy has been used since 1999 to reposition agrobiodiversity in the horticulture sector. The main target groups should be chosen as strategic partners, including farmers, students, researchers, policy-makers and consumers. The objective is to let stakeholders know about the value and potential of agrobiodiversity and constraints hindering its optimal exploitation. Methodologies used should be diverse and user-friendly, and encourage participation. These include orature, song, dance and narratives; demonstration plots; print media, leaflets, posters and newspapers; lectures, seminars and workshops; exhibitions and shows, radio and TV, documentaries and cooking competitions (e.g. IRIN, 2009). These methods were used in an endeavour to sensitise and make a case for agrobiodiversity to all stakeholders.

Capacity-building in Horticulture

University students from agricultural faculties normally form the major human resources in research and extensions services in Kenya and other African countries. It is important to build the capacity of those who will undertake research on agrobiodiversity and those who will effectively disseminate information and transfer technology. At the university level, human resources development and expertise on agrobiodiversity have been achieved by restructuring

undergraduate and postgraduate programmes at agricultural colleges and universities (Abukutsa, 2010).

Students on internships from overseas (Germany) have been trained for 3 months on AIVs and conservation of endangered tropical plants at Maseno University and Jomo Kenyatta University of Agriculture and Technology (JKUAT) (Herbst, 2007). Postgraduate research theses on agrobiodiversity have been completed in various public and private universities in Africa. Over 200 researchers and extension workers from all over Africa were trained on AIVs between 2002 and 2008, undertaking a 6-month diploma training course on vegetable crop production and research at AVRDC – The World Vegetable Center’s Regional Center for Africa in Arusha, Tanzania.

To successfully reposition indigenous vegetables and crops, farmers are very important as they are the producers; so, apart from creating awareness, building their capacity and training them is vital. Farmers have been trained in Kenya and Tanzania on seed production of AIVs, and it is envisaged that these farmers can act as catalysts for the promotion and repositioning of AIVs at the grassroots level (Abukutsa-Onyango, 2009a).

Policy-makers are vital in promoting a commodity. Four policy-makers were nominated to attend ‘The promotion of African indigenous vegetables in urban and peri-urban agriculture in African cities: a policy dialogue workshop’ at Rhodes University in January 2003. These policy-makers were drawn from the Kenya Agricultural Research Institute, Ministry of Agriculture, National Council for Science and Technology, and Nairobi Municipality Council. This was funded by the European Union through the project ‘Networking to promote the sustainable production and marketing of indigenous vegetables through urban and peri-urban agriculture in Sub-Saharan Africa’ (the ‘IndigenoVeg’ project), which involved seven African countries and five European organisations.

Sustainable Quality Seed-supply Systems

The first step in promoting any crop is the provision of quality seed. Selections made from accessions collected have been multiplied, evaluated, bulked, packaged and distributed to farmers as a temporary stop-gap, as further breeding work to develop cultivars is planned. Seed-supply systems for indigenous vegetables were set up at Maseno University Botanic Garden and JKUAT Department of Horticulture as an intermediate measure for farmers to access quality seed (Abukutsa-Onyango, 2009b).

Conservation of Agrobiodiversity

In situ and *ex situ* conservation of AIVs was implemented from 2001. Maseno University Botanic Garden was established in 2001 and is home to 200 plant species, of which 20% are indigenous fruits and vegetables. The BIOTA project was funded by Federal Government of Germany, and the purpose of the garden was combined research, teaching, conservation and recreational use (Abukutsa-Onyango, 2009a).

Markets for Produce and Products

Market surveys indicate that the demand for indigenous vegetables is not fully met in Kenyan urban and peri-urban markets. Potential markets have been identified in Kisumu, Nairobi, elsewhere in East Africa and throughout Sub-Saharan Africa. Linking farmers to markets has been undertaken by our strategic partner Farm Concern International. Promoting a commodity with an assured market is vital for the commodity’s success. There are potential urban, national, regional and international markets. People in the diaspora in the UK and USA have expressed a desire to have AIVs supplied to them. This would require preserving and some processing, and calls for research in this area.

Availability of Acceptable Recipes, Processing Technologies and Product Prototypes

Many consumers have expressed concern that traditional methods of preparation are time-consuming and tedious, especially for the younger generation. Traditional recipes were therefore collected and standardised. New recipes were also developed and evaluated. Product prototypes have been developed and are being evaluated, along with some of the recipes (Habwe *et al.*, 2009). To enhance consumption of AIVs, participatory selection and ranking of AIV recipes were carried out. Organoleptic and acceptability tests were conducted for recipes and prototype products in western Kenya and elsewhere in eastern Africa. Ranking was done on the basis of taste and appearance. Recipes prepared with traditional salt, lye², were significantly accepted by all testers in terms of appearance and taste. Participatory selection of the priority AIVs will also enhance acceptability (Musotsi *et al.*, 2005; Habwe *et al.*, 2009).

Development of Dissemination Materials

A diverse selection of effective dissemination materials would enhance the repositioning of AIVs for farmers and consumers. Simplified technical leaflets were developed on the production of African nightshade, spiderplant, vegetable amaranths, jute mallow, slenderleaf, pumpkin leaves and African kale, and used in training and to disseminate technical information on AIVs (Abukutsa, 2010).

THE ROLE OF AGROBIODIVERSITY AND THE SIGNIFICANCE OF ITS REPOSITIONING IN THE HORTICULTURE SECTOR

The Role of Agrobiodiversity

In 2010, the International Year of Biodiversity, people all over the world worked to safeguard this irreplaceable natural wealth and reduce biodiversity loss. This is vital for current and future human wellbeing. The International Year of Biodiversity was a unique opportunity to increase understanding of the vital role that biodiversity plays in sustaining life on Earth. Humans are an integral part of nature; our fate is tightly linked with biodiversity – the huge variety of other animals and plants, the places where they live, and their surrounding environments (Abukutsa, 2010). People rely on this diversity of life to provide the food, fuel, medicine and other essentials we simply cannot live without. Yet this rich diversity is being lost at a greatly accelerated rate because of human activities. This impoverishes us all and weakens the ability of the living systems, on which we depend, to resist growing threats such as climate change. Agricultural biodiversity is critical to human survival, but is significantly undervalued. The International Year of Biodiversity promised a wealth of opportunities for raising awareness of the role that biodiversity plays in the lives of people and the special importance of agricultural biodiversity. Climate change and increasing pressures on agricultural land are putting at risk the very tool that can help farmers adapt to these challenges: agricultural biodiversity. Bioersivity International mounted a global awareness campaign – ‘Diversity for Life’ – which gained momentum during the year. Diversity for Life undertook a range of communication and educational activities targeting policy-makers, the media and schools in a number of countries around the world. The campaign provided an opportunity for consistent advocacy on the key objective that people should diversify their diets and that policy-makers should integrate the conservation and use of biodiversity into national poverty-reduction strategies and plans (Abukutsa, 2010).

² ‘Lye’ is African traditional salt obtained by filtering ash from selected plants, and has been used for cooking for centuries; it is edible – not to be confused with sodium hydroxide!

Diversity for Life tells the stories of people whose passion for diversity is helping, in small and large ways, to create a healthier, more food-secure world. It focuses on the images and stories of the ‘Guardians of Diversity’: individuals who have dedicated their lives to safeguarding the diversity of plants and animals and making sure that it is used by people to improve their lives. Africa abounds with agricultural biodiversity resources – genetic resources, crop species, trees, fish, livestock, as well as microbes, pollinators and production environments. The story of what has been done on AIVs contributed to this celebration and offered some strategies for the African green revolution.

According to Thrupp (1997), experience and research have shown that agrobiodiversity can increase productivity, food security and economic returns; reduce the pressure of agriculture on fragile areas, forests and endangered species; make farming systems more stable, robust and sustainable; contribute to sound pest and disease management; conserve soil and increase natural soil fertility and health; contribute to sustainable intensification; diversify products and income opportunities; reduce the spread of risks to individuals and nations; help maximise the effective use of resources and the environment; reduce dependence on external inputs; improve human nutrition (Ekesa *et al.*, 2008); provide sources of medicines and vitamins; and conserve ecosystem structure and the stability of species diversity. Furthermore, agrobiodiversity serves as a source for biotechnological applications.

Despite their stigmatisation, horticultural indigenous food crops have played a very important role in food security and nutrition on the African continent. There is an urgent need to strategically reposition indigenous vegetables and fruits in the horticultural sector, so that their potential can be fully exploited for food nutrition and income generation and contribute to achieving both Vision 2030 in Kenya and the Millennium Development Goals (MDGs).

The Significance and Impact of Repositioning Agrobiodiversity in the Horticulture Sector

- Increased number of students researching agrobiodiversity in Africa.
- Availability of quality seed of some indigenous vegetables and fruits in Africa.
- Increased yields and production of some priority indigenous vegetables and fruits in some African countries.
- Availability of dissemination materials and increased research and reference materials.
- Increased popularity, availability and consumption of indigenous vegetables and fruits.

Products, quality seed, and leaflets on indigenous vegetables and fruits have resulted in good crops for farmers, and availability of indigenous vegetables and fruits in supermarkets. A contribution was made to the livelihoods of people in Africa through the sustainable production and utilisation of indigenous fruits and vegetables, resulting in improved food security, nutrition and health; increased incomes and improved livelihoods; and sustainable development (Abukutsa, 2010)

CONCLUSIONS AND RECOMMENDATIONS

- Agrobiodiversity has value and potential that needs to be exploited in food security and nutrition in Africa.

- Horticultural biodiversity such as AIVs needs to be strategically repositioned to exploit its potential.
- Strategic repositioning will require a paradigm shift and must involve all players along the value chain.
- Researchers must actively engage policy-makers, the private sector and producers.
- Strategic repositioning of agrobiodiversity in the horticulture sector will greatly contribute to the achievement of Vision 2030 in Kenya, MDG1 on hunger, food insecurity and malnutrition, and MDG7 on ensuring environmental sustainability.

Research Direction, Perspectives and Engaging the Private Sector

- Seed production, processing, packaging and distribution could be taken on by seed distribution agents and community-based organisations.
- Product prototypes could be developed into business ventures.
- Recipes can be used in restaurants, hospitals, organisations and airlines.
- Curriculum development at agricultural universities should be focused on these developments.
- Strong collaboration will be needed with stakeholders from agriculture sector ministries, the private sector and grassroots organisations.

A Parting Shot

Agricultural biodiversity comprises high-profile commodities with nutritional and unrivalled health benefits. These commodities have a role to play in food security, nutrition, income and sustainable development in Africa and beyond – they are a gold mine to be harvested.

ACKNOWLEDGEMENTS

The author gratefully acknowledges Jomo Kenyatta University of Agriculture and Technology and Maseno University. Financial assistance from the Plant Genetic Resources Institute, VicRes-SIDA, International Foundation for Science, the European Union, National Council of Science and Technology, Kenya and JKUAT is acknowledged. Special thanks to CTA for meeting my travel, accommodation and other costs that enabled me to travel to Ouagadougou in July 2010 to give this keynote address to the 2010 Women and Young Professionals in Science Competitions during FARA's Science Week.

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