



# Realizing the promise of neglected and underutilized species

## POLICY BRIEF

# NUS

### Key messages

Neglected and underutilized species (NUS), also known as minor or 'orphan' crops, can help address global issues such as reducing hunger and poverty, and adapting to climate change:

- Rural communities, especially in marginal areas, grow, collect, consume and market a wide range of NUS, including 'forest foods', which contribute significantly to their livelihood.
- NUS can help farmers manage economic and environmental risks, and present important options for adapting agriculture to changes in climate.
- Genetic diversity in NUS, and indigenous knowledge about their use, are critical for sustainable food and agricultural systems.
- Rapid gains may be made from research and development to improve value chains and popularize the consumption of NUS.
- Many NUS are highly nutritious. When part of a diverse diet they help combat malnutrition, hidden hunger, overweight and obesity.
- Greater recognition of, and demand for NUS can empower women, who are often the main producers, processors and traders of these resources.
- The genetic diversity in NUS is in rapid decline, calling for urgent action to conserve them in genebanks and on farms.
- The human and institutional capacity for research, and for supporting the conservation and use of NUS, is fragmented, uneven and poorly financed.

## Agricultural biodiversity and NUS

Biodiversity – or biological diversity – is the variety within and between all species of plants, animals and micro-organisms and the ecosystems within which they live and interact. Agricultural biodiversity, a subset of biodiversity, is the result of natural evolution, and selection and breeding by farmers over millennia.

Many farmers, especially in areas unsuited to high-yielding crop varieties, rely on a wide range of NUS<sup>1</sup> for their livelihoods. Species such as Bambara groundnut and quinoa have evolved over time and are adapted to the particular conditions where they grow, often in low-input, rainfed agricultural systems. Hundreds of plants, trees, fungi and animals in wild ecosystems also provide food and income. But the importance of NUS – also known as minor or orphan crops – is often overlooked. Agricultural policies and markets favour genetically uniform varieties of a few high-yielding staple and commodity crops such as wheat, rice, tea, coffee and cacao.

NUS such as Andean grains, minor millets and leafy vegetables have attracted scientists' and donors' attention for at least 20 years. Only recently, however, has their strategic contribution to addressing poverty, and food and nutrition insecurity, become

more broadly recognized. The 2012 Cordoba Declaration on Promising Crops for the XXI Century, the 2013 International Year of Quinoa celebrations and the African Orphan Crops Consortium's recent launch of the African Plant Breeding Academy are but a few examples of the heightened interest in such species. A range of organizations are backing efforts to enhance the conservation and use of NUS,<sup>2</sup> but further investments are needed to mainstream these species in food and agricultural systems.

Recently, agricultural organizations and policymakers have recognized the current role and the untapped potential of NUS for food and nutrition security, generating income in rural areas, building resilience, adapting to climate change, and mitigating climatic, agronomic and economic risks. In 2008, the first international symposium on this theme was held in Arusha, Tanzania, followed by a similar event in Kuala Lumpur, Malaysia, in 2011. In September 2013, Ghana hosted the 3<sup>rd</sup> International Conference on Neglected and Underutilized Species: For a Food-Secure Africa.<sup>3</sup>

Drawing on the lessons learned from the initiatives mentioned above, this policy brief highlights key roles of NUS in addressing five critical development challenges: conservation of agricultural biodiversity; agricultural and rural development; climate change; food and

<sup>1</sup> 'Neglected and underutilized species' is a broad term which includes, for example, crops, trees, animals and insects. This policy brief focuses primarily on species of plants (crops, trees, medicinal plants).

<sup>2</sup> The work of Bioversity International to enhance the sustainable conservation and use of NUS around the world is generously supported by the International Fund for Agricultural Development (IFAD); the Technical Centre for Agricultural and Rural Cooperation (CTA); the Federal Ministry for Economic Cooperation and Development, Germany (BMZ); Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH; the Food and Agriculture Organization of the United Nations (FAO); the European Union (EU) and the African, Caribbean and Pacific (ACP) Secretariat; the CGIAR Research Program on Climate Change, Agriculture and Food Security; and the CGIAR Research Program on Policies, Institutions and Markets.

<sup>3</sup> This conference was organized by Bioversity International, the International Foundation for Science (IFS), Ghana's Council for Scientific and Industrial Research (CSIR), the Food and Agriculture Organization of the United Nations (FAO) and Crops for the Future (CFF).

nutrition security; and gender, culture and empowerment of women. The need for capacity development in NUS is also stressed. Recommendations and key actions indicate ways forward to mainstream NUS into policies and programmes at national, regional and international levels.

## NUS: key roles

### Conserving agricultural biodiversity

Humankind depends on sound agroecosystems, and sound agroecosystems depend on biodiversity at ecosystem, species and genetic level. Globally, more than 4,000 food-plant species are commonly eaten (Proche et al., 2008). The genetic diversity of NUS, landraces of major crops, and their wild relatives constitutes a very important part of agricultural biodiversity but is in rapid decline. Worldwide, farmers are abandoning NUS as globalization, population growth and urbanization lead to changes in agricultural and food systems. According to the Food and Agriculture Organization of the United Nations (FAO), since the 1900s around 75% of crop diversity has been lost. This loss of agricultural biodiversity is caused by a complex array of economic, social and demographic drivers, including agricultural and food systems that focus on intensive production of a very limited number of crops.

The alarming decline of NUS genetic resources and the traditional knowledge associated with them has far-reaching implications for agriculture. This decline inhibits natural evolution and adaptation in crop species, reduces future options for breeding improved varieties and developing value chains, and lessens the resilience of agroecosystems and

their ability to adapt to change, including climate change.

The Convention on Biological Diversity (CBD), its Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, and the United Nations Decade on Biodiversity 2011–2020 clearly recognize the importance of agricultural biodiversity. But much remains to be done to increase policy makers' awareness of the importance of conserving this diversity, including conserving the diversity of hundreds of NUS threatened by severe genetic and cultural erosion. Currently, Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture excludes most NUS. This omission hinders international exchange of germplasm for research and farming, and makes NUS ineligible for funding via the Treaty's benefit-sharing fund.

The global genebank system for conserving agricultural biodiversity *ex situ* comprises more than 1,740 genebanks and over 7.4 million crop samples (FAO, 2010). These collections focus primarily on staple and commodity crops, and their wild relatives. Many NUS are poorly represented; their conservation and continued evolution largely depends both on their use on farms and their preservation in healthy wild ecosystems.

### Advancing agricultural and rural development

Since the advent of the Green Revolution, the model for agricultural growth has been to increase the productivity of a limited number of staple and commodity crops. According to FAO, between 1970 and 2010, plant breeding, agricultural technology, irrigation, fertilizers and agro-chemicals,

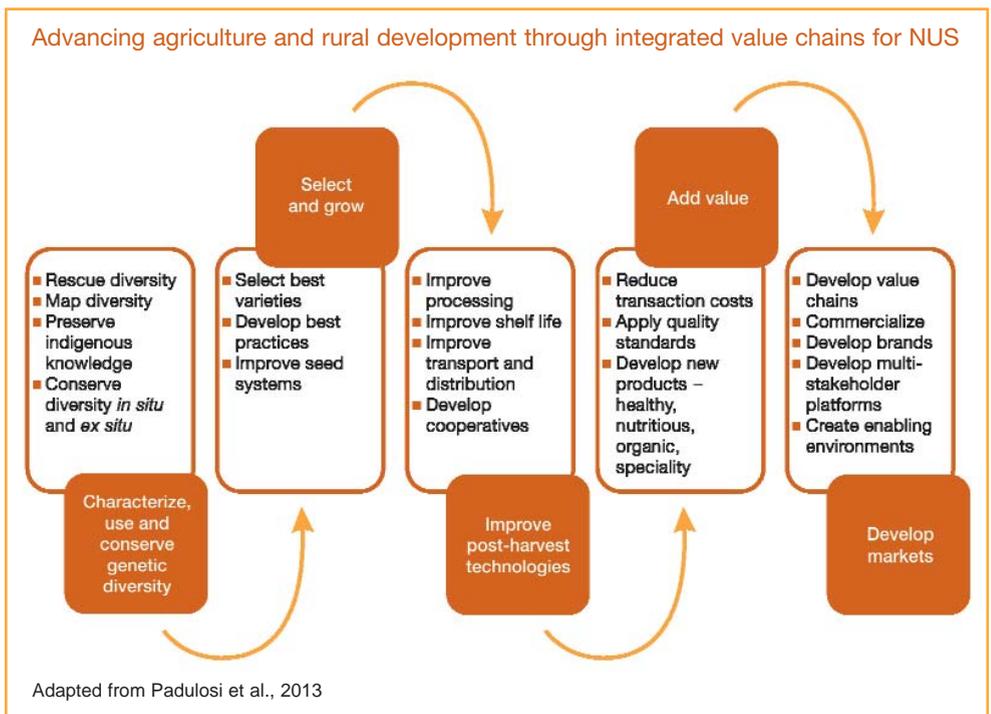


coupled with expansion of the cultivated area, more than doubled global cereal production. The increase in cereal production has been instrumental in fighting hunger and feeding the growing global population, but the gain has been uneven between and within countries and regions. In most of sub-Saharan Africa, production of cereals in the last three decades has not kept pace with population growth, and the continent is a net importer of these crops.

In many rural communities, NUS, including 'forest foods', complement major staples in diets and are a fall-back option if staple crops fail. They are often a significant source of income, especially for women. In marginal environments, where poverty and food insecurity is most prevalent, NUS are often central to farmers' strategies for reducing climatic and economic risks. NUS can play a key role in advancing agricultural and rural development.

Internationally, the rising interest in natural ingredients for food, cosmetic, pharmaceutical, nutritional and health products present great opportunities for NUS. Poor communities which produce NUS can also potentially take advantage of eco-labelling, denomination of origin branding, fair trade and slow food initiatives. What is needed is simultaneous, integrated support along value chains from farm to market.

At present, however, African farmers have limited access to quality seed of varieties of NUS with desired traits. Rural communities also have few avenues for accessing markets for NUS and NUS products. Value chains are often poorly developed and inadequately supported by research, extension services and agribusiness. Constraints also include sub-standard processing and packaging, absence of grading, irregular supply, food safety regulations and so on. But, with the



right support, there can be rapid progress. Policy support for research and development, coupled with recent investment, has led to the development of value chains for African leafy vegetables in Kenya, quinoa in Peru and Bolivia, baobab in Southern Africa, chilli peppers in Latin America and minor millets in India.

Partnerships and collective action along value chains are central to developing domestic and international markets for NUS. A multi-stakeholder approach – involving, for example, scientists, producers, traders and policymakers – works particularly well in analysing constraints and opportunities, developing capacity and introducing new skills in producing, processing and marketing both vertically and

### **Removing a trade barrier for baobab fruit powder**

PhytoTrade Africa, a non-profit, membership-based trade association in Southern Africa, supports the development of value chains and markets in the natural products industry in the region. One of its achievements has been securing approval to export powdered baobab fruit to the European Union as a food ingredient. Baobab, growing in hot, dry lowland areas, produces fruits which are dried and ground to make a nutritious powder. This can now be exported for use in the European food industry.



### **Multi-stakeholder platforms for developing value chains for NUS**

The production and consumption of quinoa, an Andean grain, is enjoying a revival. Multi-stakeholder platforms involving poor communities across Bolivia, researchers, university professors, non-governmental organizations, marketing experts and policymakers have successfully brought quinoa to domestic and international markets.

What lies behind the quinoa success story is persistent work on many fronts to improve cultivation, post-harvest and processing practices, conserve quinoa diversity, link farmers to markets and build capacity. This work was fundamental in developing domestic and international value chains for this underutilized crop. Many donors, development agencies and local actors have contributed considerably as well, and deserve credit for these achievements.

Although the food industry prefers white or cream quinoa, demand for coloured quinoa is increasing due to the gastronomic potential of such varieties. Product diversification – a well-known phenomenon which has been observed for many other commodities – has therefore occurred, with consumers now willing to purchase different quinoa varieties (black, red, those with special functional ingredients, etc.). The trend towards healthy foods also provides an opportunity to promote quinoa varieties currently not attractive to the quinoa export market. Hence promotion and research to further develop quinoa value chains is continuing.

horizontally along value chains. Partners in the private sector are important for developing processing technologies and for marketing, while partners in the non-government sector can help farmers gain recognition of their rights.

### Adapting to and mitigating climate change

Climate change and variability have far-reaching impacts on agricultural systems and associated agricultural biodiversity, such as pollinators and soil micro-organisms. To ensure food and nutrition security, in the short term farmers will need to manage droughts, changing growing periods, more frequent extreme weather events and the spread of pests and diseases. In the longer term, farmers may experience a mismatch between local climatic conditions and the crop varieties they currently have access to. They might therefore need to shift to new varieties or species, and countries will have to adapt their seed systems accordingly.

NUS grown as complements to major crops help farmers spread risks. Typically adapted to local conditions, farmers often perceive them to be stress-tolerant, and to better resist drought and other climate-related hazards. NUS thus have an important role in strengthening the resilience of agricultural production systems as climate changes.

But, for NUS to be part of 'climate-smart agriculture', agricultural research and development policies must recognize and support their role. Realizing the potential of such species in adapting to climate change requires, among other actions, investment in research to develop new varieties with useful adaptation traits, better mechanisms for allowing farmers to access germplasm, and robust

### Climate-proofing agricultural systems

Minor millets are genetically widely diverse. Within this diversity are strains adapted to different soils, marginal, arid and mountain environments, and areas where the major cereals usually fail. Because minor millets have a short life cycle and an efficient root system, they have a comparative advantage where water is scarce and rainfall is low. This makes them good candidates for replacing wheat and rice in countries such as India where these staple crops may gradually become less productive due to climate change.



interventions to develop markets and value chains of priority NUS. Participatory variety selection involving farmers, and extensive collaboration with farming communities in testing and evaluating new germplasm, will be important.

## Improving food and nutrition security

The proportion of undernourished people in developing countries has decreased significantly since the 1990s. But FAO (2013) estimated that between 2011 and 2013, 842 million people – one eighth of the world population – were suffering from chronic hunger. In sub-Saharan Africa, 38% of children under five are stunted as a result of chronic malnutrition. 'Hidden hunger', a deficiency of micronutrients – vitamins and minerals – affects as many as 3 billion people globally. Micronutrient deficiency and obesity frequently exist side by side, causing a 'double burden'. According to the World Health Organization (2013), in 2008, 1.4 billion adults in both developed and developing countries were overweight or obese, and faced increased risks for non-communicable diseases including, among others, cardio-vascular diseases, diabetes and some cancers. In part, obesity is linked to rapid changes in food systems towards more processed food, supermarkets, convenient fast foods and rejection of traditional foods.

In addressing food security, agricultural policies have, by and large, focused on increasing productivity, but have paid less attention to the nutritional value of food systems. Policies often overlook the health benefits of a diverse diet based on a variety of nutritious foods. NUS have much to offer in this respect. Many compare favourably with staple crops in terms of vitamin and micronutrient content and could be used more widely to diversify diets. Fruit and vegetables are particularly important. A new focus on nutrition-sensitive agriculture strengthens the links between the agriculture sector and the health and nutrition sectors, and includes nutritional objectives in agricultural programmes.



### **Mainstreaming NUS in food and nutrition policies**

Since 1997, the Peruvian government has required the inclusion of quinoa and other native grains in its school breakfast programme. The state has become one of the main buyers of native crops in Peru, leading to an increase in the area under cultivation. In the 1980s, the area sown to quinoa annually was about 15,000 hectares. By 2000, the area had risen to around 30,000 hectares.

Nutrition policies in Nepal, Zambia and Papua New Guinea, while not specifically aimed at boosting production of NUS, stress growing a diversity of nutritious food crops and using nutritious foods that are available locally. The Indian National Food Security Bill, approved in September 2013, includes minor millets in the Public Distribution System along with rice and wheat. The bill will stimulate wider use of millets across India, creating demand and providing an incentive for farmers. The bill is a major step in strengthening nutritional security in the country.

## Valuing gender and culture, and empowering women

The cultural, social and gender context of most NUS is fundamentally different from that of major crops. Recognizing the cultural traditions, religious beliefs, and social and economic motivations of the 'custodians' of these crops is important. In many cases it is mainly women who care for, cultivate and market NUS, including 'forest foods'. This means that in developing value chains for these crops, a gender perspective is critical.

Processing NUS can be laborious and is usually part of women's workload. In Bolivia and Peru, improved processing technology has helped to increase local consumption and sales of Andean grains. Upgrading value chains by improving grading, packaging and product development are also ways to raise women's income. Helping rural communities – and especially women – to realize the potential of crops that have been overlooked is a powerful way of strengthening their identity, raising their visibility and empowering them.



## Strengthening capacity

Most agricultural research, development and education organizations are set up to support agricultural policies whose primary focus is on staple and commodity crops. The human and institutional capacity to support research, conservation and use of NUS is fragmented, uneven and poorly financed.

Problems constraining realization of the agronomic and income potential of NUS need to be addressed from a systems perspective rather than in isolation. Constraints such as the poor availability and quality of seed, variability in agronomic traits, laborious post-harvest processing, lack of standards for packaging and distribution, and a perception of NUS as 'poor man's crops' can be addressed by research and development systems, but a holistic view is of essence. Strengthening capacity – for participatory, multi-disciplinary research, for facilitating stakeholder platforms to upgrade value chains and for gender-differentiated research and interventions – is essential.

*"We want to see value chains develop for these crops for the maximum benefit of farmers and local communities."*

Final remarks, 3<sup>rd</sup> International Conference on Neglected and Underutilized Species, Accra, Ghana, September 2013

## Recommendations and key actions

Over the past ten years, several significant international meetings – Chennai 2005, Arusha 2008, Suwon 2010, Kuala Lumpur 2011, Cordoba 2012 and Accra 2013 – have recognized the potential of NUS in tackling food and nutritional insecurity, poverty, environmental degradation, and adapting to climate change. Policymakers have a critical role to play in framing enabling institutional environments to realize this potential.

### 1. Include NUS in national and international strategies and frameworks that address global issues

- Include NUS in strategies to alleviate poverty, ensure food security, adapt to climate change and achieve sustainable agriculture.
- Direct financial resources for implementing the CBD to conserving and managing NUS.
- Promote research into the various roles NUS can play in alleviating poverty, ensuring food security and adapting to climate change.

### 2. Establish national and regional lists of priority NUS on which to focus

- Conduct national studies and inventories of cultivated and wild NUS, using a range of both scientific and traditional information sources.
- Organize national priority-setting processes that allow key stakeholders, including farmers' organizations and the private sector, to participate fully in deciding species on which to focus.
- Strengthen sub-regional and regional collaboration and align priorities.

### 3. Support research on NUS and their agronomic, environmental, nutritional and socio-economic contributions to resilient production systems

- Systematically assess communities' access to, and use of NUS, and validate their contribution to households' livelihood systems, through gender-sensitive research.
- Collect, organize and make available geographic, morphological, biochemical, nutritional and genetic data, and bridge the gap between scientific and traditional knowledge concerning NUS.
- Expand research on the role of NUS in strengthening the resilience of agricultural systems and adapting them to climate change.
- Include NUS in national and international research agendas, including crop improvement programmes.

### 4. Support the development of value chains and small agribusinesses for priority NUS

- Facilitate multi-stakeholder processes involving both public and private actors to identify constraints in value chains and agree on strategies for upgrading them.
- Develop technical solutions, standards, institutional support, and capacity for processing, packaging and marketing NUS products, and enhance access to credit.
- Provide support, incentives and an enabling environment for organizations that provide services to NUS value chain actors.



## 5. Strengthen collaboration and information sharing between research, extension, farmers and farmer organizations

- Involve multiple stakeholders and promote an action-research culture to ensure that research is problem-oriented, demand-driven and gender-sensitive.
- Capitalize on information and communication technologies to involve farmers in research, improve market information and share best practices.
- Strengthen knowledge-sharing platforms at national, regional and global levels to facilitate access to tools, methods, information and databases, and link scientific and traditional knowledge.

## 6. Promote the cultivation of NUS through campaigns to raise awareness of the commercial opportunities they offer and their agronomic and nutritional benefits

- Run campaigns in urban areas to promote diverse foods based on local crops in partnership with chefs, supermarkets, the hotel industry and the media.
- Raise awareness among farmers and communities, and particularly among women, of the nutritional benefits of a diverse diet that includes NUS.
- Link agricultural, and health and nutrition policies and programmes to promote a food-based approach to nutrition.

## 7. Increase support for conservation of NUS on farms, *in situ* and *ex situ*, and strengthen seed systems

- Develop long-term conservation strategies for NUS and their wild

relatives that combine *ex situ*, *in situ* and on-farm conservation.

- Expand Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture to include broader coverage of NUS.
- Expand national seed systems to include popular farmer and local varieties, and support programmes for multiplying seed of priority NUS.

## 8. Empower custodian farmers and support farmers' rights to share the benefits from NUS

- Recognize and identify options to implement farmers' rights with regard to sharing the benefits from varieties of NUS.
- Empower farmers by providing information and training on the benefits of NUS and ecologically sustainable farming practices.
- Ensure NUS are included in the definition of 'principal foods' in the *Codex Alimentarius*.

## 9. Strengthen the capacity of individuals and organizations in research, education and development of NUS

- Include local and traditional crops in primary school educational curricula, grow them in school gardens and use them in school meals.
- Integrate topics on NUS in higher agricultural education curricula and in on-the-job training for working professionals.
- Strengthen institutional capacity to lead and facilitate NUS research and development, within a broader agricultural development agenda.

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## Recommendations

- Include NUS in national and international policies that address global issues such as reducing hunger, malnutrition and poverty, adapting to climate change and achieving sustainable agriculture.
- Establish national and regional lists of priority NUS on which to focus research and development efforts.
- Support interdisciplinary research on NUS and promote multi-stakeholder processes to enhance their use.
- Support the development of value chains and small agribusinesses for priority NUS.
- Strengthen collaboration and information sharing on NUS among research, extension, farmers, farmer organizations and market actors.
- Promote the use of NUS through campaigns to raise awareness of the commercial opportunities they offer, and their agronomic and nutritional benefits.
- Increase support for the conservation of NUS on farms, *in situ* and *ex situ*, and strengthen their formal and informal seed systems.
- Support custodian farmers and recognize farmers' rights to sharing the benefits arising from NUS.
- Strengthen the capacity of individuals and institutions in research, education and development of NUS.



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