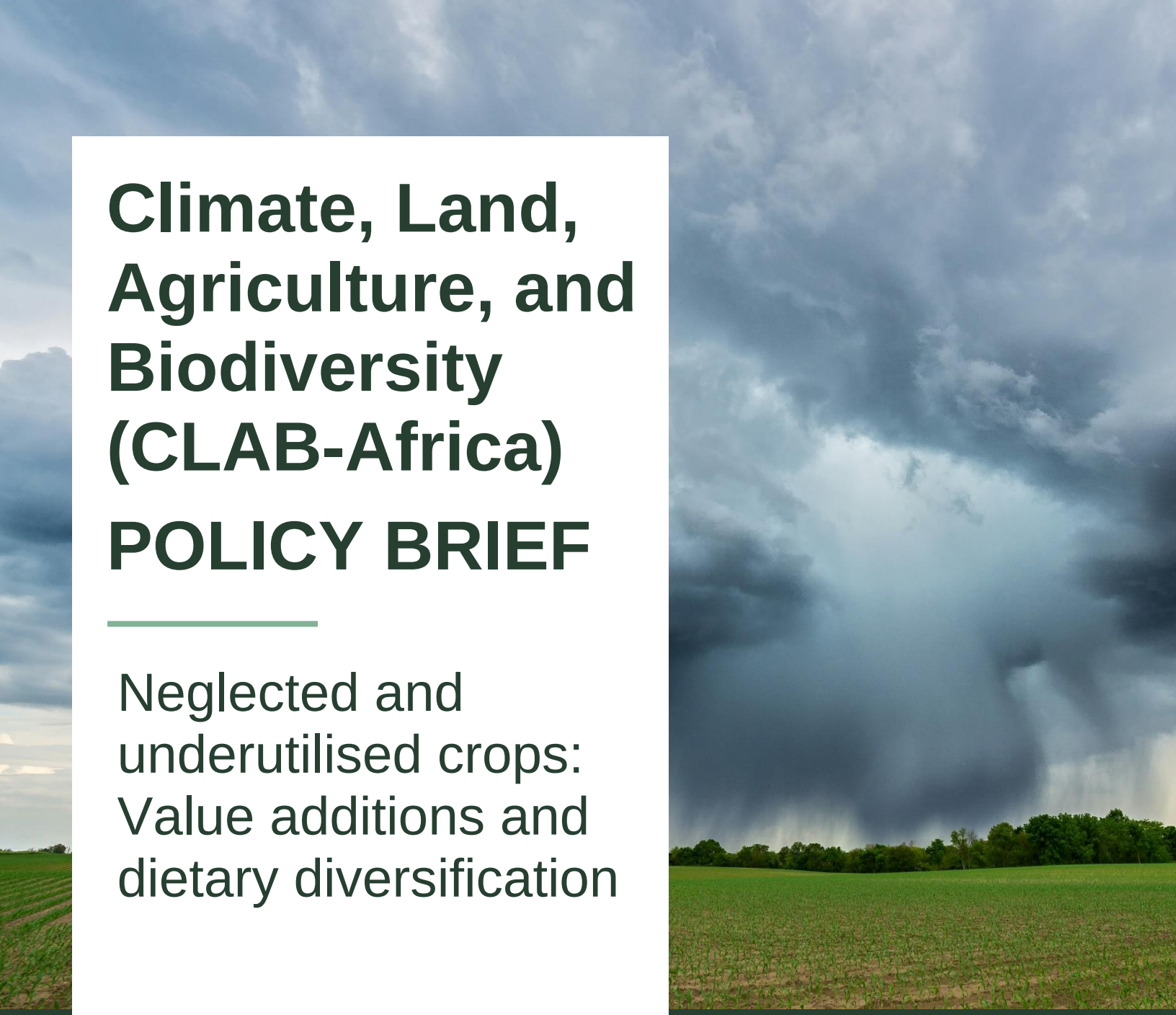

Climate, Land, Agriculture, and Biodiversity (CLAB-Africa)

POLICY BRIEF

Neglected and underutilised crops: Value additions and dietary diversification

Brief #2401
October 2024

Caroline Fadeke Ajilogba
Sue Walker

ARUA-SFS Centre of Excellence in Sustainable Food Systems
UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
FUTURE AFRICA
FANRPAN Policies for a Food Secure Africa
BILL & MELINDA GATES foundation

Summary

Key points:

- With the projected increase in the world population to 9 billion by 2050 and the negative impact of climate change on key food crops such as maize, rice, and wheat, there is an urgent need to increase both the perceived and actual value of indigenous, neglected, and underutilised African food crops.
- Value addition to neglected and underutilised crop species (NUCS) increases their visibility and economic value. This will help to reduce malnutrition, locally and globally, promoting dietary diversification for nutrition and meeting the goal of zero hunger.
- Furthermore, value addition goes beyond dietary diversification to include methods of marketing the crops and products and making them accessible to the local and global population through partnerships between farmers, companies, and the government. This will help these crops serve as food-security agents in mitigating and adapting to the impacts of climate change on how we produce, transport, process, and consume food.
- The Food and Agriculture Organisation of the United Nations (FAO) has set crops as the entry point for building on existing global policies on neglected and underutilised species. This helps to address hunger and malnutrition and attain the Sustainable Development Goal (SDG) of zero hunger. Therefore, these policy recommendations are avenues to promote NUCS as vehicles for addressing hunger and malnutrition.
- Some of these NUCS – including baobab, bambara groundnut, and Moringa, among others – are already being researched to determine and expand their value-addition potential in Africa.

Recommendations:

- Create markets and platforms for NUCS. This can help reduce by up to 50% the carbon footprint due to wastage of crops that are not purchased. This is one way of meeting SDG 12, targets 12.2 and 12.12b.
- Create community farms and gardens that promote blending of maize with 10% identified and well-researched NUCS in each locality (especially millet, sorghum, bambara groundnut, and/or Moringa). This can increase dietary diversity and contribute to improved micronutrient intake.

Context

Neglected and underutilised crop species (NUCS)

This policy brief forms part of a series of policy briefs across the spheres of climate change, land-use management, agriculture, and biodiversity and outlines the intricate relationships among these, emphasising the need for a holistic approach to policymaking. By addressing these interlinked areas, policymakers can foster sustainable, equitable, and inclusive development that secures food systems, supports rural livelihoods, and combats climate change. This brief explores current challenges and provides actionable recommendations relevant to the climate impact on food systems thematic cluster of the Climate, Land, Agriculture, and Biodiversity (CLAB-Africa) project. The aim is to contribute to transforming Africa's agri-food systems to be resilient and sustainable.

The brief is informed by findings from the CLAB-Africa Synthesis Report on the impact of climate change on food systems in Africa, highlighting the urgent need for dietary diversification and the use of NUCS to address the impact of climate change on food security. It encourages using NUCS and their value additions to improve dietary diversification and promote markets for them.

NUCS or orphan crops are generally wild or semi-domesticated crop species adapted to local environments. It has also been shown that these species can provide better value in terms of combating hunger, malnutrition and poverty (Chivenge et al., 2015; Li et al., 2020). They have high nutritional content, which includes energy, protein, vitamins, and fibre. In most cases, they grow well on marginal land and easily fit into different farming systems where they can be intercropped with other staples. They bring diversity into cropping systems as they are stress-tolerant, sustainable, and climate-resilient (Li & Sidiqqui, 2018).

Despite these attributes, the contributions NUCS can make to sustainable food systems are highly undervalued due to insufficient recognition and information. Some challenges NUCS face include agro-technical, socioeconomic, policy, and institutional perspectives resulting in underutilisation. The general perception of NUCS as food meant for poor people also reduces their production, utilisation, and consumption. Lack of government support further leads to an environment that is not conducive to the production, processing, marketing, distribution, and consumption of these crops (Li et al., 2020).

Overview Of Research

Promoting dietary diversification with NUCS

Heavy reliance on only a few crops to feed the majority of the globe's population negatively affects ecosystems, dietary diversity, and health (Li et al., 2020; Nube & Voortman, 2011). Malnutrition and micronutrition deficiencies are also increased as a result of dependence on only a few types of food (Li et al., 2020; Nube & Voortman, 2011). Dietary diversification is observed to be cost-effective because dependence on a few crops reduces the cost of such crops, making them more available, and other neglected crops are open for general

consumption. Dietary diversification also makes both the main crops and neglected crops affordable and sustainable, thereby reducing hunger and malnutrition and reducing the effects of climate change, as most of them are drought-tolerant and climate-resilient crops (Ajilogba et al., 2022; Karunaratne et al., 2015; Li et al., 2020; Li & Siddique, 2020; Mabhaudhi et al., 2017). Furthermore, these promising NUCS are nutrient-dense, locally available, profitable, environmentally adaptable, and fundamental to improving dietary and production diversity.

Value addition with NUCS

It is imperative e that NUCS are recognised in and placed at the forefront of policy strategies to mitigate the impact of climate change. This can be done by promoting value additions of some of these crops. For example, the Moringa tree is highly nutritive, and all parts of the tree can be utilised for nutrition and commercial purposes (Gopalakrishnan et al., 2016). It is known as a "miracle tree" and is easily cultivable. It is used as a potential antioxidant, anti-cancer, anti-inflammatory, anti-diabetic and anti-microbial agent (Reddy et al., 2020). It has also been used as a supplement in infants and children's meals to treat malnutrition in Senegal and Benin, which exemplifies value addition (Kasolo et al., 2010; Mutiara et al., 2013). Food and beverage industries have also shown interest in Ethiopia, considering using Moringa to fortify their processed foods and as raw material for soft and energy drinks (UNIDO, 2021).

Bambara groundnut is a drought-resistant legume known as a "complete diet" due to being rich in essential minerals, unsaturated fats, and amino acids. Bambara groundnut flour has been used in food fortification, infant foods, bread, noodles, animal feeds, and fish feeds (Tan et al., 2020).

Baobab is an indigenous drought-resistant tree whose fruit can be processed into baobab fruit powder and baobab oil. It is also used to provide fibre, fodder, and medicine. The waste from the husk can be converted into viable soil alternatives for growing horticultural products. There is also a growing demand for the highly nutritious baobab fruit pulp in Europe and North America (Jackering et al., 2019; Kaimba et al., 2020).

A recent review of studies on the impact of climate change on food systems from 2012–2023 revealed that neglected and underutilised crops such as cowpea, bambara groundnut, and sorghum are important in mitigating this impact. It was observed from a topic trends analysis that there is a shift from research on topics such as water stress and soil to conservation agriculture, drought tolerance, and climate variability, including crops such as sorghum. This trend was also evidenced by thematic mapping, which showed more research was being conducted on role played by crops such as cowpea, bambara, and maize in mitigating climate impact on food systems. Although staple crops such as wheat and maize were observed to still be heavily emphasised in African food systems, more emphasis on NUCS and their value addition can help reduce the impact of climate change in Africa.

Policy Recommendations

Summary of recommendations

- **Create markets**: The government should lead the creation of markets and make space and platforms available through public-private partnerships so that buyers and farmers of NUCS can be connected. These viable markets and platforms could help reduce by up to 50% the carbon footprint due to wastage of crops that are not purchased. This is one way of meeting Sustainable Development Goal (SDG) 12, targets 12.2 and 12.12b (UN, 2021). An innovation to support the creation of markets would be a mobile application designed to connect and give timely information to farmers, producers, and purchasers.
- **Support community and home gardens**: The government should legislate that communities, in partnership with academia and private companies, own community farms that grow NUCS indigenous to each community to meet the needs of companies that sell these crops either as main products or as processed products for the local or export market. Furthermore, these gardens should include mandatory blending of all maize with 10% identified and well-researched NUCS in each locality to increase dietary diversity and contribute to improved micronutrient intake.
- **Add the processed products from NUCS to school feeding programmes**: Through the Department of Health and Education, the government should introduce localised, community-grown underutilised crops to replace a significant proportion of foods prepared in school feeding programmes. The Department of Education, the Department of Health, researchers, and food production companies should promote this expanded utilisation of NUCS products to reduce malnutrition and micronutrient deficiency. This will also help to improve education and learning outcomes.
- **Food fortification alternatives**: Governments should legislate that manufacturers involved in micronutrient production and importation produce micronutrients such as vitamins A, iodine, iron, and folic acid by processing 20% of the food fortificants from NUCS to reduce importation of these products. This aligns with the Southern African Development Community (SADC) minimum standards for food fortification, supports the operationalisation of the Regional Agricultural Policy (RAP), and facilitates the implementation of some of the components of the SADC Food and Nutrition Security Strategy (2015–2025).

Audience

This policy brief aims to engage the following stakeholders in dialogues about the critical need for collaborative, inclusive, and context-specific approaches to address the impacts of climate change on food systems in Africa:

- *Government*: Ministries of Agriculture and Environment, parastatals, and state agencies on agriculture and climate change.
- *Development partners*: World Bank, UN agencies, African Development Bank (AfDB).

- *Community-based organisations*: Farmer groups.
- Academia.
- Religious institutions.
- Civil society organisations.

References

Ajilogba, C. F., Habig, J., & Babalola, O. O. (2022). Carbon source utilization pattern of soil bacterial microbiome of bambara groundnut rhizosphere at the different growth stages determines soil fertility. *Frontiers in Sustainable Food Systems*, *6*. https://doi.org/10.3389/fsufs.2022.1012818

Ali, A., & Bhattacharjee, B. (2023). Nutrition security, constraints, and agro-diversification strategies of neglected and underutilized crops to fight global hidden hunger. *Frontiers in Nutrition*, *10*, 1144439. https://doi.org/10.3389/fnut.2023.1144439

Bioversity International. (2017). *Mainstreaming agrobiodiversity in sustainable food systems*. Bioversity International.

Brondizio, E., Díaz, S. M., Settele, J., Ngo, H., Gueze, M., Aumeeruddy-Thomas, Y., Bai, X., Geschke, A., Molnár, Z., Niamir, A., Pascual, U., & Zayas, C. (2019). *Assessing a planet in transformation: Rationale and approach of the IPBES Global Assessment on Biodiversity and Ecosystem Services*. IPBES. https://doi.org/10.5281/zenodo.3831673

Chivenge, P., Mabhaudhi, T., Modi, A. T., & Mafongoya, P. (2015). The potential role of neglected and underutilised crop species as future crops under water scarce conditions in Sub-Saharan Africa. *International Journal of Environmental Research in Public Health*, *12*(6), 5685–5711. https://doi.org/10.3390/ijerph120605685

Garn, S. M., & Leonard, W. R. (1989). What did our ancestors eat? *Nutrition Reviews*, *47*(11), 337–345. https://doi.org/10.1111/j.1753-4887.1989.tb02765.x

Gopalakrishnan, L., Doriya, K., & Kumar, D. S. (2016). Moringa oleifera: A review on nutritive importance and its medicinal application. *Food Science and Human Wellness*, *5*(2), 49–56. https://doi.org/https://doi.org/10.1016/j.fshw.2016.04.001

Jackering, L., Fischer, S., & Katja, K. (2019). A value chain analysis of baobab (Adansonia digitata L.) products in Eastern and Coastal Kenya. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, *120*, 91–104. https://api.semanticscholar.org/CorpusID:211802140

Kaimba, G. K., Muendo, M. K., & Mithofer, D. (2020). Marketing of baobab pulp in Kenya: Collectors' choice of rural versus urban markets. *African Journal of Agricultural and Resource Economics, 15*(3), 194–212. https://api.semanticscholar.org/CorpusID:238080049

Karunaratne, A. S., Walker, S., & Ruane, A. C. (2015). Modelling Bambara groundnut yield in Southern Africa: Towards a climate-resilient future. *Climate Research*, *65*, 193–203. https://api.semanticscholar.org/CorpusID:131716719

Kasolo, J. N., Bimenya, G. S., Ojok, L., Ochieng, J., & Ogwal-okeng, J. W. (2010). Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities. *Journal of Medicinal Plants Research*, *4*, 753–757.

Khoshbakht, K., & Hammer, K. (2008). How many plant species are cultivated? *Genetic Resources and Crop Evolution*, *55*, 925–928. https://doi.org/10.1007/s10722-008-9368-0

Li, X., & Siddique, K. H. (2018). *Future smart food. Rediscovering hidden treasures of neglected and underutilized species for Zero Hunger in Asia*. FAO. https://openknowledge.fao.org/handle/20.500.14283/i8907en

Li, X., & Siddique, K. H. M. (2020). Future Smart Food: Harnessing the potential of neglected and underutilized species for Zero Hunger. *Maternal and Children Nutrition*, *16*(S3), e13008. https://doi.org/10.1111/mcn.13008

Li, X., Yadav, R., & Siddique, K. H. M. (2020). Neglected and underutilized crop species: The Key to improving dietary diversity and fighting hunger and malnutrition in asia and the pacific. *Frontiers in Nutrition*, *7*, 593711. https://doi.org/10.3389/fnut.2020.593711

Mabhaudhi, T., Chimonyo, V. G. P., Chibarabada, T. P., & Modi, A. T. (2017). Developing a roadmap for improving neglected and underutilized crops: A case study of South Africa. *Frontiers of Plant Science Section Agroecology 8*, 2143. https://doi.org/https://doi.org/10.3389/fpls.2017.02143

Mutiara, T., Titi, E. S., & Estiasih, W. (2013). Effect lactagogue moringa leaves (Moringa oleifera Lam) powder in rats. *Journal of Basic and Applied Scientific Research*, *3*, 430–434.

Nube, M., & Voortman, R. L. (2011). Human micronutrient deficiencies: Linkages with micronutrient deficiencies in soils, crops, and animal nutrition. In B. Thompson & L. Amoroso (Eds.), *Combating micronutrient deficiencies: Food-based approaches* (pp. 289–311). FAO/CAB International.

Reddy, B., Pradeep, P., & Padmavathi, T. (2020). Development and evaluation of value-added products from Moringa leaves. *Journal of Pharmacognosy and Phytochemistry, 9*(5), 660–663. https://api.semanticscholar.org/CorpusID:226406645

Tan, X. L., Azam-Ali, S., Goh, E. V., Mustafa, M., Chai, H. H., Ho, W. K., Mayes, S., Mabhaudhi, T., Azam-Ali, S., & Massawe, F. (2020). Bambara groundnut: An underutilized leguminous crop for global food security and nutrition. *Frontiers in Nutrition*, *7*, 601496. https://doi.org/10.3389/fnut.2020.601496

UN (United Nations). (2021). *The 17 goals*. https://sdgs.un.org/goals/

UNIDO (United Nations Industrial Development Organization). (2021). *Improved rural livelihoods through supporting the moringa value chain development in Southern nations, nationalities and peoples' region, Ethiopia*. UNIDO.

This research was undertaken under the Climate, Land, Agriculture, and Biodiversity (CLAB-Africa) project, under auspices of the African Research University Alliance Centre of Excellence in Sustainable Food Systems (ARUA-SFS), hosted by Future Africa, University of Pretoria.

CLAB-Africa is a collaboration between the University of Pretoria and the Food, Agriculture, and Natural Resources Policy Analysis Network (FANRPAN). The project is led by Prof. Frans Swanepoel (Principal Investigator) and Prof. Tafadzwanashe Mabhaudhi (Co-Principal Investigator).

This research was made possible by the generous financial support of the Bill & Melinda Gates Foundation.

Published by the University of Pretoria, Lynwood Road, Pretoria 0002.