African Vegetable Biodiversity Rescue Plan 2025 – 2035

Collecting, conserving and using vegetable genetic resources for improved health, income and climate resilience

World Vegetable Center

African Union

CROP TRUST

AUDA-NEPAD
AFRICAN UNION DEVELOPMENT AGENCY

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Cover photo: Sicelo Ndzimandze in Eswatini, one of many smallholders who are now producing African vegetables for their families and for sale. Sicelo is also supplying the local school with fresh green leaves to supplement the children's lunchtime meals.

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Foreword

Achieving 'zero hunger' by 2030 is the second of the UN's Sustainable Development Goals (SDGs), after 'no poverty'. However, figures on the UN SDG webpage are alarming. In 2022, an estimated 2.4 billion people in the world faced moderate to severe food insecurity, a number that increased by some 400 million over the previous three years. Also rising are those suffering from chronic hunger, affecting 735 million people in 2022, almost 10% of the world's population. Tackling this huge and growing crisis demands immediate attention and coordinated global efforts.

Hunger, and acute nutritional deficiencies or 'hidden hunger', disproportionately affect people in Africa. To make an impact, many governments and organizations have highlighted the importance of diversifying food production to promote a wider range of healthier foods, alongside support for developing more sustainable farming systems. To this end, African vegetables, naturally adapted to local conditions and cultures after generations of interaction with humans and the environment, can contribute significantly to a greater diversity in what is grown and eaten.

Many African vegetables are highly nutritious, are easy to add to farming systems because they require limited space and less time to grow, and tend to be more resistant to droughts, floods, pests and diseases than other crops. For example, African eggplant, African nightshade, amaranth, bitter leaf, Ethiopian mustard, jute mallow and many more can support nutrition sensitive agriculture and may adapt better to our changing climate than many global vegetables. Vegetable production also generates more income and employment than other segments of the agricultural economy, and improved postharvest and processing technologies would further enhance local agribusinesses that are especially suitable for youth and women.

In Africa, most food and agriculture policies are not aligned with promoting healthy diets, and thus may inadvertently undermine food and nutrition security outcomes. Meanwhile, it has been shown that mainstreaming African vegetables into food systems would support the achievement of UN SDG#2 (zero hunger). Other challenges include weak seed systems, and low technical capacity for vegetable research, seed technology, plant breeding, agronomy, postharvest and processing. Therefore, actions to support quality seed supply and encourage sustainable use of vegetable biodiversity requires strengthened partnerships among plant genetic resources stakeholders across the continent.

It is against this background that this Rescue Plan was developed, to address these challenges using a holistic approach to unlock the potential of African vegetable biodiversity by addressing supply, demand and policy challenges, and grasping the opportunities.

This Rescue Plan is aligned with relevant global, continental and national frameworks, such as the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Convention on Biological Diversity (CBD), and the Nagoya Protocol for addressing Access and Benefit Sharing, and others such as the African Biodiversity Strategy and Action Plan (ABSAP), African Seed and Biotechnology Program (ASBP) under the auspices of the African Union and supported by FAO, have complementary aspirations. Also recognizing the key role of agriculture in the transformation of African economies, are the African Union Agenda 2063 (Agenda 2063), the Comprehensive Africa Agricultural Development Programme (CAADP), the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods (Doc. Assembly/AU/2(XXIII)), and the Africa Manifesto on Forgotten Foods. In addition, this Rescue Plan is part of the Vision for Adapted Crops and Soils (VACS) launched in February 2023. VACS supports the African Union Common Position on Food Systems, the AU Green Recovery Action Plan, and the Africa Fertilizer and Soil Health Action Plan.

The African Vegetable Biodiversity Rescue Plan is a major step forward to achieving these interrelated goals. Its implementation will help to improve the nutrition, livelihoods and resilience of hundreds of millions of people across Africa. It must be applauded, and fully supported.

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OASIS

Executive summary

If well integrated into the food systems of African countries, vegetables can contribute significantly to achieving the UN Sustainable Development Goals, of zero hunger, no poverty, and climate action. But realizing this requires urgent investment and efforts to rescue, conserve and use African vegetable biodiversity. This is especially relevant in the identified 'hotspots' of vegetable biodiversity in the continent.

However, vegetable biodiversity in Africa and around the world is under threat, because of climate change, urbanization, and homogenization of diets. Meanwhile, vegetable species and their wild relatives are very poorly conserved both in situ and ex situ, making up less than 10% of total global genebank accessions. This is a major concern, given how many vegetable species there are compared to cereals and other major crop groups. Losing this biodiversity means losing options for climate resilience and nutrition security for current and future generations.

It is paramount to rescue and conserve this biodiversity before it is too late, and encourage its use in breeding programs and directly in farmers' fields.

This African Vegetable Biodiversity Rescue Plan has been developed to unlock the potential of African vegetable biodiversity, by simultaneously addressing supply, demand, and policy challenges. It is also aligned with global, continental and national frameworks that have components which aim to improve the rescue, conservation and sustainable use of agrobiodiversity. 'African vegetables' are those that are indigenous to the continent, or indigenized (introduced and adopted long ago), and are adapted to local farming systems and food needs after interaction with humans and the environment over many generations. They are suitable for integrating into more diversified farming systems that are more resilient to climate change, being hardy and highly nutritious, requiring limited space, growing on short rotations, and providing plenty of options for farmers, traders and processors to improve their livelihoods.

Implementing this Rescue Plan will result in the genetic diversity of prioritized African vegetables and their wild relatives being salvaged and safeguarded through complementary ex situ and in situ activities, supported by national, regional and international policies. This diversity will in turn be actively used by farmers, breeders and researchers from African countries to increase the supply of nutrient-dense food. To increase demand, this Rescue Plan also calls for policy support to raise awareness, and to incorporate African vegetables in school feeding programs and homestead production.

This Rescue Plan is an outcome of a process that started at the 2021 UN Food Systems Summit, where there was a call for urgent action to rescue, conserved and use vegetable biodiversity. A study on the diversity and conservation status of African vegetables (van Zonneveld et al., 2021a) showed how little of Africa's vegetable biodiversity is adequately conserved. The research also identified six 'hotspots' of vegetable biodiversity in sub-Saharan Africa, and proposed priority actions for safeguarding these genetic resources for food and agriculture.

A draft African Vegetable Biodiversity Rescue Plan was developed, and stakeholder consultations were organized to gather feedback from experts across the continent, including those from subregional plant genetic resources networks of the Southern Africa Development Community, West and Central Africa, and the Plant Genetic Resources Management Working Group under the Seed and Biotechnology Program of the African Union.

The plan was validated at a workshop on 14–15 December 2023 in Mbabane, Eswatini, that brought together for the first time the three regional plant genetic resources networks in sub-Saharan Africa and national genebanks from 16 countries, presided over by Hon. Mandla Tshawuka, Eswatini Minister of Agriculture. This was followed by validation at the African Union Commission on 22–24 April 2024 in Addis Ababa. This Rescue Plan is a foundation stone, that has been jointly laid by many. And from this, using vegetables and their diversity, we will build a healthier and wealthier Africa, and that is more resilient to the climatic and economic shocks that are to come.

African Vegetable Biodiversity Rescue Plan validation workshop participants, December 2023, Mbabane, Eswatini

Vision, mission and objectives

Vision

African vegetable biodiversity is conserved for the long term, and sustainably used for the benefit of people in Africa and the global community.

Mission

To rescue, conserve, and use African vegetable biodiversity, contributing to zero hunger, sustainable economic growth, and climate-resilience.

Objectives

This Rescue Plan has four strategic objectives that reflect the intended outcomes from interventions.

i. Rescue and conserve genetic resources of African vegetables for germplasm exchange and for use by current and future generations.
ii. Support the development of integrated seed systems of African vegetables, through the characterization, documentation and sharing of germplasm, and support its sustainable use in research, breeding, and cultivation by farmers.
iii. Conduct innovative research and networking to develop and share adapted and improved vegetable varieties that meet the needs of farmers, traders and consumers.
iv. Enhance human resource capacities and raise awareness of the values of and demand for African vegetables, and their mainstreaming into existing national and regional policies and programs in Africa.

The objectives are translated into four components.

- Component 1: Rescue and conservation.
- Component 2: Information and sustainable use.
- Component 3: Partnerships and enabling policies.
- Component 4: Research, education and mainstreaming.

Within the four components are eight actions, and 16 outputs (Table 1).

Table 1. Rescue Plan components, actions and outputs

Components	Actions	Outputs
1. Rescue and conservation	Rescue of African vegetable biodiversity	- Inventories conducted and current status assessed in the six vegetable biodiversity hotspots and beyond. - At least 30,000 landraces and wild relatives collected in six hotspots and beyond.
	Ex situ and in situ conservation	- One pan-African genebank, two regional genebanks, and at least five national genebanks, have established quality management systems and implemented standard operating procedures following international standards. - In situ conservation of prioritized crop wild relatives implemented, with backups in the vegetable genebank network.
2. Information and sustainable use	Characterization and documentation	- Over 40,000 accessions morphologically and genetically characterized, for research, breeding, and farming. - Germplasm information uploaded to online knowledge sharing platforms.
	Sustainable use	- Germplasm regenerated and made accessible to researchers, breeders and farmers, following national and international regulations.
3. Partnerships and enabling policies	Partnerships and networking	- Strengthened partnerships between genebanks and germplasm user networks to promote utilization of genebank collections.
	Policy and advocacy	- Awareness created among policy makers on the multiple benefits of African vegetables for improving health and wealth. - Genetic resources and seed policies developed that catalyze access and use of vegetable germplasm by farmers, breeders and other users. - African vegetable biodiversity conservation and use incorporated in the National Biodiversity Strategies and Action Plans of at least three countries per regional economic community.
4. Research, education and mainstreaming	Research and education	- Relevant education programs incorporated in school and university curriculums. - Breeding programs for African vegetables supported to use the collected and conserved germplasm by trained breeders and other relevant scientists. - Farmer training conducted on on-farm conservation and awareness of the benefits of African vegetables.
	Mainstreaming	- At least eight country governments have incorporated African vegetables in home grown school feeding programs, with support for public procurement of vegetables for these programs. - Increased access to and consumption of African vegetables through improved seed supply to farmers, and vegetable supply to local markets.

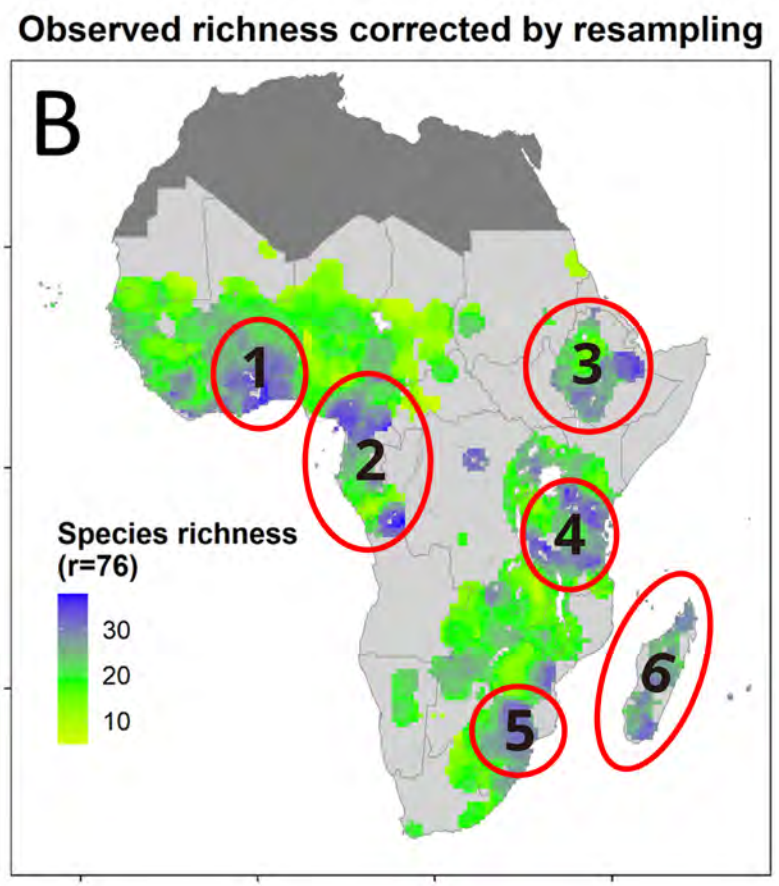
The need for action

Africa's population is expected to rise from 1.5 billion currently, to 1.9 billion by 2035. And most of this growth will occur in cities. This will obviously exacerbate existing food insecurity and malnutrition challenges in the continent, with 40% of women of reproductive age already suffering from anemia, 31% of children under 5 years suffering from stunting, and with 42% of adult women and 29% of adult men being overweight or obese (Global Nutrition Report, 2022). Furthermore, climate change is expected to add to food insecurity through adverse impacts on biodiversity and agriculture.

African vegetables are seen as a key element in the process of transforming African agrifood systems, for more climate resilient and nutrition sensitive food supply and consumption (African Union, 2021; Argumedo et al., 2023; van Zonneveld et al., 2023). Vegetable production can diversify farming systems for climate change adaptation, because African vegetables tend to be hardy, require limited space, and grow on short production cycles, while being highly nutritious and providing more options for farmers, traders and processors to improve their livelihoods.

Such a transition, however, requires interventions along the entire vegetable value chain, and that must start with the rescue and conservation of African vegetable biodiversity, followed by demand creation, and the development of cultivars preferred by farmers and consumers (Mwadzingeni et al., 2021). Germplasm collection is especially relevant in identified African 'hotspots' of vegetable biodiversity, considering the poor conservation status and low conservation capacity in the continent (van Zonneveld et al., 2021a). Only one third of African countries currently have seed genebanks (World Bank, 2017), and the ex situ and in situ conservation status and knowledge of African vegetables and their wild relatives is poor (van Zonneveld et al., 2021a).

Based on a gap analysis conducted in 2020, high levels of species richness were found in six hotspots of diversity of African vegetables. These are in: (i) West Tropical Africa – Ghana, Togo, and Benin; (ii) West Central Tropical Africa – Cameroon; (iii) Northeast and East Tropical Africa – Ethiopia; (iv) East Tropical Africa – Tanzania; (v) Southern Africa – Eswatini; and (vi) Indian Ocean – Madagascar (Figure 1). In addition, Angola, Burkina Faso, DR Congo, South Sudan, and other countries have potential areas of high species richness that require further exploration for traits of interest for local use, and regional efforts to adapt, sustain and diversify food systems.



1. West Tropical Africa, with a focus on Ghana, Togo and Benin

2. West-Central Tropical Africa, with a focus on Cameroon

3. Northeast and East Tropical Africa, with a focus on Ethiopia

4. East Tropical Africa, with a focus on Tanzania

5. Southern Africa, with a focus on Eswatini

6. Indian Ocean, with a focus on Madagascar

Figure 1. African vegetable biodiversity hotspots (adapted from van Zonneveld et al., 2021a).

The African vegetable sector is also constrained by low productivity and production. The average yield of vegetables is less than 10 tonnes per hectare, yet under optimal growing conditions, the potential yield for improved varieties is between 25 and 45 t/ha. The availability of the harvested produce further shrinks because of high levels of postharvest losses, and ever-fluctuating levels of demand and supply. Key value chain constraints include a lack of good quality seeds, limited use of improved production techniques and tools, and weak linkages to input and product markets (McMullin et al., 2021).

Nutrition insecurity is a major problem, where 57% of Africans cannot afford a healthy diet (FAO, 2022). However, current food and agriculture policies of African countries are often not aligned with the objective of healthy diets, and thus may inadvertently undermine food and nutrition security (FAO, 2022). Meanwhile, it has been shown that mainstreaming African vegetables into food systems can support the achievement of UN SDG#2, zero hunger, and tackle food security and improved nutrition while also promoting more sustainable agricultural systems (N'Danikou et al., 2022).

Vegetables, and especially African vegetables such as amaranth, African eggplant, nightshade, bitter leaf, Ethiopian mustard, jute mallow and many more, are highly nutritious. These African vegetables are also more adapted to local conditions than global or conventional vegetables such as broccoli, tomato or carrot, and they are part of local food cultures (African Union, 2021). Thus, African vegetables are valuable assets for meeting the need of improving diets and health, and supporting nutrition-sensitive agriculture under a changing climate. Increased vegetable production also generates more income and employment than any other segment of the agricultural economy, and value addition offers even more tangible employment opportunities in local agribusinesses, and that are especially suitable for youth and women.

However, African vegetable seed systems are still weak, with the informal seed sector dominating and providing most seed used by farmers for most African vegetable crops, while smallholder farmers have limited access to improved quality planting material. There is also low technical capacity in Africa for vegetable research, including seed technology, plant breeding, agronomy, postharvest and processing. Therefore, actions are urgently required that support quality seed supply and that encourage the sustainable use of vegetable biodiversity through strengthened research and development partnerships among plant genetic resource stakeholders.

This African Vegetable Biodiversity Rescue Plan provides a roadmap to rescue, conserve and use African vegetable biodiversity that will contribute to improved health, sustainable economic growth and climate-resilience, across the continent.

Alignment with existing policies and initiatives

The aspirations of the African Vegetable Biodiversity Rescue Plan are aligned with relevant global, regional and national policies and initiatives, that also share components that seek to improve the rescue, conservation and sustainable utilization of vegetable biodiversity. It is also a step towards achieving a Global Rescue Plan, that was presented to the 2021 UN Food System Summit, to safeguard and use vegetable and fruit biodiversity at a global level (van Zonneveld et al., 2021b).

Importantly, this Rescue Plan contributes to multiple UN Sustainable Development Goals: SDG#1 – no poverty; SDG#2 – zero hunger; SDG#3 – good health and well-being; SDG#4 – quality education; SDG#9 – industry, innovation and infrastructure; SDG#13 – climate action; SDG#15 – life on land; and SDG#17 – partnerships for the goals. In addition, it complements many other international conventions and treaties, and continental level agendas and manifestos.

This Rescue Plan also supports the UN Convention on Biological Diversity, an important global framework that is dedicated to promoting sustainable development. The Convention has three main objectives: (i) conservation of biological diversity, (ii) the sustainable use of the components of biological diversity, and (iii) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. These are adopted in regional and national biodiversity plans, that form the basis for National Biodiversity Strategies and Action Plans (NBSAPs).

This Rescue Plan is aligned to the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and FAO's Global Plan of Action for PGRFA that promote the conservation and sustainable use of plant genetic resources for food and agriculture, and the fair and equitable sharing of the benefits arising from their use, in harmony with the CBD. Access and benefit sharing is further articulated in the Nagoya Protocol, which is also in alignment with the CBD.

This Rescue Plan also aligns with the implementation of the Fund Disbursement Strategy of the Global Crop Diversity Trust (Crop Trust) and Crop Conservation Strategies for priority African vegetables including cucurbits, African eggplant, and vigna (leguminous vegetables) (Ebert et al., 2019; Solberg et al., 2021; Nair et al., 2022). The Crop Trust coordinated the development of these strategies to enhance the conservation and use of these crop genepools, in line with the ITPGRFA.

Furthermore, there is the African Seed and Biotechnology Program (ASBP), under the auspices of the African Union and supported by FAO. Within this program is the Plant Genetic Resources Management Working Group (PGRM-WG), with two main objectives. These are, to (i) advocate for policy reforms for the management and conservation of plant genetic resources at national, regional, and continental level; and (ii) advocate for adequate, long term conservation and sustainable utilization of plant genetic resources across the entire continent.

At the continental level, other relevant priority policy frameworks include the Africa Union Agenda 2063 (Agenda2063) which builds on and seeks to accelerate the implementation of past and existing initiatives for growth and sustainable development, including the Comprehensive Africa Agriculture Development Programme (CAADP) and the Malabo Declaration. Both recognize the key role of the agricultural sector in the transformation of African economies.

This Rescue Plan also supports the position of the African Union to mainstream traditional food plants – both indigenous and indigenized – in Africa's food systems (African Union, 2021). The Africa Manifesto on Forgotten Foods is of particular significance, as it advocates for renewed interest from the general public, policy makers and relevant stakeholders for repositioning 'forgotten' food crops in terms of food security in GFAR, FARA, and the CAADP XP4 Programme (2021). The Manifesto also calls for concrete actions that contribute to achieving multiple UN Sustainable Development Goals (SDGs), and seeks to bring back 'forgotten' crops to the agricultural mainstream to fast-track the realization of their hidden benefits.

Finally, this Rescue Plan is part of the Vision for Adapted Crops and Soils (VACS), launched in February 2023, which supports the African Union Common Position on Food Systems, the AU Green Recovery Action Plan, and the Africa Fertilizer and Soil Health Action Plan.

Proposed actions

The following sections explain the activities in each phase for each of the eight key actions:

(i) rescuing African vegetable biodiversity.

(ii) ex situ and in situ conservation.

(iii) characterization and documentation.

(iv) sustainable use.

(v) partnerships and networking.

(vi) policy and advocacy.

(vii) research and education.

(viii) mainstreaming into existing policies and programs.

All actions are also summarized in Annex 1.

Phase 1 – Short term actions (2025–2029)

Phase 1, of four years, will begin with preparatory period, for fundraising and the establishment of the structures that will oversee implementation, including a Secretariat, International Advisory Panel, and Governance Board, as further described in the 'Operational model' section that follows. This will be followed by implementation of eight strategic actions that will increase the collection of African vegetable germplasm from vegetable biodiversity hotspots in Africa, alongside capacity strengthening for national genebank staff, improving conservation infrastructure, promoting germplasm exchange and use, increasing fundraising, and networking to promote a more enabling policy environment. Specific targets and actions are further defined, below.

Rescuing African vegetable biodiversity – Seed samples will be collected of at least 10,000 landraces and wild relatives of some 25 priority species identified by van Zonneveld et al. (2021a, 2023) and the Vision for Adapted Crops and Soils (VACS) initiative, focusing on six vegetable biodiversity hotspots in sub-Saharan Africa (see Figure 1).

Ex situ and in situ conservation – For ex situ conservation, one pan-African vegetable genebank and two regional vegetable genebanks will coordinate long term conservation, germplasm exchange, collaborative research, and capacity strengthening with national genebanks in Africa. These three hubs will also ensure duplication of collections in two other locations, including the Svalbard Global Seed Vault. In situ conservation will also be promoted for threatened wild relatives and wild species used as vegetables, in collaboration with national agriculture and environment ministries.

Characterization and documentation – To better understand the diversity of African vegetables and provide vegetable germplasm to breeders from the African Plant Breeding Association and other networks, this Rescue Plan will support the regeneration, and morphological, ecogeographic and genetic characterization of at least 15,000 newly collected or existing seed samples. This information will be documented and made accessible by regional and national genebanks through a common information management system and knowledge sharing platforms.

Sustainable use – Germplasm will be made available to users, including breeders working on African vegetables. A 'breeding intelligence' platform will be established for pre-breeding and breeding, to increase the open access availability of phenotypic, genotypic and nutritional profiles of conserved material. Links will be reinforced with other initiatives that promote the sustainable use of underutilized crops, such as APBA, AOCC, AVBC, BOLD, BOLDER, TAVI and VACS.

Partnerships and networking – This Rescue Plan will be incorporated into the agendas of the Plant Genetic Resources Management Working Group of the African Seed and Biotechnology Platform (ASBP). Actions will strengthen the capacities of the network of African genebanks to ensure more sustainable conservation, exchange and use of vegetable germplasm. Thousands of farmers are already engaged in on-farm evaluation of improved varieties and promising accessions from genebanks, and they will form the basis for further citizen scientist farmer networks, with due recognition for their contributions to developing new climate resilient varieties that meet farmer and consumer needs. This will contribute to demand-driven breeding and inclusive seed systems that align with the objectives of ASBP for developing improved varieties.

Policy and advocacy – Regional plant genetic resources networks will be strengthened and engaged in policy dialogues and advocacy for more harmonized regulations on germplasm access and benefit sharing, that promote sustainable use and conservation of African vegetable biodiversity, and drive agricultural innovation. Countries will be supported to develop seed sector roadmaps that recognize and promote integrated seed systems for African vegetables. At least two national institutions will support the Rescue Plan and include African vegetable biodiversity conservation and use in their National Biodiversity Strategies and Action Plans. Awareness raising for the general public will be promoted on the nutrition, health and economic benefits of increased production and consumption of African vegetables.

Research and education – Agrobiodiversity research and development programs will be strengthened in at least four national universities, supported by training curriculums including the use of citizen science and other participatory evaluation methods, to increase the demand, supply and use of African vegetables, linked to school garden and school feeding programs. More vegetable breeders and seed system specialists will be trained to support the development of improved varieties and the availability of quality vegetable seed.

Mainstreaming – At least two governments will institutionalize the inclusion of African vegetables into national school feeding programs and food and nutrition security strategies, including support for public procurement of African vegetables for schools involved.

2

Phase 2 – Medium term actions (2029–2032)

In the second phase, of three years, targeted collections will continue in vegetable biodiversity hotspots to fill identified gaps. The established germplasm conservation hubs, now up to international standards, will actively support national genebanks and provide training to further strengthen capacity. Capacities will be strengthened to develop improved varieties and improved supply of quality vegetable seed. Partners will promote the scaling of vegetable production and incorporation into national food and nutrition programs. Partnerships between regional networks will promote national and subregional policies that support the mainstreaming of African vegetables in food systems for sustainable healthy diets.

Rescuing African vegetable biodiversity – At least 10,000 additional seed samples of landraces and wild relatives will be collected, focusing on the six identified vegetable biodiversity hotspots.

Ex situ and in situ conservation – The pan-African and two regional vegetable genebanks are fully equipped and continue to be managed following international standards, expanding long term conservation, germplasm exchange, collaborative research, and capacity building. A priority list of crop wild relatives will be developed to guide future in situ conservation, and with ministries of environment, in situ conservation is further promoted for the most threatened species used as vegetables.

Characterization and documentation – This Rescue Plan will support national genebanks to establish quality management systems following international genebank standards. At least three national genebanks will have developed and implemented the full range of standard operating procedures following international standards. Germplasm information will be uploaded to knowledge sharing platforms for at least 15,000 African vegetable accessions, and support will be provided for the regeneration and morphological, ecogeographic and genetic characterization of at least 15,000 further accessions.

Sustainable use – Genebanks will be actively engaged in pre-breeding activities, and make information on plant genetic resources accessible to breeders and farmers to advance crop improvement. Collaborations will be strengthened with other initiatives that promote the sustainable use of neglected and underutilized crops, as outlined above.

Partnerships and networking – This Rescue Plan will be promoted by the Plant Genetic Resources Management Working Group of the African Seed and Biotechnology Platform. Subregional plant genetic resources networks will also incorporate African vegetable biodiversity conservation and promotion into their respective agendas. Private sector engagement will be encouraged, to strengthen the development of improved varieties and the supply of African vegetable seed.

Policy and advocacy – Recognizing that countries in Africa interdepend on each other and other countries for genetic resources, this Rescue Plan will support the implementation of national, regional and international policies for germplasm exchange. Access and benefit sharing regarding the use of collected and conserved vegetable germplasm will follow national regulations, in line with international agreements including ITPGRFA, CBD and the Nagoya Protocol. Better seed system policies will be developed and implemented with increased support for variety registration, that is critical to catalyze access and use of vegetable germplasm by breeders, companies and farmers. Also, at least four national institutions will have included African vegetable biodiversity conservation and use in National Biodiversity Strategies and Action Plans (NBSAPs), aligned with the Global Biodiversity Framework.

Research and education – Agrobiodiversity research programs will be strengthened in six national universities and agricultural research institutes, to generate new knowledge that supports biodiversity management and promotes its use. Research collaboration on vegetable improvement and agronomy will be increased, to better understand the genetic diversity of African vegetables, with links to school garden programs, vegetable biodiversity education, and school feeding programs. This strategy will raise awareness amongst younger generations about the importance of African vegetables. More vegetable breeders and seed specialists will be trained to develop improved varieties and support quality seed production, with private sector engagement.

Mainstreaming – At least four countries will institutionalize the inclusion of African vegetables into national school feeding programs and into primary school curricula. The use of African vegetables will be promoted through awareness raising events that include recipes and tasting of various dishes, and they will be incorporated at scale in home and school meals in more geographical areas and countries.

3

Phase 3 – Long term actions (2032–2035)

In Phase 3, of three years, established germplasm collections will continue to be conserved following international genebank standards, with support to breeding and cultivation by farmers as part of compliance with Article 9 of the ITPGRFA on farmer rights. Genebanks and their partners under access and benefit sharing mechanisms and conditions, will become more engaged in collaborative research and networking to increase the sustainable use of their vegetable germplasm collections, to better meet the nutritional and climate needs. Vegetables will be further mainstreamed into food systems by the increased scaling of home and school gardens, and school feeding programs.

Rescuing African vegetable biodiversity – At least 10,000 further seed samples of landraces and wild relatives will be collected in the six hotspot regions, and related information made available. Genebanks will continue to modernize their genebank information management systems, including the entry of seed inventory and passport data into online databases.

Ex situ and in situ conservation – One Pan-African vegetable genebank and two regional genebanks continue to be managed to international standards, as regional hubs for the long-term conservation and exchange of African vegetable germplasm, collaborative research, and capacity building. Conserved germplasm is accessible to plant breeders, farmers and other users.

Characterization and documentation – At least five national and regional genebanks will have developed quality management systems and will continue to follow standard operating procedures. Additional germplasm information and inventory data will be uploaded to knowledge sharing platforms such as Genesys. This Rescue Plan will support the regeneration and morphological, ecogeographic, and genetic characterization of at least a further 10,000 accessions, with data uploaded to online platforms.

Sustainable use – Genebanks will strengthen the information on plant genetic resources accessible to breeders and farmers to advance crop improvement. Collaborations will be strengthened with other initiatives that promote the sustainable use of underutilized crops, as outlined above.

Partnerships – This Rescue Plan, adopted by the Plant Genetic Resources Management Working Group of the African Seed and Biotechnology Partnership Program, will be further promoted to all involved actors (Annex 2). Regional and continental genebank networks and plant genetic resources institutions increase the conservation and use of African vegetables. Genebanks will strengthen partnerships with farmer networks and other germplasm users to encourage the utilization of genebank collections. The Africa Vegetable Breeding Consortium and African Plant Breeders Association will increase research and breeding of African vegetables.

Policy and advocacy – Better policies on access and benefit sharing will help to promote the use of the collected and conserved vegetable germplasm, alongside improved policies and seed systems to meet the needs of farmers, consumers and others along the value chains. At least eight national institutions will have included African vegetable biodiversity conservation and use in National Biodiversity Strategies and Action Plans.

Research and education – Agrobiodiversity research programs will be further strengthened in national universities and agricultural research institutes, generating more knowledge to support biodiversity management and promote use. Additional work will link more school garden programs to vegetable biodiversity education and school feeding, furthering awareness amongst younger generations about the importance of African vegetables. The supply of improved vegetable to farmers and local, national and regional markets will be increased, leading to increased availability of affordable African vegetables.

Mainstreaming – The use of African vegetables is expanded in home and school meals, increasing consumption, nutrition, health and wellbeing. At least eight countries will institutionalize the inclusion of African vegetables into national school feeding programs and primary school curriculums. Multiple approaches including vegetable business networks, contract farming and e-markets will be used to develop vegetable value chains.

Implementation arrangements

Operational model

Secretariat, international advisory panel, and governance board – The day-to-day operations of the African Vegetable Biodiversity Rescue Plan will be conducted by a secretariat based at the World Vegetable Center regional center in Tanzania, and guided by a governance board and an international advisory panel that together will form the African vegetable biodiversity 'Rescue Alliance'. The governance board will be composed of representatives of funders, WorldVeg, the African Union Commission and the Global Crop Diversity Trust. The international advisory panel will consist of experts across the eight actions of this Rescue Plan, appointed by the governance board that will be responsible for selecting proposals for funding and providing guidance on the overall coherence of the portfolio and backstopping needs.

Fundraising – The governance board will develop a fundraising strategy and establish a trust fund to receive and hold financial resources. The board will engage on a regular basis with funders and governments to actively raise further funds and increase alignment of the Rescue Plan to existing government investments in order to streamline implementation of the actions with current policies and programs.

Calls for projects – The secretariat will launch calls to implement the eight identified actions of this Rescue Plan. Expressions of interest and supporting letters from national partners and regional networks responding to the calls will be evaluated by the international advisory panel. Funds will also be allocated to masters and doctoral scholarships, workshops, training courses and conferences, as proposed by the secretariat and approved by the governance board. WorldVeg, CGIAR centers and other international agricultural research centers will provide technical backstopping and capacity strengthening as required.

Monitoring, evaluation, learning and impact assessment – All projects will comply with monitoring and evaluation procedures, and conduct impact assessments that will be standardized for all funded operations. WorldVeg will ensure that there is a systematic approach to capture learning and assess outcomes.

Visibility and communication –
Virtual discussion groups will be established for each of the eight actions to stimulate knowledge exchange and collective action. Results will be made available online.

Impact pathway

In the first component of this Rescue Plan, collecting germplasm in vegetable hotspots and increased investment in genebank infrastructure and quality management, will lead to the rescue and conservation of crucial African vegetable biodiversity (Outcome 1). This outcome enables the reversal of biodiversity loss and increased options for transforming food systems.

In the second component, characterization and documentation of vegetable biodiversity, and making the information available, will promote the sustainable use of this biodiversity by different users, including farmers, consumers, traders, breeders and seed sector enterprises. This will lead to innovations in crop improvement and cropping systems leading to more resilient and nutrient-dense food production (Outcome 2). This outcome will drive innovation, improve livelihoods and incomes of farmer households, enhance nutrition of rural and urban households, and increase self-sufficiency.

In the third component, proposed activities will strengthen partnerships between genebanks, breeders, farmers and other actors in the seed system. It will advocate for national and regional seed and biodiversity policies that stimulate the use and exchange of vegetable germplasm and the registration of vegetable varieties in line with the ITPGRFA and other international conventions. These activities will lead to vibrant vegetable seed systems to supply quality planting material that meet the needs of producers and consumers (Outcome 3), and diverse farming systems that produce more and better food (Outcome 4). These outcomes will further drive agrifood innovation, improve livelihoods and incomes, enhance nutrition of rural and urban households, and increase self-sufficiency.

In the fourth component, engaging in innovative research and dialogue with policy makers will foster the integration of African vegetable biodiversity conservation into National Biodiversity Strategies and Action Plans, into curriculums at primary and secondary schools and universities, and into school feeding programs. This Rescue Plan will also align with innovative and participatory breeding initiatives. These activities will lead to increased capacities for conserving vegetable biodiversity, and enhancing its use for improved food production and enriched diets (Outcome 5). These outcomes incorporate conservation, research, production and consumption of African vegetables into local, national and regional policies and programs, leading to major long-term transformations in African food systems for improved health, income and climate resilience.

Box 1. Economic and social costs of inaction vs. benefits of action

According to the World Economic Forum, "50% of the global economy is under threat from biodiversity loss" because it reduces our resilience to shocks, and limits discovery of new solutions in food, agriculture and health that could enable the elimination of hunger and poverty (Hanley and Perrings, 2019). Here, we are interested in an important subset – the loss of agrobiodiversity – defined as the range of species, varieties and ecosystems, together with crop wild relatives, pollinators, and other associated organisms, used by humans for food and agriculture (Frison et al., 2011). However, functional relationships between agrobiodiversity and economic and social values are insufficiently quantified, despite the premise of correlation that dominates scientific and political arenas (Paul et al., 2020). Hard data is lacking, and what studies do exist have only looked at singular aspects, areas or crops (e.g. Chavas and Di Falco, 2012).

Alongside the rapid loss in all global biodiversity, agrobiodiversity, including vegetable biodiversity, continues to decline in farmland and natural ecosystems (Pilling et al., 2020). This narrows the options for developing new, more nutritious and climate resilient varieties, decreases our portfolio of crops and varieties to diversify farming systems for climate change adaptation, and reduces the chance of achieving the 2030 Sustainable Development Goals (van Zonneveld et al., 2023). Local vegetable landraces and crop wild relatives are the basis for breeding more nutritious varieties that can cope with climate change, are resistant to pests and diseases, and meet consumer demand (FAO, 2019). Exploring these opportunities is only possibly by rescuing local varieties, conserving them following international standards, and making seed available for breeding and farming.

The economic benefits appear clear. Increased production and growing agribusinesses will increase income generation at local levels, and reduce dependencies on vegetable imports that will impact positively on national balances of payments and foreign currency reserves. But is there any evidence that this is the case? There are very few detailed studies, but those available do show manyfold returns on improved incomes and livelihoods from investing in rescuing, conserving and using vegetable biodiversity.

In East Africa, 98% of African eggplant seed commercially produced in the region are of improved varieties developed by the World Vegetable Center from collections held in its genebanks. For African eggplant in Tanzania alone, each dollar invested in germplasm conservation and use for variety development and registration returned two dollars in the first 10 years after investment, with a total social gain of US$5 million, and five dollars in the subsequent 10 years, with a total social gain of more than US$27 million (Schreinemachers et al., 2017). For tomato in Tanzania, each dollar invested returned 10 dollars in the first 10 years after investment, with a total social gain of US$255 million, and 63 dollars in the subsequent 10 years, with a total social gain of US$639 million (Schreinemachers et al., 2017). With amaranth in Tanzania, WorldVeg-developed cultivars and selections from genebank accessions had mean yields that were 6 tonnes per hectare higher, or double that of other cultivars (Wanyama et al., 2023), although economic returns on investment were not evaluated.

Asia has a longer history in developing improved varieties for traditional vegetables that provides further insights. Research results showed that returns from investing in conserving and using vegetable biodiversity were high, especially when combined with promoting good agricultural practices. Improved bitter gourd varieties that were developed by using local landraces allowed farmers in Vietnam to earn an extra US$11 for every dollar spent on quality seed (Pekelharing, 2014). With mungbean in Myanmar, four new varieties developed on the basis of the global mungbean genebank collection at WorldVeg created aggregate economic gains of US$1.4 billion over 36 years (1980 to 2016), projected to increase to US$3.7 billion by 2030. International donors and the Myanmar government invested about US$5 million in the country's mungbean research and development over this period, with each dollar invested generating US$92 in economic gains up to 2016, and US$181 expected by 2030 (Sequeros et al., 2020).

Besides direct economic benefits there are also clear health benefits that would reduce public health costs in Africa, by investing vegetable biodiversity conservation that would result in increased production and consumption of more nutritious foods. For instance, the World Health Organization estimated that the seven million cases of diabetes recorded in 46 African countries in the year 2000 resulted in a total economic loss of more than US$25 billion (7.6% of GDP), or US$2,000 to US$11,000 per patient depending on gross national income (Kengne et al., 2013). In West Africa alone, some 50,000 adult deaths were attributed to coronary heart disease and cancer, related to unhealthy diets and low consumption of vegetables (Global Nutrition Report, 2022), and about 10% of health expenditure by African governments between 1990 and 2007 was on treating non-communicable diseases and their impacts (Nyaaba et al., 2017).

Box 2. Cost estimates for implementing the African Vegetable Biodiversity Rescue Plan (million US$)

Components and actions	Phase 1 2025-2029	Phase 2 2029-2032	Phase 3 2032-2035	Total
1. Rescue and conservation	***11.5***	***14.5***	***15.0***	***41.0***
Rescue of African vegetable biodiversity	3.5	4.0	4.5	12.0
Ex situ and in situ conservation	8.0	10.5	10.5	29.0
2. Information and sustainable use	***14.0***	***14.0***	***12.0***	***40.0***
Characterization and documentation	10.0	10.0	8.0	28.0
Sustainable use	4.0	4.0	4.0	12.0
3. Partnerships and enabling policies	***2.5***	***3.5***	***3.5***	***9.5***
Partnerships and networking	1.0	1.5	1.5	4.0
Policy and advocacy	1.5	2.0	2.0	5.5
4. Research, education and mainstreaming	***11.5***	***11.5***	***11.5***	***34.5***
Research and education	5.5	5.5	5.5	16.5
Mainstreaming into existing policies and programs	6.5	6.0	6.0	18.0
Total	**39.5**	**43.5**	**42.0**	**125.0**

Conclusions

Extrapolating estimated economic returns in Box 1 across a wide range of African countries and vegetable crops, suggests substantial benefits from investing in this African Vegetable Biodiversity Rescue Plan. Based on an average investment of US$12.5 million per year to implement the plan (Box 2) and using conservative estimates, expected economic returns could be between US$250 million and US$1.4 billion across the next 10 years. And this would be very likely to grow exponentially thereafter, with more benefits for generations to come as more seed is conserved, shared and used over time.

There are direct benefits from increased production and trade, to local economies – rural and urban – but also to national balance sheets, with increased taxes, reduced imports, and increased exports. Then there are the savings in health costs resulting from healthier diets, by both increased micronutrient availability on the one side, and reduced risks of non-communicable diseases on the other. And then there are myriad social benefits that are difficult to measure. Healthier children are less likely to miss school and more likely to perform better. Increased employment opportunities in rural areas will reduce migration to burgeoning cities or abroad. Then there are the incalculable benefits of improved wellbeing, on individual, community and national levels.

Implementing this Rescue Plan will ensure that African biodiversity is collected and conserved, before it is lost forever, for the benefit of generations to come. There will be a continent-wide network of genebanks, better equipped and with more qualified staff, safeguarding and sharing genetic resources. Using the newly conserved vegetable germplasm will encourage more breeding of improved varieties, not only with higher yields, but also with more resistance to heat, flooding, pests and diseases that are predicted become more prevalent. And increased vegetable production will result in more diverse farming systems, that will increase resilience to all the shocks that may come.

And, imagine. Business as usual, or more adapted and improved vegetables in diversified farming systems – in all zones, peri-urban market gardening, rooftop gardens, school gardens, home gardens? Short value chains of nutrient-dense African vegetables, or dependence on imports? Which would you prefer, when the next pandemic comes along, when fuel prices rise, when external crises affect trade? All in all, the costs in Box 2 can be seen as a very small price to pay, indeed, for all the rewards and resilience that will result.

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Annexes

Annex 1. Actions, targets and milestones

Actions	Phase 1 (2025–2029)	Phase 2 (2029–2032)	Phase 3 (2032–2035)
Component 1. Rescue and conservation			
Rescue of African vegetable biodiversity	- Inventories conducted in six hotspots to update the current status of African vegetable biodiversity conservation. - At least 10,000 accessions of diverse African vegetables collected in six hotspots and beyond. - Baseline monitoring of biodiversity trends in the six hotspots and beyond completed.	- At least 10,000 (cumulative total, 20,000) landraces and wild relatives collected in the six hotspots and beyond, of diverse African vegetable crop species. - Monitoring of biodiversity trends in the six hotspots and beyond continued.	- At least 10,000 (cumulative total, 30,000) landraces and wild relatives collected in the six hotspots and beyond, of diverse African vegetable crop species.
Ex situ and in situ conservation	- Develop a comprehensive plan with technical, financial, administrative and legal processes, for establishing regional vegetable genebanks. - One pan-African and two other vegetable genebanks established and equipped as regional hubs.	- A pan-African vegetable genebank and two others established as regional hubs. - One pan-African genebank, two regional genebanks, and at least five national genebanks have developed standard operating procedures - A priority list of crop wild relatives developed to guide in situ conservation.	- One pan-African genebank, two regional genebanks, and at least five national genebanks have established quality management systems and implemented standard operating procedures following international standards. - In situ conservation of prioritized crop wild relatives implemented, with backups in the vegetable genebank network.
Component 2. Information and sustainable use			
Characterization and documentation	- At least one regional and two national genebanks implement information management systems and upload information to knowledge sharing platforms. - At least 15,000 accessions are regenerated, morphologically, ecogeographically, and genetically characterized.	- At least three genebanks develop and follow standard operating procedures. - Germplasm information of at least 15,000 accessions uploaded to knowledge sharing platforms. - At least 15,000 (cumulative total, 30,000) accessions are regenerated and characterized.	- Germplasm information and inventory data are uploaded to knowledge sharing platforms. - At least 10,000 (cumulative total, 40,000) accessions are regenerated and characterized.

Annex 1. Actions, targets and milestones

Actions	Phase 1 (2025–2029)	Phase 2 (2029–2032)	Phase 3 (2032–2035)
Sustainable use	- African vegetable germplasm made accessible to users (farmers, community seed banks, breeders, researchers, industry) following existing national regulations.	- African vegetable germplasm is made accessible to more users following existing national regulations.	- African vegetable germplasm is made accessible to additional users following national and international regulations.
Component 3. Partnerships and enabling policies			
Partnerships and networking	- The Rescue Plan is adopted and promoted by all stakeholders involved.	- The Rescue Plan is implemented by all stakeholders involved.	- Strengthened partnerships between genebanks, farmer networks and other germplasm users to promote the utilization of genebank collections.
Policy and advocacy	- Regional plant genetic resources networks strengthened and engaged in policy dialogues and advocacy for harmonized national regulations. - Countries supported to build seed sector development roadmaps. - Advocacy to incorporate African vegetable biodiversity conservation and use in national biodiversity strategies in at least three countries per regional economic community. - Promotion of integration of African vegetables in school feeding programs. - Material transfer agreements established or adapted for access to vegetable germplasm in the six hotspots and beyond.	- Better seed and genetic resources policies developed, to catalyze access and use of vegetable germplasm by farmers, breeders and other users. - Countries supported to implement seed sector development road maps. - Regional plant genetic resources networks further strengthened and engaged in policy dialogues and advocacy for harmonized national regulations. - African vegetable biodiversity conservation and use incorporated in national biodiversity strategies in at least three countries per regional economic community.	- Genetic resources and seed policies developed, to catalyze access and use of vegetable germplasm by farmers, breeders and other users. - Vibrant seed systems established that meet farmers and consumers' needs. - Regional plant genetic resources networks further strengthened and engaged in policy dialogues and advocacy for harmonized national regulations. - African vegetable biodiversity conservation and use incorporated in national biodiversity strategies in at least three countries per regional economic community.

Annex 1. Actions, targets and milestones

Actions	Phase 1 (2025–2029)	Phase 2 (2029–2032)	Phase 3 (2032–2035)
Component 4. Research, education and mainstreaming			
Research and education	- Pilot agrobiodiversity research programs in at least four national universities. - Increasing awareness on the importance of African vegetables among young people. - University training curricula on African vegetable conservation and use developed, for short term and long term research programs. - Promotion of the conservation and benefits of African vegetables in primary and secondary schools. - Farmer training on on-farm conservation and awareness of the benefits of African vegetables.	- Continued strengthening of agrobiodiversity research programs in six national universities. - Increased research collaboration on genetic diversity of African vegetables, climate adaptation, seed behavior, agronomy and breeding, with training and exchange visits on genebank management, etc. - Increasing awareness of the importance of African vegetables among young people. - Farmer training on on-farm conservation and the benefits of African vegetables.	- School garden programs and vegetable biodiversity education incorporated in primary and secondary school curricula. - Agrobiodiversity research programs incorporated in the curricula of at least six national universities. - Breeders and researchers are trained and supported to use African vegetable germplasm. - Farmer training on on-farm conservation and awareness of the benefits of African vegetables.
Mainstreaming	- At least two governments institutionalize the incorporation of African vegetables into school meals, and support public procurement of vegetables for school feeding programs. - Develop value chains and markets for African vegetables.	- At least four governments institutionalize the incorporation of African vegetables into school meals, and support public procurement of vegetables for school feeding programs.	- At least eight governments incorporate African vegetables into school meals, and support public procurement of vegetables for school feeding programs. - Increased access to African vegetables through improved seed supply to farmers and vegetable supply to local markets.

Annex 2. Key actors, their proposed roles and responsibilities

Stakeholder mapping and analysis identified key actors who should be involved in the rescue, conservation, use and promotion of African vegetable biodiversity, and in which aspects they could be involved, e.g. research and development, policy development and implementation, advocacy and communication, etc. including those from the donor community. Including a wide range of stakeholders will leverage resources and promote accountability and transparency.

Key actors	Roles and responsibilities
African Union Commission, and the Plant Genetic Resource Management Working Group (PGRM-WG)	• Lead efforts to promote implementation of this Rescue Plan, and advocate for the adoption of strategies, policies and programs. • Coordinate implementation of this Rescue Plan at continental level. • Support capacity strengthening of stakeholders to manage risks associated with the loss of plant genetic resources. • Promote development and use of relevant adopted international standards. • Enhance capacity strengthening within African Union Member States. • Support effective participation of African delegates in ITPGRFA Commissions. • Support resource mobilization for implementing this Rescue Plan.
Plant genetic resources networks (regional and national)	• Offer a forum for consultation on aspects of this Rescue Plan. • Provide technical and research-based recommendations to all stakeholders involved in implementation of the Rescue Plan at national, regional and continental levels. • Facilitate coordination of this Rescue Plan in PGR committees at all levels.
National plant genetic resources centers	• Lead implementation and coordination of the Rescue Plan at national level. • Promote use of relevant adopted ITPGRFA international standards.
World Vegetable Center	• Coordinate fundraising to support implementation of this Rescue Plan. • Coordinate communication of this Rescue Plan at global level. • Serve as this Rescue Plan steering committee secretariat. • Promote the sustainable use of vegetable germplasm.
National and international research centers	• Conduct research and development on African vegetables. • Ensure information and knowledge sharing on African vegetables and the scaling of technologies at all levels (horizontal and vertical). • Enhance awareness amongst national and international research centers. • Mobilize resources to support implementation.
National governments, policy makers	• Develop and implement supportive policies. • Create an enabling environment. • Review and align national regulations, standards and reforms with the CBD and ITPGRFA. • Enact new legislative measures and policies to deal with weaknesses, gaps and duplications that have hindered implementation of ITPGRFA standards. • Promote transparency of legislative instruments through improved compliance to national reporting obligations. • Enhance advocacy for policies and funding for PGR activities included in this Rescue Plan.

Annex 2. Key actors, their proposed roles and responsibilities

Key actors	Roles and responsibilities
Extension services, civil society, NGOs	• Educate and raise awareness on ITPGRFA compliance. • Promote Rescue Plan related technology uptake and exchange. • Provide necessary information to producers. • Train farmer organizations and producers on best PGR practices and encourage adoption. • Coordinate educational opportunities and training courses. • Raise awareness on the general importance of this Rescue Plan.
Producers/ farmers	• Advocate and participate in education programs. • Ensure compliance with ITPGRFA regulations. • Enhance Rescue Plan related technology uptake.
Consumers	• Provide feedback on crop varieties and landraces. • Lead the promotion of safe, sustainable and nutritious diets. • Advocate for training in African vegetable production, and appreciation of their value.
Private sector	• Use the germplasm to develop improved varieties that meet needs. • Ensure compliance with ITPGRFA and other ABS policies. • Promote partnerships and collaboration with competent authorities.
Regional and national farmer organizations	• Collect and aggregate surveillance data. • Advocate for good farming practices, and coordinate education opportunities. • Advocate on behalf of producers, and actively participate in Rescue Plan awareness raising. • Educate members in best PGR practices and influence adoption. • Communicate PGR issues and needs to extension agents, NPGRCs and local governments.
Regional economic communities	• Lead implementation of this Rescue Plan at regional economic community level. • Develop and implement regional policies and support regional harmonization of legislation. • Coordinate and develop links between national, continental and international PGR bodies.
Global organizations	• Coordinate adoption of international standards, capacity building and technical assistance. • Support policy dialogues to institutionalize the inclusion of African vegetables into agriculture, food and nutrition security policies and programs.
Funding agencies	• Provide funding for national and regional PGR programs.

Annex 3. SWOT analysis

A SWOT analysis based on consultations with plant genetic resources networks in Africa and literature on African vegetables, identified a number of strengths, opportunities, weaknesses and threats, regarding the conservation and sustainable use of African vegetable biodiversity to address key global challenges. The actions presented in the following chapter address these identified weaknesses and threats.

Strengths	Weaknesses
- High vegetable biodiversity across the continent. - Several hotspots with a wide diversity of vegetable species. - High nutritional value, good for human health and wellbeing. - Significant potential for the management of non-communicable diseases. - Relatively low input requirements for production. - High potential of most species for resilient production systems and climate change adaptation. - Established PGR networks at regional and continental levels.	- Inadequate research and development capacity in most countries in Africa. - African vegetables are often viewed as weeds and poor people's food. - Bias for conventional vegetables. Inadequate policy attention. - Weak seed systems. - Weak value chains for African Vegetables, with limited scope for profitable production and marketing. - Lack of postharvest technologies especially for leafy African vegetables. Insufficient public sector investment.
Opportunities	**Threats**
- Increasing recognition of the valuable roles of African vegetables in the development agenda. - Positive diet and lifestyle changes in favor of African vegetable consumption in some parts of Africa. - High potential internal market in Africa. - African vegetables are connected to global research and development agendas on climate change adaptation and nutrition.	- Unfavorable policy environment for sustainable use of African vegetable biodiversity. - Absence of private sector participation. - Change in land-use, consumption, and value- chains threaten the existence of local varieties and crop wild relatives. - Emerging diseases affecting African vegetables. - Underrepresentation of vegetables in the Annex 1 list of the ITPGRFA potentially limits germplasm exchange.

Annex 4. Acronyms

ABS	Access and benefit sharing
AOCC	Adapted Crops and Soils; African Orphan Crop Consortium
APBA	African Plant Breeders Association
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASBP	African Seed and Biotechnology Program
AUC	African Union Commission
AUDA-NEPAD	African Union Development Agency
AVBC	African Vegetable Breeding Consortium
BOLD	Biodiversity for Opportunities, Livelihoods and Development
BOLDER	Building Opportunities for Lesser-known Diversity in Edible Resources
CAADP	Comprehensive Africa Agriculture Development Programme
CBD	Convention on Biological Diversity
CCARDESA	Centre for Coordination of Agricultural Research and Development for Southern Africa
CORAF/ WECARD	West and Central African Council for Agricultural Research and Development
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
GFAR	Global Forum on Agricultural Research and Innovation
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
NBSAP	National Biodiversity Strategy and Action Plan
NPGRC	National plant genetic resources center
PGR	Plant genetic resources
PGRM-WG	Plant Genetic Resources Management Working Group
SADC	Southern Africa Development Community
SPGRC	Southern Africa Development Community Plant Genetic Resources Center
SWOT	Strengths, weaknesses, opportunities, and threats
TAVI	Taiwan Africa Vegetable Initiative
WCA	West and Central Africa
WECAN-PGR	West and Central African Network for Plant Genetic Resources
WHO	World Health Organization

Annex 5. Glossary

Term	Definition
Accession	A distinct, uniquely identifiable sample representing a cultivar, breeding line or population, which is maintained in storage for conservation and use.
African vegetables	Vegetable crops that are indigenous to Africa or are indigenized (introduced long ago), and are adapted to farming systems and local food needs after generations of interaction with humans and the environment.
Biodiversity	The variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species, and of ecosystems.
Biodiversity rescue	To collect and save components of biodiversity from an existing threat or dangerous situation where a population is at risk.
Crop wild relatives	Related undomesticated species or wild ancestors of a crop. Crop wild relatives may provide abiotic and biotic stress tolerance or other desirable characteristics for breeding.
Cultivar	A crop variety produced through crop improvement by farmers, practitioners, or/and professional breeders.
Genetic resources	Genetic material of plant, animal, microbial or other origin containing functional units of heredity with actual or potential value for humanity, as defined by the Convention on Biological Diversity.
Germplasm	The genetic material that forms the physical basis of heredity and that is transmitted from one generation to the next by germ cells.
Genotype	The genetic constitution of an individual plant or organism.
Landrace	A local cultivar or animal breed that has been improved by traditional methods of selection. Landraces may be able to better tolerate certain pests or pathogens and environmental extremes.
Seed sample	The minimum number of individuals representing a population, and that is used as an ex situ conservation unit.
Variety	A recognized division of a species, next in rank below subspecies. It is distinguishable by characteristics such as flower color, leaf color, or the size of the mature plant. The term is considered to be synonymous with cultivar.
Vegetable biodiversity	The variability within and between vegetable species, including their wild relatives, associated organisms (for example pollinators and the microbiome), associated human culture, and diversity of habitats and farming systems which form the ecological complexes they are part of.

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The **World Vegetable Center** is an international non-profit institute for vegetable research and development. It mobilizes resources from the public and private sectors to realize the potential of vegetables for healthier lives and more resilient livelihoods.

WorldVeg's globally important genebank, improved varieties, production and postharvest methods help farmers to increase their vegetable harvests, raise incomes in poor rural and urban households, create jobs, and provide healthier, more nutritious diets for families and communities. With headquarters in Taiwan, field operations are led from regional centers in Benin, India, Mali, Tanzania and Thailand, and through offices in other countries.

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