Bioversity International

SAPM

Strategic action plan to strengthen conservation and use of Mesoamerican plant genetic resources in adapting agriculture to climate change

2014 - 2024

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International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and its Benefit-Sharing Fund

The International Treaty, the only multilateral instrument regulating the conservation and sustainable use of plant genetic resources for food and agriculture (PGRFA), has as objective the conservation and sustainable use of PGRFA and the fair and equitable sharing of the benefits arising from their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security. To date, 130 countries have signed the International Treaty.

The existence and availability of funds at national and international levels needs to be guaranteed in an efficient and complementary way in order to fulfil this objective. The Funding Strategy of the Treaty is a mechanism to strengthen global efforts for conservation and sustainable use of PGRFA. Through its Benefit-Sharing Fund, which is also part of the Multilateral System of the Treaty, funds are mobilized directly to support projects on conservation and sustainable use of PGRFA in developing countries.

The Benefit-Sharing Fund of the Treaty opened the second call for proposals in 2011 and approved funding of 19 projects (7 projects for developing strategic action plans and 12 projects of immediate impact). The project reported herein is one of the projects approved and funded by the Benefit-Sharing Fund for developing a Strategic Action Plan to Strengthen Conservation and Use of Mesoamerican Plant Genetic Resources in Adapting Agriculture to Climate Change. (www.planttreaty.org)

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Executive summary

MESOAMERICA, one of the main centres of domestication and diversification of globally important crops, hosts a wealth of plant genetic resources. Although this region will face unprecedented challenges due to climate change, it has in these plant genetic resources an essential asset to adapt its agricultural systems to the anticipated changes and provide food security for the population.

Panoramic from the Sierra de los Cuchumatanes, Guatemala

The Strategic Action Plan to Strengthen the Conservation and Use of Mesoamerican Plant Genetic Resources in Adapting Agriculture to Climate Change (SAPM) is a ten-year road map to strengthen conservation, access and use of plant genetic resources in Mesoamerica, as a strategic element for food security and agricultural adaptation to climate change and other threats.

The SAPM comprises the following six thematic components and activities: **(1) the conservation component** includes, a) on-farm and *in situ* conservation of plant genetic resources, through the creation and recognition of integrated biocultural territories within existing conservation programmes, as well as supporting local seed systems, and, b) a new, efficient *ex situ* conservation system that allows optimal services to users, including small-holder farmers; **(2) the sustainable use component** identifies the measures needed to facilitate availability of diverse varieties with adaptive potential to changing climate conditions, to encourage on-farm crop diversification and to promote the dissemination of improved varieties; **(3) the institutional and policies component** includes measures to support the conservation and sustainable use thematic components, steps towards the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in Contracting Party countries, and measures to implement farmers' rights; **(4) the education and capacity-building component** describes actions for ensuring the full and effective participation of famers' organizations, decision makers, and academic and other professionals in implementing the SAPM, as well as actions for raising public awareness; **(5) the operational component** identifies regional coordination frameworks and mechanisms needed for implementing the SAPM, including revitalizing plant genetic resources networks and liaising with regional government institutions, among others; **(6) the financial component** identifies actions needed for resource mobilization to support SAPM implementation. The thematic components are all interconnected and implementation of the Action Plan is foreseen in an integrated manner.

The Strategic Action Plan has been formulated using a methodology that combines the analysis of scientific evidence on the current state of plant genetic resources for food and agriculture (PGRFA) in the region, and of climate change challenges and opportunities, and a broad participatory process involving regional stakeholders. The compilation and comprehensive analysis of scientific evidence and relevant policies on conservation, access and use of plant genetic resources was complemented with a genebanks study and a survey administered to more than one hundred farmers in the region. All this information was used to generate a diagnosis on the status of plant genetic resources in the region. For the diagnosis, the SAPM has focused on ten Mesoamerican crops and their wild relatives: maize, beans, cassava, sweet potato, cucurbits, amaranth, peppers, papaya, avocado and a native forage (*Tripsacum*), prioritized for their local, regional and global importance for food security, their contribution to diet diversity and income generation, and their potential for adapting to biotic and abiotic stresses. However, the SAPM and its strategies and activities are relevant to all PGRFA in the Mesoamerican region. Results of analyses and documents used in the analyses are available in Spanish to the public in the ITZAMNÁ website (http://itzamna-mesoamerica.org).

The diagnosis was shared with regional stakeholders in the first SAPM regional consultation held in Guatemala and was used as the basis for identifying priority actions to be included in the Action Plan. The first draft of the SAPM was prepared

with these inputs and the draft was subsequently reviewed and discussed at the second consultation meeting held in Costa Rica. Representatives of all Mesoamerican Contracting Party countries to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)– Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama–participated actively in these consultations. Representatives of Mexico also participated in the consultations. This unprecedented consultation process convened more than a hundred representatives of different sectors of national governments (agriculture, environment, and health), regional government organizations (SICA, CAC, CCAD[1]), universities, regional and international agriculture organizations (IICA, CATIE, FAO, CIAT, FEWS NET[2]), farmers, civil society and donors.

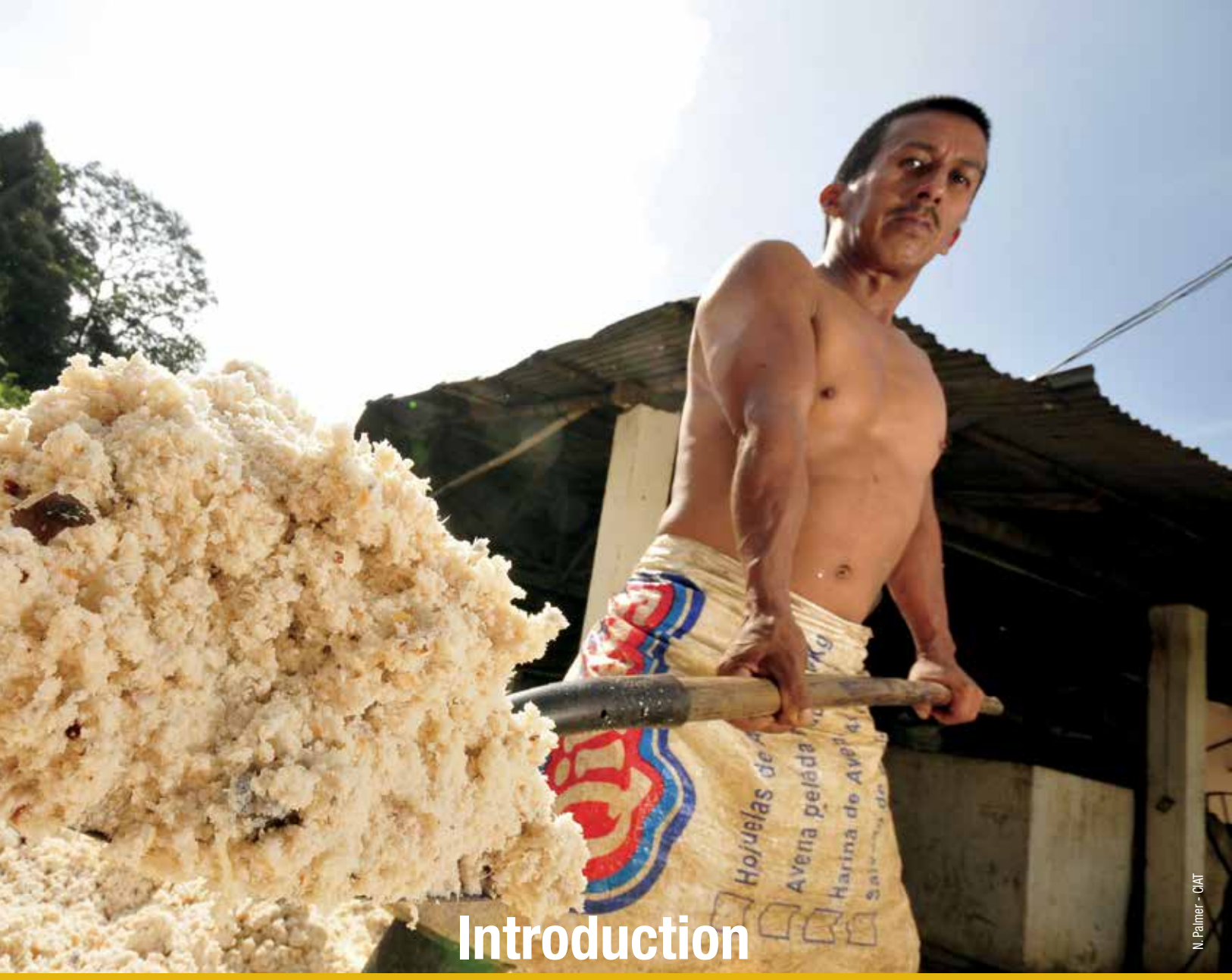
CAC at its Ordinary Meeting of Ministers held in Panama City, on 1 and 2 August 2013, agreed to support the SAPM. CAC urged and instructed its Executive Secretariat to facilitate the link between the SAPM and its Technical Group on Climate Change and Integrated Risk Management, SICTA[3] and other similar initiatives in the framework of CAC. Additionally, IICA offered its support to the implementation of the SAPM.

The ITPGRFA financed the development of the SAPM through its Benefit-Sharing Fund.

[1] Central American Integration System (SICA, from the name in Spanish), Central American Agricultural Council (CAC, from the name in Spanish), Central American Commission on Environment and Development (CCAD, from the name in Spanish)

[2] Inter-American Institute for Cooperation on Agriculture (IICA, from the name in Spanish), Tropical Agricultural Research and Higher Education Centre (CATIE, from the name in Spanish), United Nations Food and Agriculture Organization (FAO), International Centre for Tropical Agriculture (CIAT, from the name in Spanish), Famine Early Warning Systems Network (FEWS NET)

[3] Central American Agricultural Technology Integration System (SICTA, from the name in Spanish).



N. Palmer - CIAT

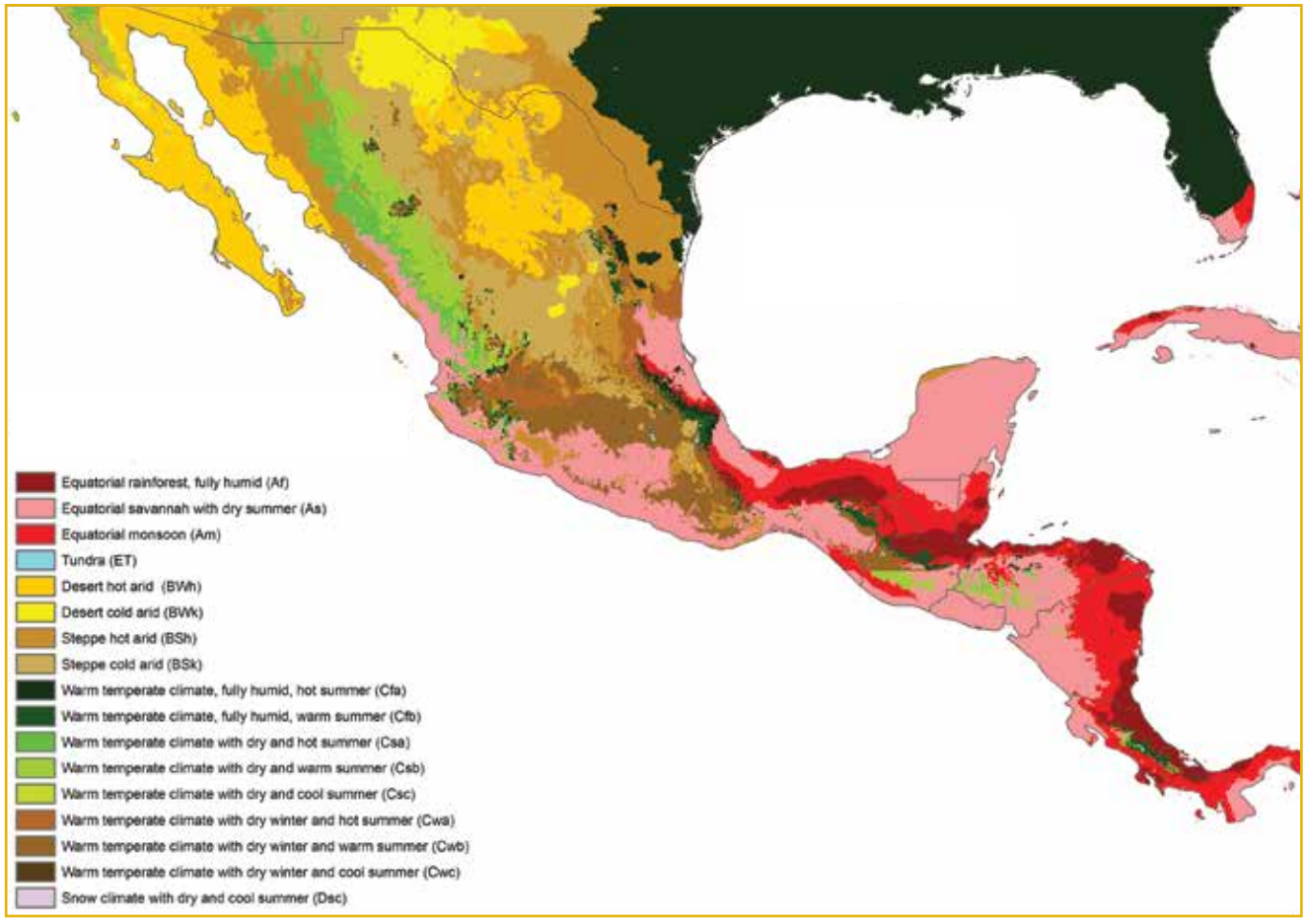
Introduction

Processing cassava flour

MESOAMERICA, the region including southern Mexico and the seven Central American countries, is one of the most vulnerable areas to climate change. Almost all climate models predict a decrease in precipitation and increased drought in this area in the decades to come. In fact, an increase in extreme meteorological events in the region has been already observed, seriously affecting national infrastructure and production systems, as happened with Hurricane Mitch in 1998 and Stan in 2005. Recent agricultural statistics show that production ups and downs are mostly due to climate problems, excess or lack of rainfall, and the associated incidence of pests and diseases. In order to maintain food security in the region, reduce its vulnerability and increase the 'resilience'[4] of production systems in the face of anticipated severe climatic disturbances, it will be crucial to develop strategies and efficient and appropriate adaptation actions for the agricultural sector.

[4] In this document, resilience refers to "the capacity of a system to recover after important disturbances" (adapted from Thomson, 2011).

Köppen climate classification for year 1975



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http://www/ccafs-climate.org/data/

On the other hand, climate change is not exactly new in the history of agriculture. Domestication of plants and the origin of agriculture coincided precisely with the global warming that marked the end of the last ice age, about 10,000 years ago. Throughout history, hundreds of generations of farmers have modified and adapted their crops to different biotic, abiotic and cultural environments, resulting in the rich diversity of plant genetic resources for food and agriculture (PGRFA) we have today. Now that looming changes are of a nature and scale never experienced in the history of agriculture, it is precisely this diversity which we have inherited that can be used to further improve cultivated species, adapting them to new climatic conditions, and meet the challenge of feeding a growing population using fewer inputs. The best use of regional genetic diversity will depend on the ability to deploy multidisciplinary approaches that maximize the synergy of traditional agricultural practices with the body of knowledge and modern scientific methods.

Fortunately, Mesoamerica is one of the primary centres of domestication and diversification of food crops in the world. Among them we find: maize, not only basic in the diet, but also central to the cultural identity in many countries of the region; beans, an important source of protein; and several vegetables, fruits and roots such as peppers, amaranth, cucurbits, avocado, papaya, sweet potato and cassava. The conservation and sustainable use of plant genetic resources of these and other native crops, including their wild relatives, are key for the adaptation of agriculture not only in the region but also in other countries that depend on crops of Mesoamerican origin for their food security.

Given that climate change is not limited to national boundaries, likewise, conservation, adaptation and sustainable use of regional plant genetic resources are not the exclusive prerogative or responsibility of any one country. Therefore,

for faster, and more effective and efficient, adaptation of agricultural production systems–taking advantage of this wealth of plant genetic resources must be a joint initiative supported by all countries in the region.

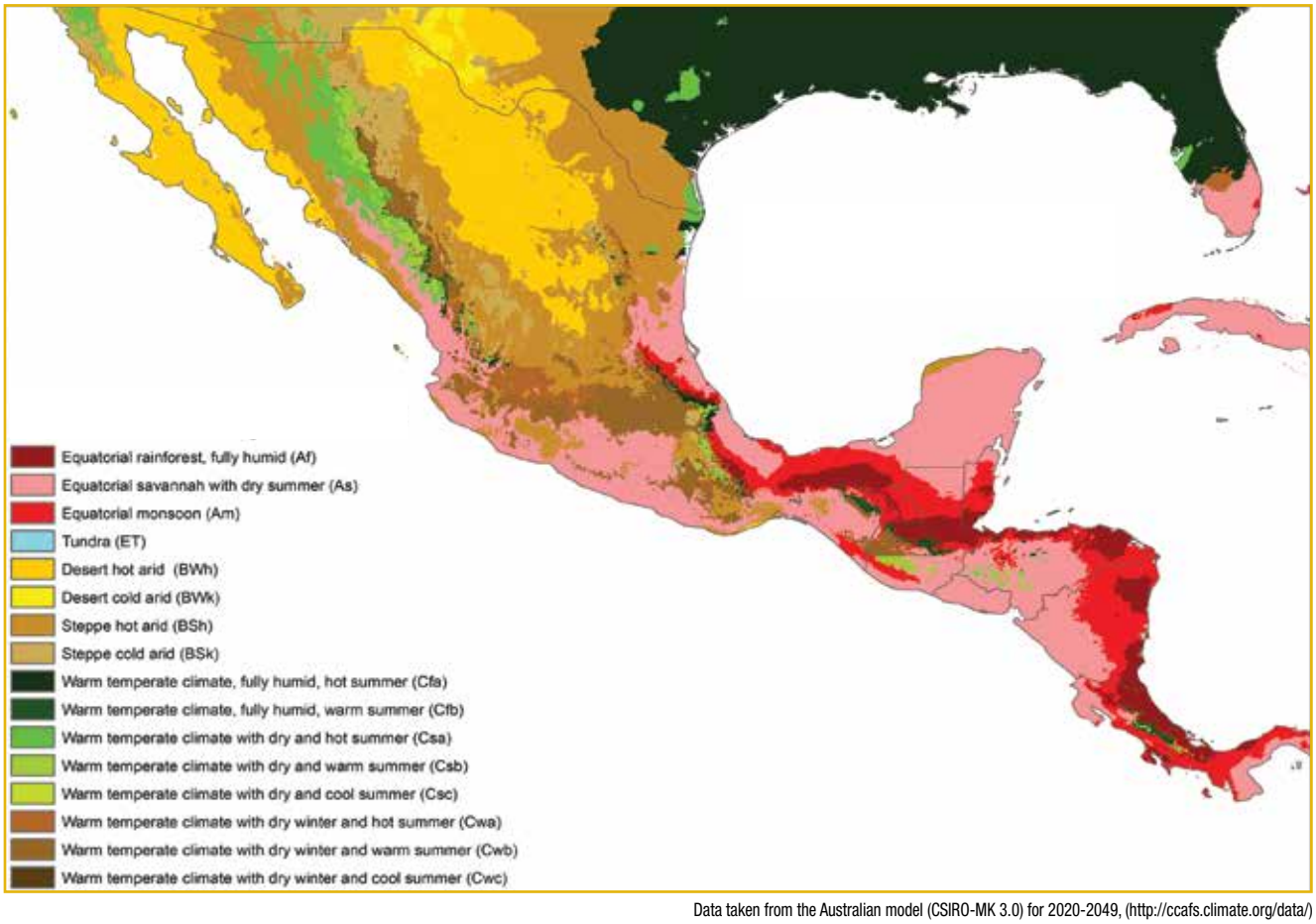
All considerations mentioned above provided the impetus for developing the Strategic Action Plan, a multidisciplinary and integrated set of actions to be implemented in the next ten years with the aim of strengthening the role of plant genetic resources conserved in Mesoamerica for the adaptation of agriculture to climate change. Now is the time for major investments to safeguard our food security.

Mesoamerican plant genetic resources are currently conserved in national and international genebanks (in *ex situ* conditions), in natural ecosystems (*in situ* conservation of wild relatives) and in farmers' fields (management of diversity cultivated on-farm). However, *ex situ*, *in situ* and on-farm conservation of these resources is still inadequate, and their use in research and production is limited; consequently their potential to respond to present and future climate change challenges has yet to be realized.

In situ and on-farm conservation of agrobiodiversity needs to focus on agricultural landscapes and indigenous territories and should be integrated with existing wild biodiversity conservation plans. The role of farmers in the conservation of agrobiodiversity, and its on-farm improvement, must be recognized and strengthened, and communities incentivised to continue providing this service of dynamic conservation of PGRFA.

To use more efficiently the existing strengths in terms of human resources and genebank facilities in the different countries, collections need to be better rationalized and coordination improved with regional and international entities,

Köppen climate classification projected for the period 2020-2049



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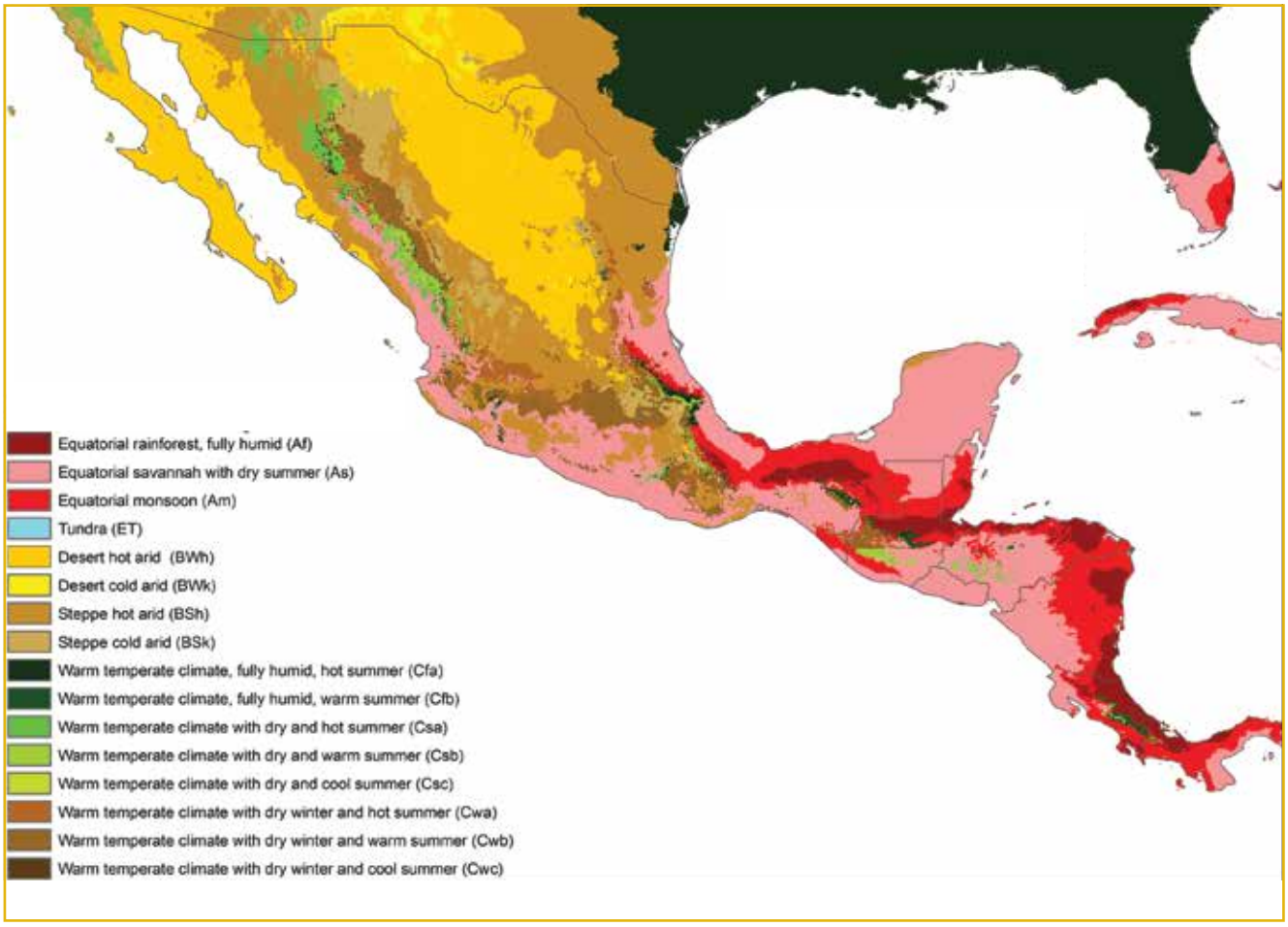
Data taken from the Australian model (CSIRO-MK 3.0) for 2020-2049, (http://ccafs.climate.org/data/)

Köppen climate classification projected for the period 2049 – 2069



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Data taken from the Australian model (CSIRO-MK 3.0) for 2049-2069, (http://ccafs.climate.org/data/)

as well as with community organizations, in order to promote germplasm flows from and to *ex situ* genebanks, encouraging the use of these resources.

Initiatives are needed to identify promising materials focused on adaptive traits and resistance to biotic and abiotic disturbances, disturbances that are being exacerbated by climate change. These initiatives would add value to materials held in genebanks, and increase their potential use in conventional or participatory plant breeding programmes. Better access to quality climate data would improve the capacity to guide the region´s conservation and breeding efforts. Agile and flexible mechanisms are essential for distributing diversity of traditional and improved seeds, to ensure quick response after disasters and to accelerate adoption of suitable materials, thereby contributing to maintaining production under climate stress conditions.

A favourable institutional environment is necessary to implement integrated actions supporting the conservation and use of Mesoamerican PGRFA. This would include raising awareness of decision makers from different sectors (environment, agriculture, health, climate change, etc.) and raising the profile of PGRFA in multiple technical and institutional strategies and initiatives being carried out under the umbrella of climate change.

The SAPM was developed over the course of one year, starting by diagnosing the conservation status and use of ten common crops in the region, and of the national, regional and international institutional frameworks relevant for conservation and management of PGRFA. The diagnosis–shared with and validated by regional experts–led to identifying the opportunities and challenges summarized below. (The complete report of the diagnosis can be found

Farmer preparing the soil for planting maize, Nicaragua

in Spanish in the ITZAMNÁ website (http://itzamna-mesoamerica.org, section Proyecto PAEM), following the thematic components adopted during the SAPM´s formulation process.

Summary of the diagnostic analysis

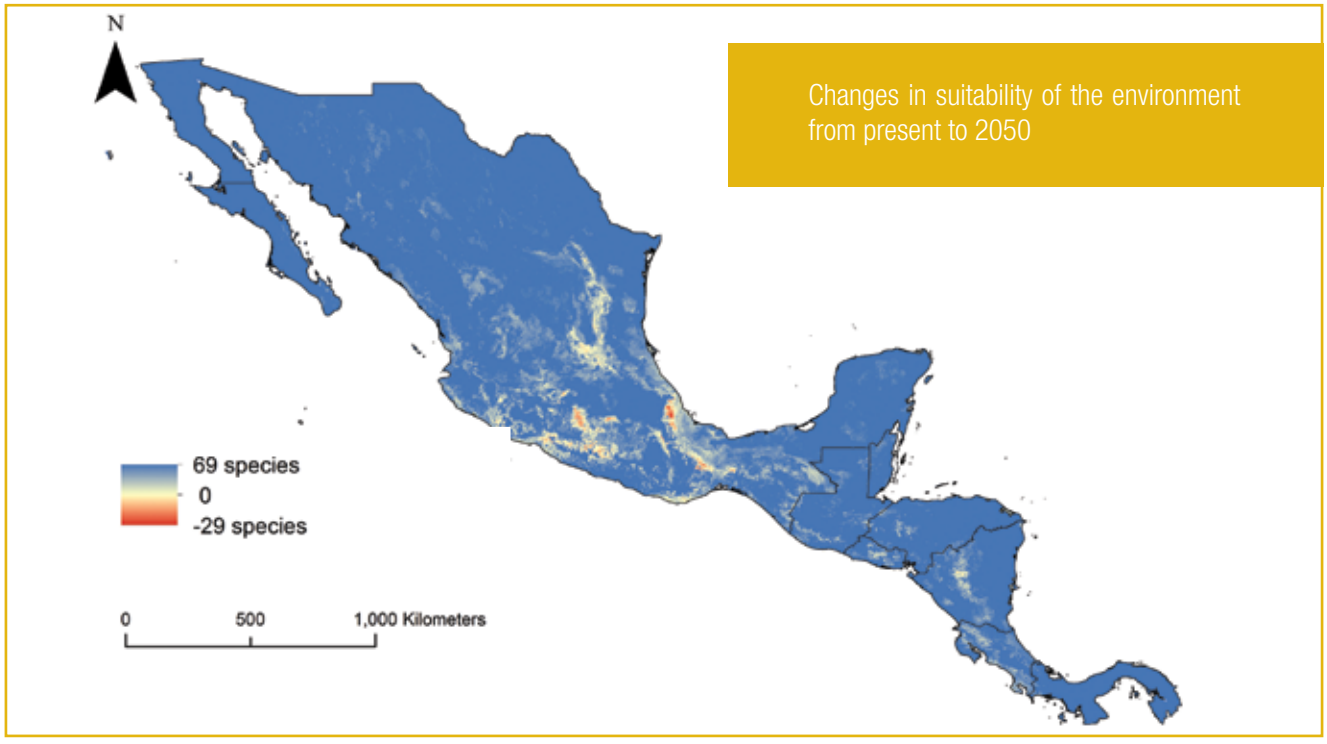
Conservation

On-farm and *in situ* conservation status

Geospatial analysis

- Under the "business as usual" scenario, climate change would cause substantial changes in the area and location of sites where most cultivated crop species and their wild relatives could thrive.
- The areas suitable for growing most of the species considered in this diagnosis could suffer displacement in the future. In mountainous areas the displacement would be mostly altitudinal shifts.
- For some crops, the surface of suitable area could increase, but for most species the models predict net reductions in current suitable areas. Reductions could be more severe for the most important crops for human food consumption.
- To mitigate reductions and displacement of suitable areas, the identification, movement and adaptation of existing germplasm potentially pre-adapted should be promoted in the region.

Climatic projections for 358 species of wild relatives



Prepared by E. Thomas and M. Beltrán – Bioversity

Projections suggest that the great majority of areas could have suitable conditions -light blue to blue- where populations of crop wild relatives could expand beyond their current distribution. Many sites would have favourable conditions for harboring as much as 69 more species than they currently do

- Potential models predict increases in suitable areas for most of the wild relatives of crops. Greater interconnectivity among ecological regions would favour natural migration and benefit conservation of most wild relatives.
- Since almost all wild relatives would increase their suitable areas under climate change, they could provide genes important for the improvement of cultivated species. The potential of wild relatives for the improvement of cultivated species is currently underutilized.
- On-farm and *in situ* conservation are essential components in the adaptation of plant genetic resources to climate change, allowing farmers to continuously generate varieties adapted to climate change, and maintaining the adaptive potential of wild relatives to changing environmental conditions. Current initiatives for on-farm and *in situ* conservation of PGRFA are in themselves insufficient to promote climate change adaptation in the field.
- Current protected areas in Mesoamerica barely overlap areas of major diversity of cultivated species and wild relatives included in this study. Thus their conservation is threatened.
- A more integrated and inclusive strategy for *in situ* conservation should focus not only on the diversity of plant genetic resources, but also on cultural diversity, because rural populations and particularly indigenous and local communities are the ones

Climate Projection – Wild Relatives

Manihot (13 spp)	241 10^6 ha ↑
Ipomoea (102 spp)	205 10^6 ha ↑
Persea (16 spp)	202 10^6 ha ↑
Phaseolus (33 spp)	172 10^6 ha ↑
Cucurbita (10 spp)	146 10^6 ha ↑
Zea (5 spp)	67 10^6 ha ↑
Tripsacum (9 spp)	60 10^6 ha ↑
Amaranthus (12 spp)	44 10^6 ha ↑
Capsicum (3 spp)	-7 10^6 ha ↓
Carica (2 sp)	-12 10^6 ha ↓
Mesoamerica (205 spp)	231 10^6 ha ↑

conserving and guarding the diversity of cultivated plants. Without their active involvement, *in situ* conservation could not be achieved.

- An integrated on-farm and *in situ* conservation strategy, both in existing protected areas and in indigenous and local community territories, could guarantee adequate conservation of most PGRFA in the region.
- Existing monitoring systems in the region need to be strengthened in order to track temporal and spatial tendencies in the conservation status of cultivated species on-farm and *in situ*.

Ex situ conservation status

Geospatial analysis

- Passport data quality of accessions conserved in national and regional genebanks in Mesoamerica is not always reliable. This and the limited availability of data hinder gap analysis and prioritization exercises. This situation must be remedied, especially to enable effective use of resources conserved in these genebanks.
- There are significant geographical gaps in the *ex situ* collections, for both cultivated PGRFA and their wild relatives.
- Given the wide range of geographical gaps, prioritization strategies are needed for planning new collecting missions more efficiently, focused on those cultivated and wild plants with greater potential, or exhibiting valuable or interesting attributes for climate change adaptation. Such prioritization strategies should take advantage of existing knowledge in a variety of scientific disciplines, such as genetics, anthropology, ecology, climatology, and agricultural sciences, among others.
- Identification of promising germplasm of wild relatives is particularly relevant as some gene pools have a great number of wild relatives (e.g. *Ipomoea* spp., 169 species) and it is essential to prioritize those with direct or potential use for improving cultivated species.

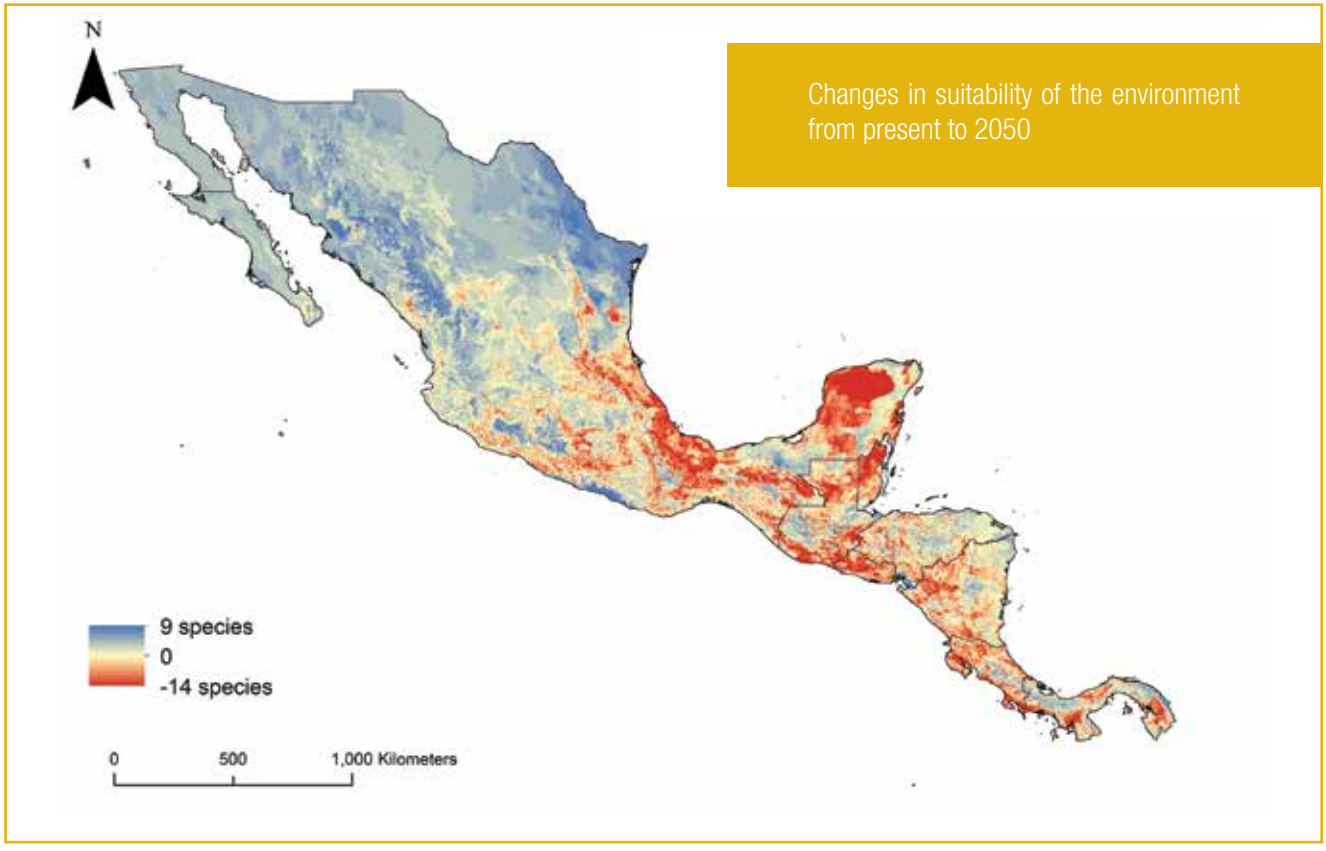
Genebanks survey

- Genebanks in the region have different purposes and infrastructure levels that could play different and complementary roles in a regional strategy for *ex situ* conservation.
- Compared to international genebanks whose role is to hold large collections of globally important genera such as beans, sweet potato and cassava, local and regional genebanks have a crucial role in the conservation of regionally important genera such as cucurbits, papayas and avocados.
- Local, regional and international genebanks have large collections of maize. *Ex situ* conservation of this genus needs to be optimized in a regionally-coordinated strategy with the international genebanks.
- Mesoamerican genebanks have difficulties distributing their materials due to the lack of a formal request system and the small amounts of accessions conserved. Most germplasm requested by external stakeholders is used for research and directly on-farm for production.
- There are specific gaps in passport data and taxonomic classification of regionally important genera such as cucurbits, peppers, papayas and avocados. By comparison, characterization and evaluation of maize and beans is more advanced.
- The big gap in maize and beans is evaluating these materials for biotic stress. For cucurbits, peppers, papayas and avocados evaluation gaps are for both biotic and abiotic stresses.

Use

- Public sector breeding programmes in the region tend to focus on basic grains, especially maize and beans, with relatively low investment in other crops.
- Investment, technology and technical capacity is scarce in pre-breeding programmes using materials available in genebanks and on-farm. Most materials released as varieties at the national level come from Consultative Group on International Agricultural Research (CGIAR) and some regional organizations like the Tropical Agricultural Research and Higher Education Centre (CATIE, from the name in Spanish) and El Zamorano Pan-American Agricultural School.
- Some emphasis has been placed on searching or developing characters for climate change adaptation in basic grains, but little in other crops.
- The regional participatory plant breeding programme has been very successful in both involving and training farmers, as well as in generating relevant varieties for local production systems. This approach has also focused on maize and beans and, depending on the country, on other non-native crops (rice and sorghum). Other native species of potential value have not received attention yet for diversifying production systems even more.

Climatic projections for 26 cultivated species



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Projections suggest that in the majority of areas -from pink to red- climatic conditions could be unsuitable for cultivating most of these species, including areas where as many as 14 species could not thrive compared with the present. Certain areas - from light blue to blue - could have more favourable conditions than they currently do, enabling cultivation of up to 9 new species that could not be grown before

Net changes in adequate areas for growing crop species

Species	Net changes (million hectares)	% Current surface area
Cucurbita maxima	57 10^6 ha	73
Capsicum chinense	56 10^6 ha	197
Cucurbita argyrosperma	41 10^6 ha	95
Capsicum pubescens	34 10^6 ha	902
Phaseolus acutifolius	28 10^6 ha	42
Capsicum baccatum	22 10^6 ha	74
Amaranthus cruentus	17 10^6 ha	96
Tripsacum dactyloides	1 10^6 ha	4
Cucurbita moschata	-1 10^6 ha	-2
Amaranthus hypochondriacus	-3 10^6 ha	-19
Persea schiedeana	-4 10^6 ha	-41
Phaseolus coccineus	-4 10^6 ha	-8
Cucurbita ficifolia	-4 10^6 ha	-19
Phaseolus dumosus	-12 10^6 ha	-62
Tripsacum andersonii	-24 10^6 ha	-80
Phaseolus lunatus	-28 10^6 ha	-38
Carica papaya	-33 10^6 ha	-57
Ipomoea batatas	-33 10^6 ha	-62
Manihot esculenta	-34 10^6 ha	-60
Cucurbita pepo	-35 10^6 ha	-64
Capsicum frutescens	-38 10^6 ha	-75
Phaseolus vulgaris	-37 10^6 ha	-37
Persea americana	-40 10^6 ha	-58
Zea mays	-45 10^6 ha	-37
Capsicum annuum	-51 10^6 ha	-55

- Despite the importance of local seed systems, especially for some crops (beans among the basic grains, and other crops) no national law recognizes this system, neither have systematic actions been taken to promote or improve it nationwide. Nonetheless, actions related to participatory plant breeding tends to strengthen informal and/or farmer seed systems and have significantly improved the quality of the seeds that reach users, especially in marginal and vulnerable areas.
- National and regional programmes (such as Seeds for Development, coordinated by the United Nations Food and Agriculture Organization, FAO) have been instrumental in promoting the development of flexible and functional seed systems, integrating elements of formal and informal systems.
- Many countries in the region have valuable experiences in community conservation of landrace seeds in the framework of participatory plant breeding initiatives or in response to disasters. Although they focus on basic grains, the portfolio of species conserved could be broadened in the short term with this decentralized conservation-for-use mechanism.
- The quantity and quality of meteorological data is not sufficient for developing current and future region-specific climate models. More high-quality meteorological data needs to be generated and made widely available in order to guide agricultural adaptation efforts more efficiently, based on PGRFA and taking into account regional climatic diversity.

Institution and policies

- All Mesoamerican Contracting Party countries to the International Treaty on PGRFA have participated in developing the SAPM; these same countries are also Contracting Parties to the Convention on Biological Diversity (CBD). However, most countries have made more progress in developing national legislation under the CBD than under the Treaty. In many countries this results in certain legal uncertainty as to how to access PGRFA and how to distribute the benefits associated with them, both under *ex situ* and *in situ* conditions. No progress has been made in other aspects of the Treaty´s implementation, for example, Art. 9 on Farmers' Rights.

http://itzamna-mesoamerica.org/

- The regional and national agricultural policies and food security policies include plans and initiatives incorporating the conservation and use of PGRFA in a more or less explicit way. Many initiatives fall under this institutional framework: conventional and participatory plant breeding initiatives, strengthening of seed systems, diversification of production systems, and family and organic agriculture. However, the role of PGRFA, including a broad number of species and their varieties, different from the basic grains, is now always viewed with a holistic approach.
- Regional and national policies on environmental management and climate change adaptation do not refer specifically to the conservation and use of PGRFA as a key tool for developing concrete actions. This is partly due to poor coordination among the different ministries in charge of environmental, climate change and agricultural issues. Plans for disaster response incorporate even less the issue of PGRFA, despite some successful experiences at the community and local levels.

Training

- There is a wide gap in the region between the richness of cultivated and wild crops, and the human resources with the skills for taking full advantage of them.
- In summary, capacity-building needs include facilitating access to information from various sources, interpreting this information so it can be applied, improving the use of knowledge generated for decision-making and the co-production of knowledge, which in turn would facilitate the generation of innovations.
- In general, the issue of conservation and use of PGRFA tends to be the domain of a rather small group of experts needing generational renewal.
- Even though the issue of PGRFA at the university level is mainly discussed in the faculties of agronomy, it would benefit from greater visibility. Collaborative agreements between higher education institutions and other public entities responsible for conservation and use of PGRFA—genebanks, conventional and/or participatory breeding programmes—could also be developed.
- A new generation of plant breeders and agricultural extension agents is needed to introduce the use of technological and molecular tools and to strengthen participatory research with farmers in the arena of PGRFA.
- There is little dialogue among environment, climate change and PGRFA experts, particularly in the collection and analysis of meteorological data.
- Decision-makers at the national and regional levels have little knowledge on PGRFA, thus losing the opportunity of incorporating them in efficient actions in other sectors, from agricultural and rural development (including market chains), to food security, climate change adaptation and disaster response.
- Although farmers are conscious of the changes resulting from climate change, they clamor for more information on local climatic conditions—and experts who can help them interpret this information—as well as seeds adapted to the new climatic conditions.
- The issue of PGRFA is relatively far from the radar of civil society. Investment is needed in educational and public awareness campaigns highlighting the everyday relevance of these resources to food and health. Scientific concepts and technical terminology need to be translated into lay language for easy comprehension.

The results of this diagnosis have been the starting point for identifying the agreed actions that make up the Strategic Action Plan for Mesoamerica (SAPM). Implementation of the SAPM over the next ten years will contribute to improving conservation and utilization of plant genetic resources in the region, consistent with international commitments made by the countries, specifically the CBD, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Second Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (Second GPA).

Formulation of the Action Plan

THE **SAPM** has been formulated based on a thorough scientific analysis of the state of conservation and use of plant genetic resources (the diagnosis). This evidence has been validated and enriched through a broad participatory consultation process with relevant regional stakeholders. An Advisory Committee[5] integrated by experts in the components of the SAPM has participated in each step of the formulation process, from defining the consultation agendas and identifying participants, to participating actively in the regional consultations and finally reviewing the different draft versions of the SAPM.

The first six months of the project to formulate the SAPM were dedicated to compiling information on the status of plant genetic resources in Mesoamerica. This diagnosis exercise focused on ten native crops and their wild relatives, in other words on the gene

Participants in the first Regional Consultation, Guatemala, 2012

[5] David Williams - Manager, Agriculture, Natural Resources Management and Climate Change Program, Inter - American Institute for Cooperation on Agriculture (IICA); Silvana Maselli - Associate Professor, Biology Department, Universidad del Valle, Guatemala; Walter Quirós - Executive Director, National Seed Office, Costa Rica; Sergio Alonzo - Coordinator, Collaborative Programme on Participatory Plant Breeding in Mesoamerica; Nick Remple - Resilience and Community Sustainability, United Nations Development Programme (UNDP)

pools of the following genera: *Zea* (maize), *Phaseolus* (beans), *Manihot* (cassava), *Ipomoea* (sweet potato), *Cucurbita* (cucurbits), *Amaranthus* (amaranth), *Capsicum* (peppers), *Carica* (papaya), *Persea* (avocado) and *Tripsacum* (forage).

These gene pools were selected taking into account, among other things, (i) their prioritization by regional experts, (ii) regional and global importance for food security (maize, beans and sweet potato), (iii) importance for indigenous and local communities in the region, (iv) contribution to the diet and to income generation (papaya, peppers, avocado and cucurbits), (v) being underutilized crops despite their recognized nutritional value (amaranth), and (vi) potential adaptation to disturbances, primarily those caused by climate change. Wild relatives of these crops were incorporated in the analysis for their potentially important genes for breeding of cultivated species, both in terms of adaptation to climate change and resistance to pests and diseases.

To understand the status of *ex situ*, *in situ* and on-farm conservation of plant genetic resources, a geospatial analysis was conducted covering the following aspects: (i) potential climate impact (projected to 2050) on both cultivated species and their wild relatives; (ii) gaps in diversity of plant genetic resources currently conserved in genebanks (including prioritization of areas for future collections); (iii) identification of germplasm conserved in genebanks with characteristics for potential adaptation to future climatic conditions; (iv) status of *in situ* conservation of wild relatives; and (v) identification of priority areas that would better conserve diversity of the majority of plant genetic resources of cultivated crops and wild relatives in the region. The main sources of data used for this geospatial analysis were the databases of genebanks in the International Centres of the CGIAR - Global Information Portal on Plant Genetic Resources (GENESYS), previously the System-wide Information Network for Genetic Resources (SINGER) - data from herbarium and from the Global Biodiversity Information Facility (GBIF), and scientific publications, among others. A total of 384 species: 26 cultivated and 258 wild species were included in the analysis. The geospatial analysis resulted in a total of more than 3,000 maps of these cultivated species and their wild relatives.

In addition to the analysis described above and to assess the state of conservation of plant genetic resources in Mesoamerican genebanks, in collaboration with CATIE, questionnaires were sent to 25 genebanks, 17 of which were answered by genebanks located from Mexico to Panama.

To get a better idea of the state of conservation and use of plant genetic resources by small-holder farmers, 144 representatives of local and indigenous farmer groups were surveyed during workshops organized by ASOCUCH in Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica.

Discussion on the status of PGR conservation and use by farmers, Nicaragua

Participants in the second Regional Consultation, Costa Rica, 2013

To complement the above diagnosis, a search was conducted of existing regional and national measures, regulations and laws pertaining to conservation and use of plant genetic resources, including capacity-building and training opportunities available. Scientific publications, policy documents, secondary literature and national statistics were compiled and reviewed, including reports submitted by the countries to FAO for the Second GPA.

Participatory formulation of the Strategic Action Plan resulting from the diagnosis phase, was undertaken with input from the scientific and academic communities, farmers and indigenous communities, national and regional *ex situ* genebanks, Mesoamerican national authorities on agriculture and environment, regional government organizations, regional agricultural organizations, and CGIAR research centres, among others. Details of this process are described in the following paragraphs and the list of participants and their affiliations are listed in Annex 1.

In the consultations, participants were selected in an iterative process, assisted by in-country National Focal Points of the International Treaty,[6] or their designees, and following suggestions made by the Advisory Committee of the SAPM. The first consultation meeting was held in Guatemala at the end of 2012. During three days, 73 representatives of the mentioned sectors, reviewed and endorsed the diagnosis, identifying missing information and possible sources where this could be found. Preparation of the first draft of the SAPM started in January 2013, based on studies of the diagnosis and results of the regional consultation held in Guatemala. The SAPM´s Advisory Committee reviewed it and the second draft was presented and discussed with 32 relevant stakeholders and national authorities of participating countries at a second regional consultation meeting held in Costa Rica in March 2013. Subsequently, this document was reviewed following recommendations and suggestions received during the second consultation meeting; the revised version was sent to the Advisory Committee of the Project and the Secretariat of the Central American Agricultural Council (CAC, from the name in Spanish).

At its Regular Meeting of Ministries held in Panama City, on 1-2 August 2013, and in the presence of Ministers and Vice Ministers, CAC agreed to support the SAPM. CAC urged and requested that its Executive Secretariat facilitate coordination of the SAPM with the Technical Group of Climate Change and Integrated Risk Management, part of the Central American Agricultural Technology Integration System (SICTA, from the name in Spanish) and other related initiatives in the framework of CAC. In addition, the Inter-American Institute for Cooperation on Agriculture (IICA, from the name in Spanish) offered its support for implementation of the SAPM.

All the analyses and documents prepared for the diagnosis are publicly available in Spanish at the ITZAMNÁ website, http://itzamna-mesoamerica.org.

[6] **Walter Quirós** - Executive Director, National Seed Office, Costa Rica: **Aura de Borja** - Head, Germplasm Bank, National Agricultural and Forestry Technology Centre of El Salvador (CENTA, from the name in Spanish); **Samuel Ajquejay** - Auditor, Plant and Animal Genetics, Ministry of Agriculture, Livestock and Food of Guatemala; **Elizabeth Santacreo** - Focal Point for the Directorate of Science and Agricultural/Livestock Technology (DICTA, from the name in Spanish) of Honduras and **Roberto Mancilla** - Coordinator, Council for the Protection of New Plant Varieties of the Ministry of Agricultural Development, Panama.

Vision of the SAPM

Mesoamerican farmers use the wealth of plant genetic resources to produce sufficient food in diversified agricultural systems, resilient to climate change and other threats, and have access to these resources which are properly being conserved for the region and the world.

Objetive of the SAPM

During the next decade conservation, access and use of Mesoamerican plant genetic resources is improved as a strategic element for food security and adapting agriculture to climate change and other threats.

N. Palmer - CIAT

Components, strategies, goals and activities of the **SAPM**

A. Conservation component

THE CONSERVATION component incorporates strategies addressing *in situ* and *ex situ* conservation of PGRFA. Specific integrated actions enhance on-farm conservation of cultivated PGRFA and their wild relatives, acknowledging the central role farmers play in interacting with their environment in biocultural territories that merit being established and recognized in such a way that local seed systems - at the heart of agrobiodiversity in these territories - are strengthened and continue to evolve. A new architecture is proposed to organize genebanks in a network to serve users of materials conserved, including small-holder farmers, in an efficient and effective way.

1. Strategies for on-farm and *in situ* conservation of PGRFA

This strategy responds to the need to promote *in situ* conservation of cultivated PGRFA and their wild relatives through holistic interventions that take into account the reciprocal relation existing between human societies and PGRFA. The establishment and formal recognition of biocultural territories is proposed, as well as their integration with existing networks and national conservation programmes.

The concept of biocultural territory[7] refers to the set of biological resources, comprising PGRFA diversity and the landscapes and ecosystems which host them, as well as to the traditions and good agricultural practices of rural populations, including indigenous and local communities, which are often the creators of cultivated plant genetic resources and de-facto guardians of the agrobiodiversity. The establishment and appropriate management of biocultural territories require both baseline information - describing all the important aspects of such territories - and monitoring mechanisms, that use simple indicators agreed at the regional level. These territories are therefore considered integral parts of on-farm and *in situ* conservation strategies.

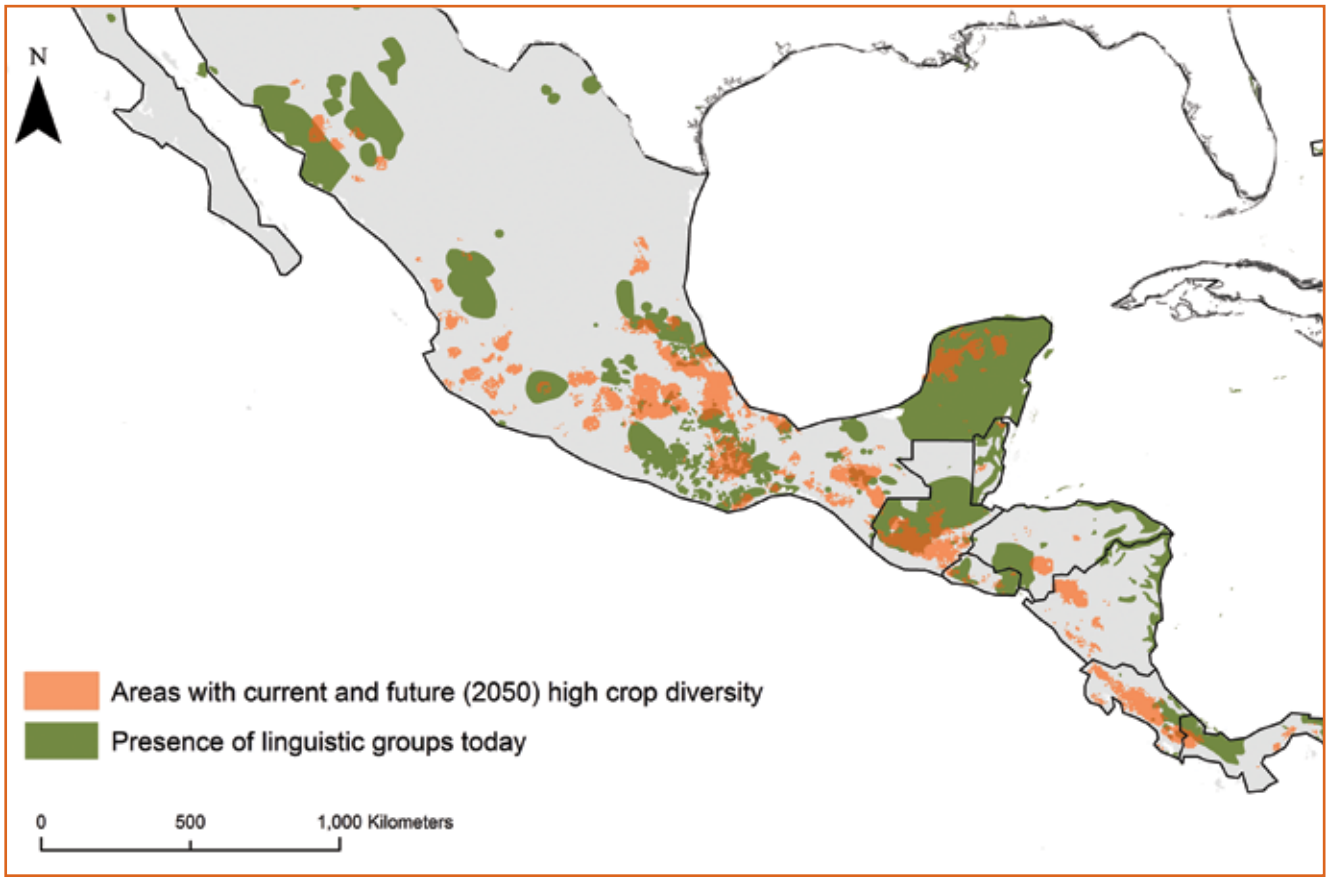
Reinforcing and acknowledging local seed systems as fundamental elements for maintaining agrobiodiversity in biocultural territories is crucial for the effective conservation of cultivated PGRFA.

[7] The concept of biocultural territory was developed in harmony with the definition of 'socio-ecological production landscapes' of the Satoyama Initiative (2010), where they are defined as habitat mosaics and dynamic land uses that have been formed over time by the interaction between humans and nature, maintaining their biodiversity and providing humans with goods and services necessary for their welfare.

Key used to the Thematic Component

Short-term activities (0 to 3 years) | Medium-term activities (3 to 7 years) | Long-term activities (7 to 10 years)

Priority areas for *in situ* conservation of cultivated species



Prepared by E. Thomas and M. Beltrán – Bioversity

Linguistic data provided by WLMS 2005 (http://www.worldgeodatasets.com/language)

Areas where the greatest crop diversity overlaps - today and in 2050 - with presence of linguistic groups today, offer the best conditions for prioritizing on-farm conservation

1.1. Promote sustainable biocultural territories integrated in existing conservation programmes and systems

Goal: Sustainable biocultural territories are established and integrated in existing conservation initiatives in the Mesoamerican region, thus contributing to better *in situ* conservation and use of PGRFA as well as of knowledge, innovation processes and practices of rural populations, including indigenous and local communities.

Activities

a. Establish regional harmonized criteria, recognizing national differences and needs, for identifying and defining biocultural territories, including trans boundary cases.

b. Establish a knowledge baseline of the state of conservation and use of cultivated plant genetic resources and wild relatives, and of the knowledge and traditional practices associated with them (cultural, ceremonial, culinary, medicinal, etc.).

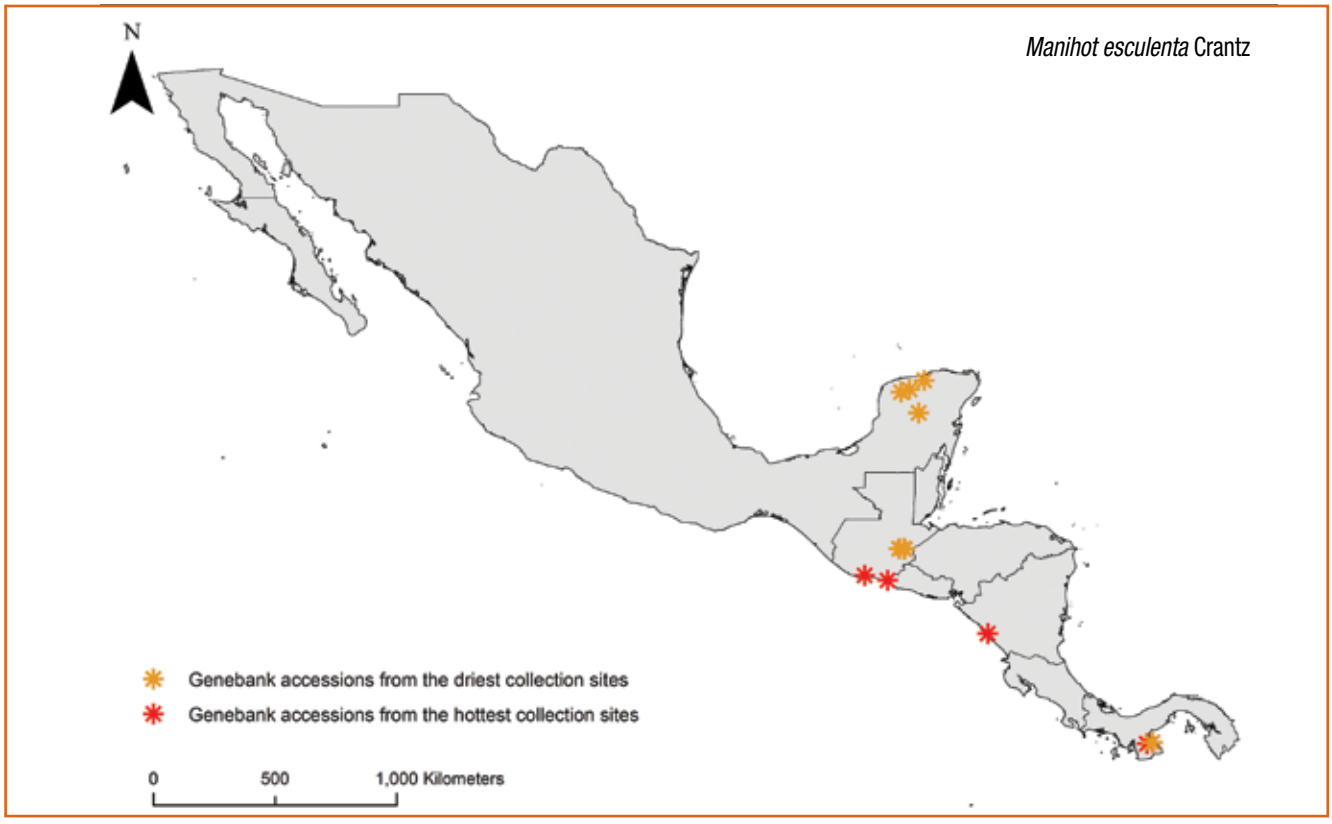
- Identify, develop and adopt simple relevant indicators at the regional level for establishing a baseline (and subsequent monitoring), taking into account gender, ethnicity and vulnerability issues.

- Develop diagnoses of existing agricultural processes, especially those related to conservation and use of agrobiodiversity, and of their economic and cultural importance for the rural population, including indigenous and local communities.
- Conduct national inventories of cultivated plant genetic resources and wild relatives - involving relevant local stakeholders, for example in developing community records - and promote their systematization at the regional level.
- Identify areas rich in PGRFA, both on-farm and in wild habitats.
- Identify the main threats faced by conservation and use of PGRFA on-farm and in wild habitats in the Mesoamerican countries.
- Use geographic information systems (GIS) to improve knowledge on past and present temporal and spatial dynamics of agrobiodiversity in the Mesoamerican region.

c. Create incentives for small-holder farmers, and indigenous and local communities, to contribute to *in situ* conservation and use of agrobiodiversity as a central component in their lives, emphasizing areas rich in PGRFA, to improve conservation and use of cultivated PGRFA and their wild relatives.[8]

d. Encourage documentation, use and exchange of knowledge, innovations and traditional practices associated with agrobiodiversity.[9]

Identification and distribution of promising accessions



Prepared by E. Thomas and M. Beltrán – Bioversity

Cassava accessions collected in the driest and hottest areas, and conserved in international genebanks, could be included in future cropping and plant breeding programs

[8] This activity should be implemented taking into account activity C.3.g on creating incentives as part of the strategy for "Promoting Farmers' Rights" in the Institutions and Policies Component.

[9] This activity should be implemented taking into account activity C.3.b on the implementation of laws and measures for maintaining traditional knowledge, as part of the strategy for "Promoting Farmers' Rights".

Agrobiodiversity fair

e. Restore degraded agricultural landscapes through sustainable land use and diversification of PGRFA in production systems, including repatriation of native crops and local varieties and implementation of sustainable farming practices with the aim of (i) promoting conservation of PGRFA through their use; (ii) attaining resilience of production systems; (iii) strengthening food and nutritional security, and (iv) reaffirming the community's cultural identity.

f. Encourage and reinforce ecological connectivity throughout agricultural landscapes and protected areas (biological corridors) to facilitate migration of wild relatives and important pollinators indispensable for sustaining agricultural production.

g. Include *in situ* conservation of wild relatives in national biodiversity strategies, and especially in management plans for natural protected areas.

h. Develop management plans for biocultural territories focused on PGRFA, in line with relevant international initiatives.

i. Strengthen national monitoring systems to identify and evaluate both trends of *in situ* PGRFA conservation and impact of current practices and new interventions, through the creation and adoption of common protocols in all countries, national and regional coordination mechanisms and use of analytical tools such as GIS.

1.2. Recognize, facilitate and incentivize local seed systems

Goal: Functional and diverse local seed systems are in operation and facilitate access, use and on-farm conservation of cultivated PGRFA.

Activities

a. Establish a baseline of knowledge on local seed systems.
   - Identify, develop and adopt simple and relevant indicators at the regional level for establishing the baseline, and subsequent monitoring.
   - Conduct national inventories of farmers and leading associations in the conservation and use of agrobiodiversity.
   - Identify decisive factors that guarantee sustainability of local seed systems and encourage their establishment.

b. Establish community seed banks maintained and monitored by local leaders.

c. Strengthen conservation in community seed banks through the adoption of technical measures and improvement of facilities.

d. Incentivize local seed systems through the organization of seed fairs, events and field days, and the socialization of experiences to facilitate dialogue and seed exchange among farmers and other relevant stakeholders.

e. Create awareness among rural populations, including indigenous and local communities, on the importance of local seed systems for the conservation and use of PGRFA[10] , and build the capacity of these communities.

f. Establish a monitoring system for local seed systems.

- Establish or strengthen and harmonize national monitoring systems, including the development and implementation of protocols, to identify and evaluate trends, impact of measures or interventions implemented on local seed systems, and establishment, use and maintenance of community genebanks.
- Encourage collaboration among all relevant stakeholders for monitoring local seed systems.

2. Implement a new architecture for the *ex situ* conservation system in order to optimize and rationalize conservation of Mesoamerican PGRFA and improve their access and usefulness

Goal: A regional *ex situ* conservation system - comprised by a network of genebanks with complementary functions - is in operation, makes efficient use of resources available for conservation, and provides optimal services to all users, including small - scale farmers.

Strategies to improve *ex situ* conservation of Mesoamerican PGRFA respond to the need to adopt a new architecture in the system for conserving and using PGRFA in the region. The new system would enhance the strengths of each of the different actors involved in *ex situ* conservation (national and local genebanks, civil society, universities, local communities, among others) and promote cooperation among them, avoiding duplication of efforts.

Figure 1 presents the overall organization of the new architecture and the interconnections among the different actors. Tasks and responsibilities of the different actors participating in the *ex situ* component of the Mesoamerican system of conservation and use of PGRFA are discussed below.

Community seed bank, Guatemala

Community genebanks

- Multiplication of germplasm, increasing its availability to farmers, particularly in times of seed shortages, such as after natural disasters.
- Short-term conservation of local orthodox germplasm, and long-term conservation of germplasm with recalcitrant seeds through collections of "live" plants in the field.

[10] This activity should be implemented taking into account activity D.e of strengthening the capacity of farmers' organizations in the Education and Capacity-Building component.

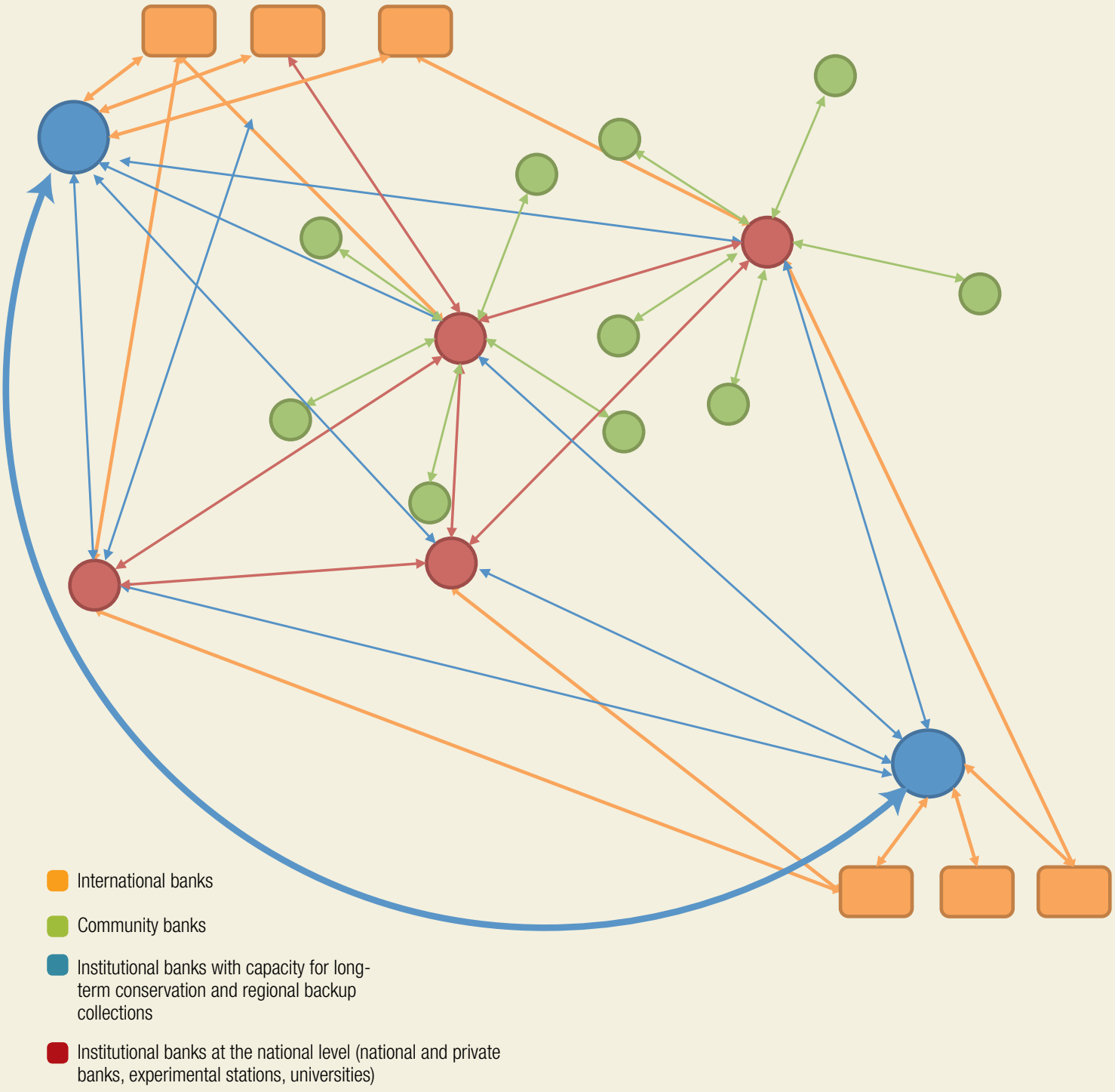


Figure 1. New architecture for *ex situ* conservation, as a component of the proposed system of conservation and utilization of PGRFA.

Institutional genebanks at the national level

- Guarantee genetic and phytosanitary quality of germplasm conserved through adequate documentation, characterization and evaluation, applying agreed standards.
- Guarantee conservation of safety duplicate collections of orthodox germplasm being used by community genebanks.
- Make interesting germplasm available to community genebanks and other users, including materials for direct planting, research or plant breeding, from the national base genebank, or other Mesoamerican or international genebanks.
- Guarantee long-term conservation of non-orthodox germplasm, through collections of "live" plants in the field.
- Guarantee maintenance of safety duplicate collections deposited in some other genebank, even if under a 'black-box' arrangement.
- Where the context allows, multiply germplasm for its distribution to farmers, particularly in times of seed shortage, as well as after natural disasters.

Institutional genebanks at the regional level with backup and long-term conservation capacity

- Long-term conservation of orthodox seeds of regionally important crops (for example maize, beans, cucurbits, peppers, etc.)
- Provide back-up services to national and international genebanks.

International genebanks

- Long-term conservation of basic grains (e.g. maize, beans), roots and tubers (e.g. cassava, sweet potato, potato) of importance for global food security.

2.1 Restructuring and strengthening national *ex situ* conservation systems

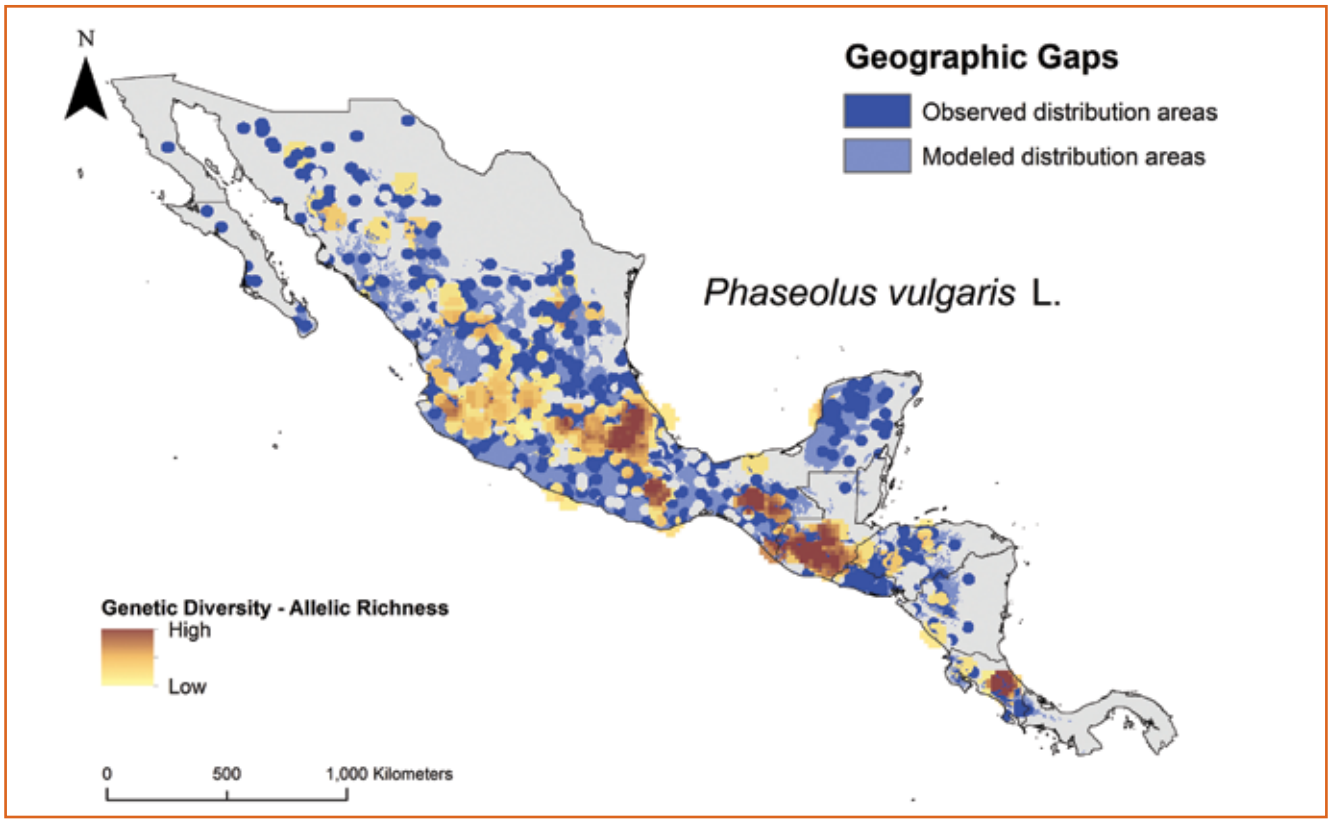
Goal: National *ex situ* conservation systems, are strengthened, integrated and linked to regional systems in Mesoamerica for conservation and use of PGRFA.

Activities

a. Elaborate inventories and national diagnoses of:
   - stakeholders (genebanks, community genebanks, competent national authorities, decision makers, universities, agricultural schools and extension programmes, among others);
   - capacity of these stakeholders to contribute to the goal;
   - facilities and networks of existing genebanks;
   - availability and accessibility of materials in *ex situ* germplasm collections and quantity of these materials distributed;
   - current policies and existing financial opportunities;
   - status of collections and operative costs related to their documentation, characterization, evaluation, gap analysis, level of duplications, representativeness of crops and wild relatives, among others.

b. Develop and strengthen national strategies for *ex situ* conservation, taking advantage of existing facilities, which include the organization and formalization of relationships among relevant national stakeholders, and with a view to integrating with and connecting to the Mesoamerican *ex situ* conservation system, based on the diagnosis.

Geographical gaps and genetic diversity



Prepared by E. Thomas and M. Beltrán – Bioversity

Priority collecting zones (coloured blue) would be areas close to those with the greatest genetic diversity (coloured dark brown)

c. Identify or nominate competent national authorities to participate in national PGRFA commissions integrated by experts of different institutions and sectors, and entrust them managing the liaison between the national and the Mesoamerican *ex situ* conservation genebank systems.[11]

d. Incorporate the national strategy of *ex situ* conservation in the relevant ministries, establishing a road map with common points, defining complementary and coordinated actions, and clarifying the ministries´ respective roles within the framework of developing a regional strategy.

e. Carry out collaborative activities among stakeholders involved in *ex situ* conservation, including community genebanks, institutional genebanks, farmers' organizations, academia, civil society, among others. These activities would include eco-geographical studies, germplasm collections, and exchange, support, evaluation, characterization, breeding and regeneration of materials conserved, among others.

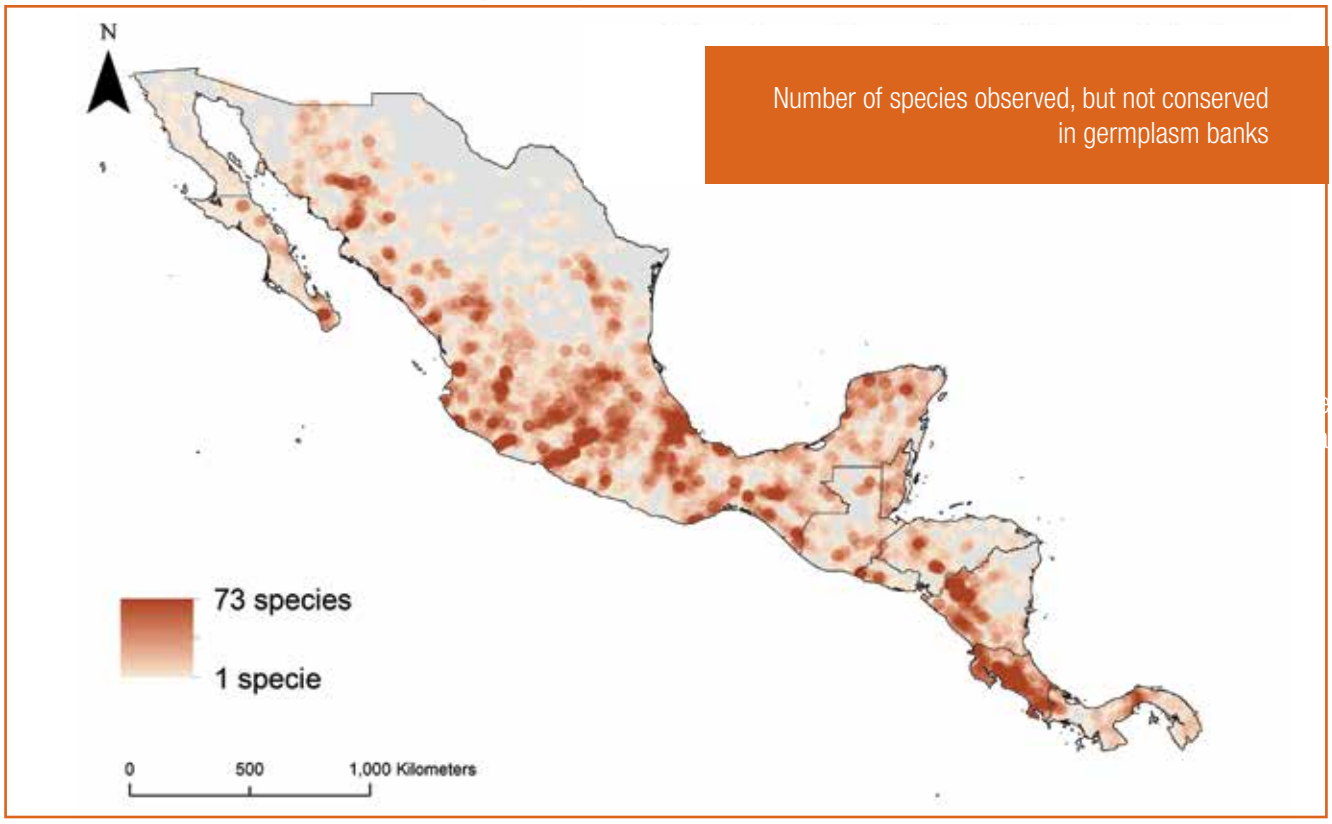
f. Develop and apply guides and standards agreed at the regional level to harmonize and improve the quality and accessibility of the passport data, and the characterization, evaluation and regeneration of germplasm conserved in institutional genebanks.[12]

g. Identify, characterize and evaluate species, varieties and accessions—particularly those having adaptation characters to climate change—and guarantee access to these materials.

[11] This activity must be implemented taking into account activity C.1.1.b, of the strategy of "Overall institutional measures" of the Institutions and Policies component, whereby the national PGRFA commissions are established.

[12] This activity must be implemented taking into account activity A.2.2.b on standardization and agreement of different activities for the management of genebanks in the Conservation component and the strategy of the new regional architecture for *ex situ* conservation.

Gap analysis – Wild relatives



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According to spatial analysis, as many as 73 species of wild relatives—whose accessions are not yet being conserved in germplasm banks—could be collected per unit of area

h. Identify and implement a sustainable and unified documentation system in terms of updates and maintenance, using existing systems, for example the Germplasm Resources Information Network (GRIN-Global).

i. Establish or strengthen sustainable community genebanks for short-term *ex situ* conservation, or emergency seed reserves in places where they are relevant and gaps exist, using as reference experiences of countries having such systems, in collaboration with extension agents and budgeting the investments required to establish and maintain new genebanks.

j. Establish or improve conditions of *ex situ* conservation in institutional genebanks for regenerating, evaluating, multiplying and distributing germplasm, thus complementing the role of community genebanks and of local seed companies as multipliers of materials.

k. Link *ex situ* germplasm evaluation, regeneration and distribution activities to the needs of participatory and conventional plant breeding programmes, applying modern biotechnology tools.

l. Guarantee the inclusion in national system *ex situ* collections of new varieties released, in accordance with national laws and honouring intellectual property rights over those varieties.

2.2 Defining and strengthening the regional architecture of *ex situ* conservation

Goal: Coordination and decision-making at the regional level related with *ex situ* conservation is timely, transparent, participatory, efficient, and agreed upon by national competent authorities in each of the different countries.

Activities

a. Standardize and reach agreement at the regional level on different key actions for appropriate management of genebanks (characterization, regeneration, evaluation, among others) and guarantee their use at the national level.[13]

b. Establish agreements among relevant entities within and outside the region to achieve an effective division of labour and share complementary *ex situ* conservation tasks for the medium and long term, in order to reduce costs and make more efficient use of existing conservation facilities in the region. Different national and international genebanks in the region specialize in certain crops and activities (for example, duplicate backups, characterization, regeneration or conservation in the short, medium and long term).

c. Promote and facilitate access to and distribution of germplasm to users through the Multilateral System of the ITPGRFA or other relevant national, regional or international legislation.

d. Adopt a regional programme for germplasm collection, prioritized with base on the inventories and national diagnoses, in consultation with experts and using GIS tools, with emphasis on either endangered materials or materials potentially adapted to climate change.

e. Develop a programme at the regional level to support collections in the field (of species with recalcitrant seeds) using techniques such as *in vitro* conservation, cryo-preservation, and other biotechnology tools.

f. Continuously promote knowledge sharing, capacity-building, and exchange of experiences within and among countries, with the aim of standardizing methods and strengthening national *ex situ* conservation systems to facilitate their integration with the new regional architecture.

[13] This activity should be implemented taking into account activity A.2.1.f of the Conservation component of the strategy for strengthening national *ex situ* conservation schemes, whereby guidelines and standards agreed at the regional level are enforced.

M. Ramírez - Bioversity

Teosintle, wild relative of maize, Chiantla, Guatemala

B. Sustainable use component

DESPITE THEIR richness in plant genetic resources, many Mesoamerican rural territories still have high levels of hunger, malnutrition and poverty, and many of the region´s PGRFA are not being used adequately to meet these great needs. Aggravating the situation is the accelerated pace of climate change, which is ever more threatening to agriculture generating big challenges for the adaptation of production systems.

Maize tortillas, El Salvador

This SAPM proposes increasing investment in the use of plant genetic resources since these can directly benefit the region, especially rural sectors where hunger and poverty are more acute. Increasing the quantity and quality of food produced and contributing to a healthy diet depends on the intelligent and sustainable use of plant genetic resources. Also, agricultural innovation and seed supply systems need to significantly increase their capacity to adapt in order to tackle climate change. Ample evidence is available on the profitability of investing in plant **breeding** to improve agricultural production, both in the region and the rest of the world.

Also known are benefits arising from on-farm and product **diversification.** Planting different crops and varieties also helps managing climate risks, such as drought or excessive rainfall which affect differently each different crop or variety. To generate more income and improve the quality of life, diversification of value-added products should be prioritized, and transformation and commercialization processes should be promoted. Both plant breeding and production diversification depend on conservation and sustainable use of PGRFA.

The fact that there is no interconnection between the use of PGRFA and **conservation** of these resources has been a problem in the region. Overall, conservation has less visibility and is taken for granted. The challenge now is to reconnect conservation and use in an integrated and effective system for managing PGRFA, in which part of the value generated from the use of these resources is reinvested in conservation to ensure sustainability of the system.

Several initiatives—such as participatory plant breeding, in which farmers are actively involved in the selection of genetic materials adapted to their specific needs—have built the capacity of farmers to undertake crop genetic improvement for small-scale agriculture. Experience has been gained in producing quality seeds, also designed for small-scale agriculture. The region is prepared to invest more financial resources to increase the scope and effectiveness of these activities and take advantage of them to reduce hunger, malnutrition and poverty. Part of this investment should be destined to improving access and availability of plant genetic resources for their use in production systems and crop breeding, and promoting on-farm and diet diversification.

1. Availability of plant genetic materials and information on their potential use

Goal: Plant genetic materials and information on their characteristics are available, in response to different needs of different users to achieve sustainable agriculture in the region.

Activities

a. Facilitate free access of users to documentation on existing collections.

b. Establish collections of promising diverse local varieties and promote their use through seed multiplication and distribution to respond to food security, climate change and market demand, among other needs.

c. Promote the supply and exchange, at the local level, of diverse varieties exhibiting ability to adapt to changing climatic conditions, through the organization of different events as well as through better use of existing *ex situ* collections.

d. Establish community and national seed reserves for post disaster replanting using diverse varieties adapted to local conditions, in coordination with conservation activities developed in community genebanks (identified in the section on seeds systems in the Conservation component).

e. Improve local registration systems, making them more inclusive of varieties developed by farmers.[14]

f. Adapt the seed quality control system to the conditions of small seed producers through the adoption of more appropriate protocols and mechanisms.[15]

2. Farm diversification enhanced—by introducing greater number of crops for climate change risk management—and income generation, health, and food and nutrition security improved.

Goal: Mesoamerican farms produce an important amount of edible species, directly benefitting farmers, improving their diet and promoting new income-generating alternatives.

Activities

a. Document local knowledge on plant genetic resources, complementing it with scientific information and promoting its use to encourage greater diversification, applying sustainable agricultural practices.[16]

b. Establish a regional scientific network on underutilized edible species, led by centres of excellence, that promote research on 20 species of regional interest to increase their use, and coordinating the mobilization of resources.

c. Encourage demand for greater diversity of crops and value-added agricultural products, for example by establishing and strengthening local product value chains, and adding value to products through mechanisms such as designation of origin, among others.

d. Promote greater use of native local crops and varieties in existing food and agricultural assistance programmes (for example, family farms and school feeding programmes).[17]

3. Innovations for better utilization of intraspecific diversity

Goal: Intraspecific diversity of crops and associated local knowledge are fully deployed in agricultural innovation processes that contribute to food and nutrition security, income generation and climate change adaptation.

Activities

a. Promote plant breeding using participatory, conventional and molecular methods for developing varieties with characteristics that enable adaptation to climate change and meet the diverse needs and preferences of farmers and consumers.

[14] This activity should be implemented taking into account activity C.3.c of the strategy "Promote farmers' rights" in the Institutions and Policies component, applying alternative mechanisms for registration and quality certification.

[15] This activity should be implemented taking into account activity C.3.d of the strategy "Promote farmers' rights" in the Institutions and Policies component, and giving recognition to local seed systems promoted in the activity.

[16] This activity should be implemented taking into account activity A.1.1.h of the strategy related to biocultural territories of the Conservation component, establishing management plans for proposed biocultural territories.

[17] This activity should be implemented taking into account activity C.1.4.c of the Institutions and Policies component, including the issue of PGRFA in different food security, education and health budgets.

Three generations of women classifying maize, Quilico, Guatemala

b. Identify and adopt cost-effective methods for exchange, evaluation and adoption by small-holder farmers of diverse varieties adapted to different geographic and climatic conditions.

c. Strengthen producers' organizations and their entrepreneurial capacity for producing and selling seeds and agricultural products, favouring small-scale farmers and their local varieties.

d. Build technical capacity in the region to capture, interpret and exchange meteorological data and facilitate its use by farmers, seed producers, plant breeders and other stakeholders involved in the conservation and use of PGRFA.[18]

[18] This activity should be implemented taking into account activity D.f of the Education and Capacity-Building component, where the issue is considered as one of the priority training themes mentioned.

C. Institutional and policies component

HIS COMPONENT aims to promote a national and regional institutional framework to guarantee effective implementation of activities proposed in the Action Plan and facilitate coordination among different stakeholders and political sectors. Implementation of the ITPGRFA in each country needs to be in harmony with other complementary instruments. This is a fundamental step to create a well-coordinated institutional framework in which to anchor the new PGRFA system.

Ceremony of the flag, Huehuetenango, Guatemala

Also proposed are actions to promote inter-sectorial interactions that place PGRFA as strategic elements for intervention in the areas of food security, sustainable territorial development and climate change adaptation. The ITZAMNÁ website (http://itzamna-mesoamerica.org), includes an initial list of other instruments, and national and international plans and programmes, that should be taken into account in developing the actions mentioned in this component, seeking synergies and complementarities, and bolstering results.

This component includes actions for strengthening the capacity of all stakeholders of the new Mesoamerican PGRFA system—from farmers to scientists, to national and regional authorities—with the aim of facilitating effective decisions for improving conservation and use of PGRFA. In addition to strengthening technical capacities, actions also focus on sensitizing the public on the issue of conservation and sustainable use of PGRFA, through communication and public awareness strategies addressing broader sectors of society to reap their support and propitiate collective actions.

1. Policy measures to support the actions of components A and B of the SAPM

Goal: Actions included in the SAPM to strengthen conservation and sustainable use of PGRFA are sustainable over time thanks to the support of public policy measures at the national and regional levels.

1.1. Overall institutional measures

a. Facilitate coordination between relevant stakeholders and competent ministries in relation to conservation, access and use of PGRFA, to support the implementation of the collaborative activities programmed in the SAPM.

b. Establish or strengthen, at the national level, institutionalization of national PGRFA commissions integrated by experts of different institutions and sectors. Link their actions to the areas of agricultural development, food security, health, risk management and disaster response, among others, as well as to the activities led by civil society organizations and farmers' organizations to integrate PGRFA in these areas and facilitate collaboration.[19]

c. Guarantee participation of national PGRFA commissions in defining national stance in relevant international negotiations involving PGRFA, environment, intellectual property rights, bilateral trade agreements and climate change.

d. Take opportune measures both to increase the scope of the meteorological network and to give free access to meteorological data at the national and regional levels for application in PGRFA conservation and use activities.Promote effective coordination among entities responsible for meteorology and climate change issues and those involved in the PGRFA system, reinforcing existing initiatives.

[19] This activity should be implemented taking into account activity A.2.1.c of the strategy for strengthening national *ex situ* conservation systems and including the participation of authorities identified or nominated.

Farmer checking his bean crop, Jamastrán, Guatemala

1.2. Policies supporting *in situ* conservation

a. Integrate the issue of PGRFA and the concept of biocultural territories in biodiversity and protected areas policies and management plans; and in policies, strategies and ecosystems and biodiversity plans for adapting to climate change at the national and regional levels (e.g. the Mesoamerican Corridor) or at the international level (e.g. the Satoyama Initiative), such that the issue of PGRFA is included in operational plans and budgets.

b. Incorporate the issue of PGRFA and the concept of biocultural territories at the national level (for example, identification of areas of high crop diversity), in existing processes of territorial planning/zoning, such that the issue of PGRFA is included in operational plans and budgets.

c. Link on-farm conservation of PGRFA and management of biocultural territories to initiatives, movements and ecological and sustainable agricultural programmes.[20]

1.3. Policies supporting *ex situ* conservation

a. Institutionalize the new *ex situ* conservation scheme, officially designating competencies of all relevant actors at the national level, including the corresponding ministries, and establishing the modus operandi of their interactions with other actors in the region, and internationally.[21]

b. Provide institutional support to community seed banks, for example by including them in local policies and plans for climate change adaptation and food security.

[20] This activity should be implemented taking into account activity A.1.1.h of the sub-component of the strategy for on-farm and *in situ* conservation, for example, through management plans for biocultural territories.

[21] This activity should be implemented taking into account activity A.2.1.c of the strategy for restructuring the national *ex situ* conservation system, thereby encouraging collaborative activities.

c. Coordinate and implement effective and agile mechanisms to attend requests and give access to germplasm conserved in national genebanks and, where applicable, following the provisions of the ITPGRFA or any other mutually agreed mechanism.

d. Have the seed registration law include the requirement to deposit a seed sample of new varieties released in the country, in the national *ex situ* conservation system, complying with intellectual property rights and legislation regarding distribution.

1.4. Policies supporting sustainable use

a. Include the issue of PGRFA in agricultural development and ecological or organic farming policies and budgets to increase investments in plant breeding programmes, production diversification and establishment of value chains based on agrobiodiversity.[22]

b. Establish joint public/private programmes to add value and promote the use of food crops based on local PGRFA (for example, designation of origin, regional gastronomic fairs, agro tourism, gastronomical tourism, organic and natural products).

c. Include the issue of PGRFA in food security and family agriculture, education and health policies and budgets to promote the use of local PGRFA as a healthy and nutritive alternative for feeding the population, with special emphasis on vulnerable groups (for example through school breakfast programmes, food supply to low income sectors of the population and to head of household single mothers).

d. Establish mechanisms for comprehensive risk management at the national level, including measures to create and maintain community and national seed reserves that contribute to food security and to response to disasters caused by climate change, assigning priority to local PGRFA.

e. Institutionalize decentralized systems for multiplying and distributing diverse, locally-adapted materials, including initiatives that support entrepreneurial development to reduce dependence on foreign seeds and food crops, and increasing production systems´ resilience to climate change, taking as an example existing initiatives as the regional Seeds for Development project and the Collaborative Participatory Plant Breeding Programme in Mesoamerica.

2. Implementing the International Treaty on Plant Genetic Resources for Food and Agriculture in Contracting Party countries

Goal: Contracting Party countries have an institutional framework for implementing the International Treaty in harmony with other national, regional and international instruments.

Activities

a. Develop a clear roadmap for implementing the ITPGRFA in Contracting Party countries, specifically naming the National Focal Points, relevant national authorities and other responsible stakeholders; defining their functions; establishing institutional procedures; and determining which materials to include in the Multilateral System.

b. Coordinate activities at the national level—in both the institutional and the legal frameworks—for the effective implementation of the ITPGRFA, in harmony with the CBD and the Nagoya Protocol.

[22] This activity should be implemented considering the activity B.2.a of the Sustainable use component and the diversification strategy, which deals with documenting knowledge and using it appropriately.

3. Promoting farmers' rights

Goal: Farmers' rights are recognized and measures for their promotion are included in legal, administrative and policy instruments at the national level.

Activities

a. Identify—as part of the diagnosis undertaken for implementing the Treaty—legal, administrative and policy frameworks, specifically for recognizing and protecting farmers' rights.

b. Implement laws and measures needed in the different countries of the region for maintaining traditional knowledge associated with PGRFA and their protection, in line with international commitments.[23]

c. Review existing national legislation and harmonize, at the regional level, laws and national measures established to recognize records or inventories of landraces or of varieties generated through participatory plant breeding.[24]

d. Recognize local seed systems in national seed laws finding alternative mechanisms for registration and quality certification, facilitating legalization and registration of enterprises or cooperatives, and improving access to quality seeds by small-holder farmers.

e. Develop mechanisms to guarantee that communities that practice traditional or small-scale agriculture have the right to participate in PGRFA-related activities and decision-making at different levels, for example by strengthening farmers' organizations.

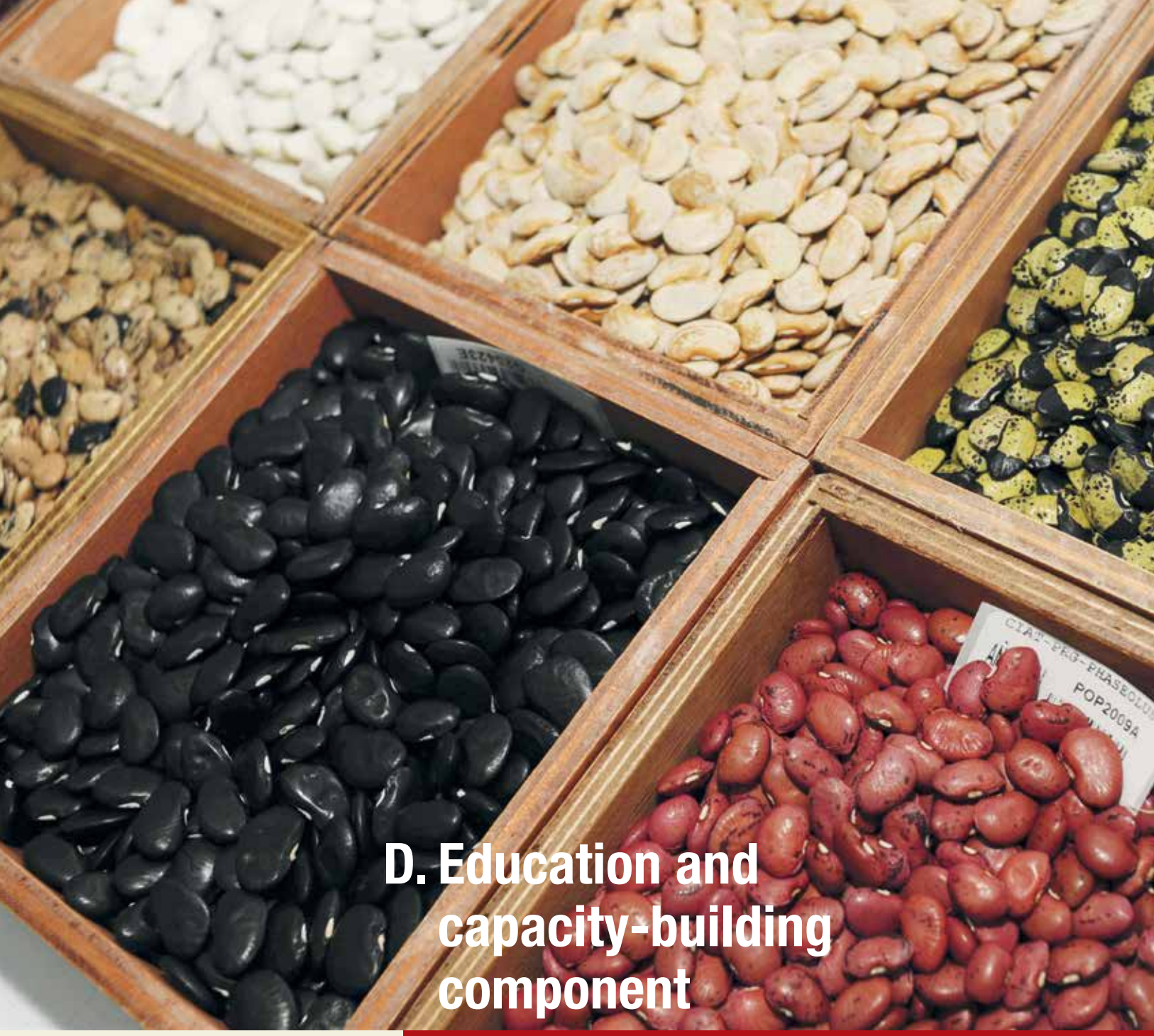
f. Promote the fair and equitable sharing of benefits arising from the use of traditional knowledge associated to PGRFA, in line with the Nagoya Protocol and other relevant international agreements.

g. Create and include incentives to improve conservation and use of cultivated and wild PGRFA, especially for small-holder farmers, and indigenous and local communities, with participation of civil society, for example, through participatory plant breeding programmes, compensation payments for conservation of agricultural biodiversity, facilitated access to markets, inclusion in fair-value chains for new products, and designation of national and regional origin, among others.

[23] This activity should be implemented taking into account activity A.1.1.d of the sub component on Biocultural territories for promoting the documentation of traditional knowledge.

[24] This activity should be implemented taking into account activity B.1.e of the strategy on Availability of PGRFA with the aim of improving registration systems.

Farmer preparing the soil for planting maize, Alauca, Honduras



D. Education and capacity-building component

HIS COMPONENT recognizes the need to strengthen and/or develop human resources with the skills required to carry out the activities of the SAPM. These needs include: updating and generational renewal of active PGRFA professionals, training new generations of service providers similar to extension agents but with a broader mandate, strengthening farmers' organizations to make better use of information for confronting climate change through the use of PGRFA, and building capacity of decision makers at multiple levels for their informed participation in implementing international commitments related to PGRFA. Response to this urgent demand is feasible by taking advantage and coordinating existing educational and capacity-building opportunities, currently dispersed in different countries and institutions in the region.

Bean samples, CIAT´s germplasm banks

1. Education and capacity-building strategy

Goal: Relevant national stakeholders in the area of PGRFA have the knowledge, skills and attitudes required to sustain and promote an integrated Mesoamerican PGRFA conservation and use system.

Activities

a. Give more prominence to the issue of PGRFA in university and professional education curricula in Mesoamerica by:

- Promoting interdisciplinary approaches;
- Responding to labour market demand for professionals in this area;
- Establishing a regional educational programme on PGRFA conservation and sustainable use, from elementary to university level;
- Increasing the amount of scholarships allocated by existing programmes on conservation and sustainable use of PGRFA.

b. Take advantage of collaborative initiatives and intensify collaboration between universities and institutions involved in conservation and sustainable use of PGRFA, through undergraduate and postgraduate thesis research, and professional internships.

c. Strengthen the capacity of and empower small farmers' organizations to interact with the formal PGRFA system in the region.[25]

d. Strengthen the capacity of and empower small farmers' organizations to interact with the formal PGRFA system in the region.

e. Develop a training programme for decision makers at the local, national and regional levels on the implementation of international agreements related to PGRFA.

f. Establish a consortium of institutions for developing a capacity-building programme on PGRFA in the region, involving institutions with comparative strengths or having relevant mandates such as CATIE, El Zamorano Pan-American Agricultural School, Earth University, CGIAR centres, the national genebank of Mexico, among others. The consortium would be responsible for:

- Establishing a central repository of educational materials—linked to the website managed by a Secretariat[26]—and providing training opportunities on PGRFA issues;
- In response to existing demand, design and offer short courses, including on-line and self-learning options, using materials already developed and based on the experience of national and international centres on priority training issues.

[25] This activity should be implemented taking into account activity A.1.2.e of the strategy on Recognizing local seed systems.

[26] The establishment of an Executive Technical Secretariat is foreseen in activity E.c

– Priority themes for professionals could include: *ex situ* conservation techniques, data base management, use of GIS tools, identification of germplasm with climate change adaptation characteristics, *in situ* and on-farm conservation management, and tools for analysing and managing biodiversity data.[27]

– Priority themes for farmers could include: plant breeding, seed conservation at the community level (formation of conservationist leaders), on-farm diversification, partnerships, entrepreneurial skills, participation in value chains, evaluation of agricultural technologies and options for climate change adaptation, for example cross visits among communities. For women, in particular, workshops on food preparation and both traditional and new products based on PGRFA, and links to agro eco-touristic activities.

Seminar on Agrobiodiversity for Supporting Food Security

2. Information dissemination strategy

Goal: The Mesoamerican society values agrobiodiversity, expresses its preferences and influences the political agenda on the issue of PGRFA.

Activities

a. Design an information dissemination, public awareness and capacity-building programme in the field of conservation and sustainable use of PGRFA that involves multiple stakeholders from different sectors, using mass media, social networks, conferences, seminars, forums and thematic events.

b. Make widely known the nutritive benefits of diversified diets; involve parents in the process. Develop initiatives to educate and give access to a healthy and diverse diet at all social levels (nutritional education at schools, campaigns in chain restaurants and cafeterias, nutritional programmes or school lunches with informative brochures or posters, establishment of school gardens, campaigns in the cafeterias of ministries and public offices).[28]

c. Disseminate the existence and usefulness of the website mentioned in the section on capacity-building.[29]

[27] This activity should be implemented taking into account activity A.1.1.b of the sub-component: On-farm and *in situ* conservation, using GIS tools for establishing the knowledge base line.

[28] This activity should be implemented taking into account activity A.1.2.d. onPromoting local seed systems through the organization of events.

[29] This activity shouldt be implemented taking into account activities E.c. of the Operational component and D.f. of the Capacity-building component.

E. Operational component

N. Palmer - CIAT

Farmer exhibiting an avocado fruit

Goal: The SAPM is implemented in a transparent, participatory, efficient and concerted way at the regional level, and national, international and regional institutions use this SAPM as a key tool in formulating policies and plans for food and nutritional security, climate change adaptation and rural development.

Activities

a. Establish the framework for implementing the SAPM, in partnership with the executive secretariats of relevant regional organizations such as CAC, the Central American Commission on Environment and Development (CCAD, from the name in Spanish), the Council of Economics and Commerce Ministers of Central America (COMIECO, from the name in Spanish), and the Council of Health Ministers of Central America and the Dominican Republic (COMISCA, from the name in Spanish); and donors and representatives of other relevant countries and organizations in the region.

b. Establish regional coordination mechanisms for implementing the SAPM through CAC´s technical groups, particularly SICTA and it's Technical Group on Climate Change and Integrated Risk Management.

c. Within SICTA, strengthen and allocate resources to the Mesoamerican Network of Plant Genetic Resources (REMERFI, from the name in Spanish), so it functions as the Executive Technical Secretariat of the SAPM. The Secretariat´s responsibilities would include:

- Maintain permanent dialogue with regional and national entities, in particular with national PGRFA commissions;
- Develop the regional annual work agenda for implementing the SAPM and present it to CAC for its approval;
- Monitor the implementation of the SAPM in the different countries;
- Make sure that actions implemented under the SAPM are in harmony with other regional and international instruments, in particular the Second GPA;
- Coordinate information dissemination on progress and results of SAPM implementation;
- Coordinate information dissemination on topics related to PGRFA conservation and use that are relevant for SAPM implementation, and facilitate the availability of this information by administering a website to this end;
- Coordinate the formulation of regional projects in line with the actions of the SAPM;
- Mobilize and manage financial resources for the implementation of the SAPM, in line with what is mentioned in its financial component.

Mesoamerican Network on Plant Genetic Resources (REMERFI)

Six sub regional networks, focused on plant genetic resources, were created in the decade of the 1990s in Latin America and the Caribbean. These networks were sponsored by IICA, CATIE, Bioversity International and SICTA. The Mesoamerican Network on Plant Genetic Resources (REMERFI, from the name in Spanish), includes Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama. The network identified Pouteria, Persea, Theobroma, Annona, Cucurbita, Capsicum, Phaseolus and Zea as priority crops for *in situ* and ex situ conservation—a task that would be accomplished by strengthening the capacity of national programs. Since its creation and during its first years of operation, REMERFI developed projects in the areas of tropical fruits, institutional capacity-building and documentation, and fomented the establishment of national genetic resources commissions. These endeavours received support from the Inter-American Development Bank (BID), the German Agency for Technical Cooperation (GTZ) and the United States Agency for International Development (USAID). In 2005, the Forum for the Americas on Agricultural Research and Technology Development (FORAGRO, from its name in Spanish) reasserted the importance of plant genetic resources, their ex situ conservation, and the key role of the networks in this context. During the period 2005-2007, REMERFI´s representatives participated in the development of the Conservation Strategy for the Americas, an effort financed by the Global Crop Diversity Trust and executed by Bioversity International. Crop prioritization developed in this conservation strategy has been used for the current Strategic Action Plan for Mesoamerica (SAPM) which includes—in addition to conservation of plant genetic resources—the use of these resources in the context of adapting to climate change.

As acknowledged by many participants in the consultation for formulating the SAPM, REMERFI faces the challenge, and also the valuable opportunity, of playing a leading role in the implementation of the Strategic Action Plan. One of the urgent issues is reaching the community of users—plant breeders, farmers and other stakeholders—so that plant genetic resources actually benefit all users, linking conservation to development plans that address the priorities of a broad spectrum of stakeholders and decision makers. REMERFI can also take advantage of this circumstance to foster and develop the appropriate mechanisms for guaranteeing important government support for plant genetic resources. Opportunities also exist for collaboration among networks; this collaboration has not yet been evidenced. An opportunity, for example, could be establishing collaboration among the strong national programs of Canada, USA, Mexico that make up NORGEN the Plant Genetic Resources Network for North America, the Amazonian Network on Plant Genetic Resources (TROPIGEN, from its name in Spanish) and the Plant Genetic Resources Network for the Southern Cone (REGENSUR, from its name in Spanish) (Ramírez, 2008).

Preparing tortillas with maize flour, El Salvador

N. Palmer / CIAT

F. Financial component

Land ready for planting, Honduras

Goal: The activities identified have a financial plan, allowing their implementation in the following ten years and leading to financial sustainability of the Mesoamerican PGRFA system.

Activities

a. Develop a cost-benefit study of the activities mentioned in this SAPM, including a strategy to distribute costs over the 10-year implementation period.

b. Identify potential financial mechanisms for thematic areas or set of actions identified in this SAPM. Among the possible mechanisms to consider are:

- National taxes on products and services, innovative financing initiatives, for example, resource mobilization through corporate social responsibility programmes, or payments for environmental services;.
- Reinvestment of benefits arising from the utilization of regional PGRFA, as defined by the Nagoya Protocol and in harmony with the ITPGRFA.

c. Guarantee the availability in national and regional budgets of specific funds for PGRFA, including operational resources for the national PGRFA commission and for genebanks under national or local responsibility.

d. Establish a common regional fund for supporting regional actions required for restructuring the PGRFA system; these funds should cover:

   - Maintenance of *ex situ* collections, available to all regional and international users, in harmony with international commitments;
   - Regional coordination of activities and exchange of experiences mentioned in this SAPM;
   - Other activities related to the conservation and use of PGRFA, concerted by all contributing countries.

e. Establish a strategic unit for resource mobilization within the Secretariat responsible for maintaining relations with international donors (GEF, UNEP, UNDP, SDC, GIZ, BID[30] , World Bank), following-up on calls for proposals and coordinating the elaboration and application of project proposals, among others.

Small farm, Nicaragua

[30] GEF = Global Environment Fund, UNEP = United Nations Environmental Programme, UNDP = United Nations Development Programme, SDC = Swiss Agency for Development and Cooperation, GIZ = German Society for International Cooperation, BID = Inter-American Development Bank.

Terms used

Agrobiodiversity: includes all biodiversity components relevant for agricultural production, including food production, sustaining livelihoods and habitat conservation of agricultural ecosystems (CIP-UPWARD, 2003).

Biocultural Territories: The concept of biocultural territories was developed in harmony with the definition of "productive socio-ecological landscapes" of the Satoyama Initiative (2010), where they were defined as mosaics of habitats and dynamic land uses that have been formed over time by the interaction between humans and nature keeping its biodiversity and providing goods and services necessary for human welfare.

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 (CBD, 1992).

Community Seed Banks: seed collections conserved and managed by local communities. These banks are created to guarantee availability of planting material for the following season(s) and of genetic material in case of variety loss (Almekinders, 2001). Usually they are used for short-term conservation, contributing to *in situ* conservation, local seed systems and local seed supply in response to natural disasters.

***Ex situ* collection:** collection of plant genetic resources for food and agriculture maintained outside their natural habitat (TIRFAA, 2009).

***Ex situ* conservation:** conservation of biodiversity outside its natural habitat; in the case of plant genetic resources conservation can be in seed banks, in vitro collections in germplasm banks, or as live collections in the field (Rao et al. 2007).

Genetic material: any material of plant, animal, microbial or other origin containing functional units of heredity (CBD, 1992).

Germplasm: the reproductive or vegetative propagating material of plants (FAO, 1994).

***In situ* conservation:** the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated plant species, in the surroundings where they have developed their distinctive properties (ITPGRFA, 2009).

International Treaty on PGRFA (ITPGRFA): The only multilateral instrument regulating the conservation and sustainable use of plant genetic resources for food and agriculture.

Multilateral System of the ITPGRFA: A system that allows the exchange between Contracting Parties of genetic diversity and information associated with genetic diversity located in genebanks and ensuring the fair and equitable sharing of the benefits arising out of their use (ITPGRFA, 2013).

On-farm conservation: *In situ* conservation of cultivated plants.

Orthodox seeds: Those that can remain viable under controlled storage conditions (Roberts, 1973).

Participatory plant breeding: Application of methodologies of genetic improvement, with the involvement and active participation of farmers in all the technological innovation process (FAO, 2011).

Plant genetic resources for food and agriculture (PGRFA): any genetic material of plant origin of actual or potential value for food and agriculture (ITPGRFA, 2009).

Recalcitrant seeds: Those that cannot be stored as they quickly lose their viability when dried and kept at low temperatures (Roberts, 1973).

Resilience: The capacity of an organism, ecosystem or community to recover from major disturbance events (Thompson, 2011).

Traditional knowledge: knowledge, innovations and practices of indigenous communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity (CBD, 1992).

Value chain: the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2001).

Variety: A plant grouping, within a single botanical taxon of the lowest known rank, defined by the reproducible expression of its distinguishing and other genetic characteristics (ITPGRFA, 2009). According to the context, it can refer to breeds and "native" or local varieties, as well as to improved, hybrids and commercial varieties.

Acronyms

BID	Inter-American Development Bank
CAC	Central American Agricultural Council
CATIE	Tropical Agricultural Research and Higher Education Centre
CBD	Convention on Biological Diversity
CCAD	Central American Commission for Environment and Development
CENTA	National Agricultural and Forestry Technology Center of El Salvador
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
COMIECO	Council of Ministers Economic and Trade of Central America
COMISCA	Council of Ministers of Health of Central America and the Dominican Republic
DICTA	Directorate of Science and Agricultural/Livestock Technology of Honduras
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning Systems Network
FORAGRO	Forum for the Americas on Agricultural Research and Technology Development
FPMA	Collaborative Programme on Participatory Plant Breeding in Mesoamerica
GBIF	Global Biodiversity Information Facility
GEF	Global Environment Fund
GENESYS	Global Information Portal on Plant Genetic Resources
GIS	Geographic Information System
GIZ	German Society for International Cooperation
GRIN-Global	Germplasm Resources Information Network
GTZ	German Agency for Technical Cooperation
IICA	Inter-American Institute for Cooperation on Agriculture
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
NORGEN	Plant Genetic Resources Network for North America
REGENSUR	Plant Genetic Resources Network for the Southern Cone
REMERFI	Mesoamerican Network on Plant Genetic Resources
SAPM	Strategic Action Plan for Mesoamerica
SDC	Swiss Agency for Development and Cooperation
Second GPA	Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture
SICA	Central American Integration System
SICTA	Central American Agricultural Technology Integration System
SINGER	System-Wide Information Network for Genetic Resources
TROPIGEN	Amazonian Network on Plant Genetic Resources
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

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Annex 1

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Annex 2. Schematic summary of the Action Plan and implementation timeline

A. Conservation Component

1. On farm and *in situ* conservation

1. Biocultural territories

- a. Harmonization of criteria to identify biocultural territories
- b. Baseline on status PGRFA conservation in biocultural territories
  - Identification of simple indicators for baseline and monitoring
  - Diagnosis of agricultural processes linked to conservation and use
  - National participatory inventories of wild and cultivated PGRFA
  - Identification of PGRFA richness hotspots
  - Threats to PGRFA conservation and use
  - Increase the use of GIS to evaluate and monitor PGRFA status
- c. Development of incentives
- d. Knowledge documentation, use and exchange
- e. Restoration of degraded agricultural landscapes
- f. Ecological connectivity
- g. Inclusion of *in situ* conservation in biodiversity policies
- h. Biocultural territories and PGRFA management plans
- i. Strengthening of monitoring systems

2. Seed systems

- a. Seed systems baseline knowledge
  - Identification of simple indicators for baseline and monitoring
  - Inventory of lead farmers and associations
  - Identifying crucial sustainability factors and promoting seed systems
- b. Inclusion of community leaders in seed banks management
- c. Technology adoption and improving bank facilities
- d. Promoting seed systems in public events
- e. Training and public awareness on importance of seed systems
- f. Seed systems monitoring
  - Collaboration among stakeholders
  - Monitoring of national seed systems harmonized (trends and protocols)

2. New system for *ex situ* conservation

1. Activities at national level

- a. Preparation of diagnosis studies and inventories
  - Relevant stakeholders for *ex situ* conservation
  - Stakeholders´ skills and capabilities
  - Existing facilities and networks
  - Access, availability and distribution of *ex situ* conserved materials
  - Existing policies and potential financial sources
  - Current state of collections and operational costs of conservation activities
- b. Strengthen collaboration among national stakeholders
- c. Establish liaison between national authorities and PGRFA commissions
- d. Mainstream *ex situ* conservation strategies in relevant ministries
- e. Collaboration among PGRFA conservation organizations and institutions
- f. Regionally-agreed conservation standards and guidelines applied
- g. Identification of promising accessions in *ex situ* collections
- h. Identifying and implementing a unified documentation system
- i. Strengthening the role of community banks in PGRFA conservation
- j. National banks as germplasm multipliers and distributors
- k. Link conservation activities to plant breeding needs
- l. Guarantee the inclusion of varieties released in *ex situ* collections

2. Activities at regional level

- a. Standardize and reach agreement at the regional level on key germplasm bank management activities
- b. Establish agreements among relevant entities for *ex situ* conservation
- c. Promote germplasm distribution through the Multilateral System
- d. Establish a regional germplasm collection program based on previous prioritization
- e. Develop a backup program for field collections
- f. Promote capacity building, knowledge sharing and exchange of experiences

B. Sustainable Use Component

1. Availability

- a. Guarantee free access to documentation on existing collections
- b. Establish and use collections of promising materials identified in response to climate change, food security, etc.
- c. Local supply and exchange of genetic materials with characteristics of adaptation to changing climatic conditions
- d. Foment community and national seed reserves for replanting after disasters, using cultivars adapted to local conditions
- e. Improve variety registration systems
- f. Adjust the seed quality control system to the context of small farmers

2. Diversification

- a. Document local knowledge on PGRFA and promoting their use
- b. Establish a regional scientific network on underutilized food species to encourage their use and mobilize resources in a coordinated way
- c. Foment demand for greater crop and agricultural products diversity through value chains and other mechanisms
- d. Promote the use of native PGRFA in food systems, in agricultural assistance and school programmes

3. Innovation

- a. Promote plant breeding of new varieties, applying conventional, participatory and molecular methods
- b. Identify and adopt cost-effective methods for exchanging, evaluating and adopting cultivars adapted to changing climatic conditions.
- c. Strengthen producer organizations and their entrepreneurial capacity for producing and marketing seeds and other agricultural products
- d. Develop capacity in the region in collecting, interpreting and exchanging climatic data to facilitate its use

Key

Actions with more than one coloured box are those that require on-going actions during a given period of time.

- Short-term activities (0 to 3 years)
- Medium-term activities (3 to 7 years)
- Long-term activities (7 to 10 years)

C. Institutional and Policies Component

1. Support measures to conservation and use components

1. Overall Measures

- a. Coordination among actors and relevant ministries related to PGRFA
- b. Strengthening national PGRFA interdisciplinary commissions
- c. Involving commissions in defining national position in relevant PGRFA agreements
- d. Coordination between meteorological and PGRFA sectors

2. Supporting *in situ* conservation

- a. PGRFA issues and biocultural territories included in climate change and wild biodiversity conservation policies and initiatives
- b. PGRFA issues and biocultural territories integrated in territorial zoning processes
- c. PGRFA issues and biocultural territories linked to sustainable agriculture initiatives

3. Supporting *ex situ* conservation

- a. Institutionalize the new *ex situ* conservation scheme
- b. Role of community seed banks recognized and supported by food security and climate adaptation policies
- c. Effective and agile mechanisms to deal with requests and give access to collections in accordance with the ITPGRFA and other agreed mechanisms
- d. Obligatory deposit of new registered varieties in the *ex situ* system, taking into account intellectual property rights for their distribution

4. Supporting sustainable use

- a. PGRFA included in agricultural development policies and budgets to incentivise plant breeding and value chains
- b. Synergies between public and private sectors to incentivise the use of local PRGFA-based foods
- c. PGRFA included in food safety, family agriculture, health and education policies and budgets
- d. Creation and management of community and national seed reserves integrated to risk management mechanisms
- e. Institutional support to decentralized seed multiplication systems, based on diverse and locally-adapted diverse cultivars

2. Implementing the ITPGRFA

- a. Road map for implementing the ITPGRFA in Contracting Party countries, defining competent authorities and other stakeholders, defining their functions; establishing institutional procedures; and determining which materials to include in the Multilateral System
- b. Activities coordinated at the national level for implementing the ITPGRFA in Contracting Party countries in harmony with the CBD and the Nagoya protocol

3. Farmers´rights

- a. Legal, administrative and policy frameworks for recognizing and protecting established farmers' rights
- b. Legal, administrative and policy frameworks established for maintaining and protecting traditional knowledge associated with PGRFA
- c. National legislation for recognizing records and inventories of local cultivars or improved varieties through participatory breeding, harmonized at the regional level
- d. Local seed systems recognized in national seed legislation, based on alternative mechanisms and quality certification standards
- e. Participation of farmers, including small-scale farmers, in decisions having to do with PGRFA at the local and national levels
- f. Fair and equitable distribution of benefits derived from the use of knowledge associated to PGRFA, following the Nagoya Protocol and other international agreements
- g. Incentives that improve conservation and use of PGRFA, especially for small-scale farmers

D. Education and Capacity Building Component

1. Education and capacity building

- a. PGRFA better positioned in university and professional curricula
  - Adoption of multidisciplinary approaches
  - Taking into account demands of labour market
  - Establishing a regional education program on PGRFA
  - Resource allocation for scholarships on conservation/use of PGRFA
- b. Close collaboration with universities and institutions, through joint research on PGRFA
- c. Farmer organizations in capacity to interact with formal seed system
- d. New generation of plant breeders and extension agents with the ability to manage and lead multi-stakeholder platforms
- e. Training program for decision makers on implementing PGRFA-relevant agreements
- f. Consortium of institutions to strengthen PGRFA-related capacities
  - Central germplasm repository and training opportunities
  - Train new generation of breeders and extension agents
  - Design short courses on PGRFA

2. Dissemination

- a. Public awareness on the issue of PGRFA conservation and sustainable use, using different mass media tools
- b. Dissemination of nutritional benefits of diversified diets at different social and educational levels
- c. Dissemination of web page of the Strategic Action Plan

E. Operational Component

- a. Executive secretariats of relevant regional organisms, donors and representatives of other countries in the region establish and make up a coordinated framework for implementing the SAPM
- b. Regional coordination mechanisms for implementing the SAPM, through CAC´s technical groups, especially SICTA
- c. Strengthen REMERFI as the Plan´s Executive and Technical Secretariat
  - Guarantee dialogue among regional and national entities
  - Establish and propose to CAC the agenda for a regional annual work plan
  - Monitor implementation of the Plan in the different countries
  - Guarantee harmonization with other instruments
  - Communicate progress and results in the Plan´s implementation
  - Through a web page, facilitate dissemination and availability of information on PGRFA use, conservation and relevant policies
  - Coordinate formulation of regional projects in the framework of the SAPM
  - Mobilize and manage financial resources for implementing the SAPM

F. Financial Component

- a. Cost-benefit study of activities and strategies mentioned
- b. Identification of possible resource mobilization mechanisms for each component (or for a set of actions)
  - National taxes on products and services (social corporate responsibility programs , payments for environmental services)
  - Reinvestment of benefits generated by commercial use of PGRFA
- c. Inclusion of specific funds for PGRFA in national budgets
- d. Establishment of a regional common fund for joint actions to support the PGRFA system
  - Maintenance and facilitated access to *ex situ* collections
  - Regional coordination of activities and exchanges of experiences
- e. Establishment of a resource mobilization unit in the Secretariat(relationship of Secretariat with donor, preparation of proposals and follow-up)

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