Bioversity International

Agricultural biodiversity to manage risks and empower the poor

Stefano Padulosi, Gennifer Meldrum, and Gaia Gullotta, Editors

Proceedings of the International Conference
27-29 April 2015, Rome, Italy

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Investing in rural people

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Bioversity International is a global research-for-development organization. We have a vision – that agricultural biodiversity nourishes people and sustains the planet.

We deliver scientific evidence, management practices and policy options to use and safeguard agricultural and tree biodiversity to attain sustainable global food and nutrition security. We work with partners in low-income countries in different regions where agricultural and tree biodiversity can contribute to improved nutrition, resilience, productivity and climate change adaptation.

Bioversity International is a member of the CGIAR Consortium – a global research partnership for a food-secure future.

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Acronyms and abbreviations

ASA	Action for Social Advancement
CBD	Convention on Biological Diversity
CBM	Community Biodiversity Management
CCAFS	Climate Change, Agriculture and Food Security
CGIAR	Consortium of International Agricultural Research Centers
Conference	The International Conference *Agricultural biodiversity to manage risks and empower the poor* held in Rome 27-29 April
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
GPS	Global Positioning System
HFIAS	Household Food Insecurity Access Score
ICEA	Istituto Certificazione Etica e Ambientale
IER	Institut d'Economie Rurale
IFAD	International Fund for Agricultural Development
IFAD-EU NUS Project	The IFAD-EU supported project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk'.
IFFCO	Indian Farmers Fertilisers Cooperative Limited
IFOAM	The International Movements of Organic Agriculture
Indigenous Partnership	The Indigenous Partnership for Agrobiodiversity and Food Sovereignty
HH Survey	Household Survey
MAP	Mesoamerican Agroenvironmental Project
NCDEX	National Commodity & Derivatives Exchange Limited
NESFAS	North East Slow Food and Agrobiodiversity Society
NUS	Neglected and underutilized species
PACS	Rewards/compensation for agricultural biodiversity conservation services
PDS	Public Distribution System
PGRFA	Plant Genetic Resources for Food and Agriculture
RSR	Rete Semi Rurali
SEPLS	Socio-ecological Production Landscapes and Seascapes
Project	The IFAD-EU supported project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk'.
UVG	Universidad del Valle de Guatemala
WEAI	Women Empowerment in Agriculture Index
WFP	World Food Programme
WG	Working Group

Executive summary

Bioversity International launched the Project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk' with an International Conference in Rome, Italy 27-29 April 2015. It was an important occasion to bring together people with different expertise from various organizations to debate on issues related to the role of agricultural biodiversity in fostering more resilient livelihoods and to solicit their guidance to refine the methodological framework to be followed in the Project's implementation.

The three-year Project, supported by the International Fund for Agricultural Development (IFAD), the European Union (EU), and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), is focused on the research and promotion of neglected and underutilized species (NUS) to improve climate change resilience, food and nutrition security, and income of resource-poor rural communities. Guatemala, India and Mali are the countries targeted by the programme, which is being implemented by the Universidad del Valle de Guatemala (UVG), Action for Social Advancement (ASA), and the Institut d'Economie Rurale (IER) in respective countries.

The Project follows a 'holistic value chain approach', developed by Bioversity International during the last 15 years and successfully deployed for use-enhancement of minor millets in South Asia and Andean grains in Bolivia and Peru. This approach reinforces the sustainable conservation of target crops and promotes their wider use, covering all aspects of their value chains from participatory selection, cultivation, harvest and post-harvest operations, to adding value and marketing. The approach devotes particular attention to the deployment of local agricultural biodiversity for nutrition security and involves capacity building of value chain actors, consumer education about the multiple benefits of hardy nutrient-rich local crops and advocacy for the development of policies that support their promotion. Key beneficiaries of these efforts are rural communities and especially indigenous peoples, who are among the most vulnerable to climate change and also among the most important custodians of agricultural biodiversity. The Indigenous Partnership for Agrobiodiversity and Food Sovereignty is an important partner of the Project who will be critical in extending the lessons and approaches to its network and raising awareness of the important role indigenous peoples serve in conserving agricultural biodiversity and knowledge on sustainable management practices.

The consultative process used during the Conference was strategic for promoting interdisciplinary dialogue that is fundamental to the Project's approach. On the first and second day, experts gave presentations in their different research areas relating to agricultural biodiversity and resilience of livelihood systems, holistic approaches for building sustainable and nutrition-sensitive food systems, and conservation and use of agricultural biodiversity. Working groups were held in the afternoon of the second day, in which the participating experts discussed strategies for designing agricultural biodiversity-based interventions and monitoring the impact of these interventions in four areas 1) food and nutrition security under climate change, 2) value chain upgrading, 3) conservation of plant genetic resources, and 4) empowerment of vulnerable groups. The results of these working groups were presented and discussed in depth on the third day, providing key inputs to refine the monitoring and intervention plan for the Project. Ways to develop an enabling policy environment and build joint initiatives with other agencies and the private sector were extensively covered throughout the discussions.

Certification and labelling was one specific approach for supporting the conservation of agricultural biodiversity that was discussed in a dedicated session of the Conference. Two main options were explored: 1) To create a novel dedicated standard to indicate that a product supports the conservation of valuable or unique plant genetic resources and 2) To include or reinforce biodiversity standards related to on-farm conservation practices in existing certification schemes, particularly 'organic' standards. The pros and cons of these options for strengthening on-farm conservation were debated, with the conclusion that the proposition to create a new label was extremely valuable but that further investigation is needed before moving forward with the idea.

On the third day of the Conference, the Project partners shared their site-specific plans for implementation and received feedback from the participating experts. These plans were further

refined in three national stakeholder consultations that were held in each country following the International Conference. The meetings were held in Bamako, Mali, on 15-16 June 2015, in Bhopal, India, on 19-20 June 2015 and in Guatemala City, Guatemala, on 25-66 June 2015. During these consultations, a thorough analysis of the local situation for nutrition, climate change, vulnerable groups and agricultural biodiversity was made to gain appreciation of how underutilized crops can be mobilized to enhance nutrition, livelihood resilience and income generation. Comparative advantages of resilient and highly nutritious local crops were debated along with issues related to the use-enhancement of these resources from agronomic, economic, and social perspectives. The crops selected to be targeted by the Project were Bambara groundnut (*Vigna subterranea*) and fonio (*Digitaria* sp.) in Mali, kodo (*Paspalum scrobiculatum*) and little millet (*Panicum sumatrense*) in India, and tepary bean (*Phaseolus acutifolius*) and Mayan spinach (*Cnidoscolus aconitifolius*) in Guatemala. These crops stood out as best options in view of their high nutritional profiles, their high appreciation in local food cultures, and the fact that they are able to respond to the effects of climate change such as soil degradation and unpredictable rains. In order to promote more nutritionally balance diets, participants also agreed that special attention should be dedicated to identify underutilized local vegetables, fruits, and pulses for promotion.

This document shares the results of the International Conference that launched the IFAD-EU NUS Project and the three national stakeholder consultations. It captures the participatory, multi-stakeholder process used to define the work plan for interventions and monitoring for this highly interdisciplinary effort. The document follows the structure of the International Conference (Annex II). It begins with an introduction to the objectives of the Conference and the Project and opening comments from the funding and implementing agencies. The abstracts of expert presentations are shared in the second section, covering a range of topics related to the multidisciplinary Project. In the third section, results of the working groups are shared, integrating comments from the plenary discussions. The indicators selected for monitoring the impact of the Project that were defined based on these discussions are also presented. A fourth section shares the results of the roundtable discussion on certification to support the conservation of agricultural biodiversity. The fifth section presents the global framework of the Project and plans for implementation in Mali, India and Guatemala, which were refined based on discussions in the International Conference and the national stakeholder consultations.

Introduction to the International Conference

Conference background

Agricultural biodiversity is an essential asset for rural households worldwide, especially for the poor and marginalized. Diversity in crops, trees and livestock allows farmers to respond to different situations and contexts and these options can build resilience within livelihood systems and improve food and nutrition security. Communities' resilience relies on their access to crops adapted to new weather patterns. It also depends on their capacity to use diversity effectively in value chains to generate income and nutritionally complete family diets.

Several neglected and underutilized species (e.g. Andean grains, fonio, Bambara groundnut, minor millets and many fruits, vegetables and pulses) are known to be tolerant to marginal growing conditions and hold great potential to contribute to resilience, nutrition and food security of communities, which can be realized if their cultivation is supported and integrated into value chains. Value chain development for such neglected and underutilized species (NUS) needs to be fostered in an integrated approach that includes gender-sensitive, pro-poor and nutrition considerations otherwise, there is risk of developing value chains with crops that fail because they are not adapted to new climate patterns, developing cropping systems for products that are difficult to market or are disconnected from local food cultures, or devising "solutions" that do not improve or even exacerbate nutritional imbalances or increase social inequities. Multiple efforts are needed to promote species and varieties adapted to climatic and socio-economic conditions, to raise awareness on the need for dietary appropriateness of food within households and to advocate for enabling policies for linking these crops to markets.

There is currently no coherent methodology for linking equitable value chain development with climate change adaptation and gender-sensitive food security and nutrition considerations. Until now, linkage between efforts to develop crops more adapted to climate change and interventions targeting agricultural biodiversity value chains have been very limited. Furthermore, efforts to conserve plant genetic diversity have not been well linked to its use in fostering more resilient production systems, value chains and nutrition. Diversification strategies that address multiple goals, including income generation, climate change adaptation and food and nutrition security have been limited so far, largely because researchers and the networks they engage in tend to be largely disconnected.

Rural communities, and particularly indigenous peoples, hold knowledge which is important for sustainably managing resources and responding to ever-evolving opportunities and threats that may affect their nutritious crops. Complementing this knowledge with innovative methods and approaches developed by other farmers, communities, and researchers can support adaptation to the changing climate. Designing holistically beneficial diversification strategies requires women and men farmers to be able to draw on a wide range of knowledge sources which supplement their own extensive knowledge, allowing them to set goals and mobilize their resources effectively. Tried and tested participatory tools (such as Community Biodiversity Registers, participatory weather data monitoring, Farmers' Field Fora, and multi-stakeholder value chain innovation platforms) are available to support diversification strategies, manage production and market risks, and guide assessment of income generation potential and nutritional value of local crops.

Conference aims

This International Conference was organized by Bioversity International in collaboration with Action for Social Advancement (ASA), Institut d'Economie Rurale (IER), Universidad del Valle de Guatemala (UVG) and the Indigenous Partnership for Agrobiodiversity and Food Sovereignty in order to launch the three-year Project entitled 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk'. The Project is supported by the International Fund for Agricultural Development (IFAD), the European Union (EU), and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and is being implemented in India, Guatemala and Mali. The objectives of the Conference were to share knowledge on ways to support the poor in managing risks using local crops, and to guide the Project team in identifying suitable, affordable solutions to be tested through this new collaborative effort.

The Conference addressed the themes of agricultural biodiversity value chains and conservation and their roles in nutrition and climate change resilience. It paid a cross-cutting focus on women and resource-poor indigenous communities and ways to support their empowerment through participatory interventions, as well as needs and approaches for capacity building and policy advocacy to support this holistic, integrated approach.

Main goals

1. Share lessons on approaches, methods and tools for empowering communities towards more resilient livelihoods through agricultural biodiversity-based solutions.
2. Guide the implementation of the IFAD-EU NUS Project for the next three years through development of a robust methodological framework.

Specific objectives

3. Enhance the scientific understanding of the role played by agricultural biodiversity in resilient and nutrition-sensitive production and food systems.
4. Share experiences applying approaches, methods and tools to assess, document, monitor, conserve and manage stress-tolerant varieties of traditional crops for more effective deployment in value chains and resilient livelihood strategies.
5. Understand how best practices on climate change adaptation are influenced and managed by farmers according to gender and other social factors and how these can be further strengthened and promoted through the Project.
6. Explore mechanisms and processes managed by rural communities (including indigenous people) for the sustainable conservation and use of agricultural biodiversity and how these can be further strengthened through the Project.
7. Identify actions for strengthening the capacity of poor and vulnerable groups to deal with climate risks within a holistic value-chain approach and other efforts meant to build capacity of national agriculture research systems in dealing with these themes.
8. Design a process by which the Project will engage with policy makers to achieve policy change for long lasting impact.

Opening remarks

Ann Tutwiler

Director General
Bioversity International
Maccarese, Italy

Welcome to all of you. It is great to have you here and great to meet the partners who are going to be involved in this Project with us. This Project is an important area of work for Bioversity International. We are looking forward to the outcomes of this inception workshop and the results of the Project's implementation over the next three years.

I will say a little today about Bioversity International's strategy. We have four high-level objectives, which we shorthand as consume, produce, plant and safeguard. These mean basically 1) to consume biodiversity for healthier diets, 2) to produce with biodiversity for improving productivity, improving livelihoods, and increasing resilience, 3) to plant a diversity of materials, making the seed and planting material available to enable meeting these needs for consumers and for producers, and finally 4) to safeguard biodiversity either *in situ* or *ex situ*. Under these high-level objectives we have developed three initiatives. The first initiative links the notion of consuming a more diverse healthy diet with production systems that underpin more diverse healthy production, healthy diets and healthy production systems. The second initiative links the notion of helping produce more diversified farming systems and more diversified landscapes with providing the appropriate planting materials to farmers to achieve that effect. Finally the third initiative links the idea of providing appropriate planting material with identifying what is appropriate planting material that needs to be safeguarded in the wild, on farms or in *ex situ* situations.

When people ask me: What crops do you concentrate on at Bioversity International? I tell them that we focus on neglected and underutilized crops. These are crops that in the future will be more nutritious, more resilient and better adapted to climate change and for these reasons they are core to achieving our institutional objectives and are integrated into all our initiatives.

I wish to highlight that participatory approaches are fundamental to pursue our goals at Bioversity International. We are working directly with farmers, farming cooperatives, and farming organizations, to ensure that we are not just delivering research but actually working with farmers to develop that research in a participatory way. This is a unique way of working within the CGIAR system and is one of Bioversity International's strong suits. Work on biodiversity can become very micro, working with one particular community and one particular crop. One of the outcomes that it would be great to see emerging out of this Project is high-level thinking on how we can take the lessons that we are learning and the methodologies, tools and materials that we have developed and scale up these approaches. We will not be successful if we are only improving the lives of people who are directly engaged in this project. We need to make sure that what will come out is something we can take to governments, extension agencies, development organizations, farmers' organizations, actors and partners who can help getting these methodologies, tools and best practices mainstreamed into the wider community.

José Manuel Capitan

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Thank you very much for inviting us to participate in this interesting Conference that is going to happen in next three days. I work for the European Union (EU) Delegation in Rome which is the delegation in charge of working with the UN Organizations here in Rome (FAO, WFP, and IFAD) and also Bioversity International, with whom we have been linking our work. This project is quite interesting for us because it is focused on many areas that we are supporting and giving great importance at the EU - nutrition, climate change and biodiversity. These areas are great priorities for us, on which we will be focusing in the coming years, without any doubt. For example, for nutrition recently we have been co-organizing and co-funding the International Conference on Nutrition that happened in November at FAO*. We have a big commitment from our previous commissioner to reduce wasting and stunting for seven million children. We are also integrating nutrition in all our policies and all our documents of work at country-level. This reflects the importance we give to this topic. The other topic that the Project will be following is climate change, which is again a top priority for us. We are in a very important year for climate change. We have the conference in Paris that will happen in December - the COP21† - which is a key meeting that will have big repercussions in coming years. Considering the importance of climate change for us, we estimate that 20% of our whole EU budget will be allocated to climate relevant actions. In discussing agriculture and climate change, our common agriculture policy in Europe has a lot of measures that try to increase the sustainability of agricultural products. We are also working on mitigating climate change in Europe. The European Developmental Cooperation also partners with 60 countries all over the world that have food security, nutrition, and sustainable agriculture as focal sectors. Finally, the other area where we are working is diversity in agriculture. We the EU recognize the importance of having diverse agricultural systems. We consider that agricultural systems vary according to different conditions and we think many lessons can be learned from traditional farming systems. We are placing a lot of emphasis in supporting diverse agriculture assistance in our funding strategy and in our development interventions. Finally, I would like to say, the Project will work mainly in three countries: Mali, India and Guatemala. I would like that you take advantage of the EU delegations in these countries that work in agriculture. Do not hesitate to contact our delegations in order to link, to make a more relevant programme and find synergy with this important research.

Antonella Cordone

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My name is Antonella Cordone and my role at IFAD is Senior Technical Specialist on Indigenous Peoples Issues. I am happy to be here and to learn about this work. I am particularly looking forward to learn how we can strengthen our partnership. I really hope these days will help us to understand better how to work together, not only at IFAD but more and more in the field. We were in New York last week for the UN Permanent Forum on Indigenous Issues and there were so many issues coming up - I see many linkages that we can make on this front. I am also very interested in monitoring resilience and was particularly struck last Friday by an interesting presentation given at IFAD by the Asian Indigenous Peoples Pact on issues covered also by this Conference. In particular I was happy to learn of new tools they have developed on how to monitor resilience at community level (the Indigenous Navigator). I can see immediately that there are lots of good opportunities on the table that we can explore together through this new IFAD, EU and CCAFS supported effort.

* Second International Conference on Nutrition (ICN2), Rome, Italy, 19-21 November 2014
† 2015 United Nations Climate Change Conference, Paris, France, 30 November to 12 December

Phrang Roy

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My name is Phrang Roy and I am the coordinator of the Indigenous Partnership for Agrobiodiversity and Food Sovereignty. The aim of the Partnership is to build a platform where science and traditional knowledge can work together around the themes of interests and knowledge of indigenous peoples. I just came yesterday from New York from attending the UN Permanent Forum on Indigenous Issues. For one who has worked all these years on indigenous issues, I was very pleased to see that indigenous local food systems have now been scaled up to the attention of many organizations. It is a pleasure to see IFAD and FAO pushing for local indigenous foods to be looked upon more seriously. During discussions held at the UN in the 2015 Year of the Soil, indigenous peoples showed many examples of how they have been protecting and safeguarding the soil through their cultivation systems. The international board has agreed that scaling up what indigenous people are doing is something quite exciting and can also create a future for us. The Indigenous Partnership together with Slow Food will be holding the Indigenous Terra Madre in North East India later this year. We will be having about 500 delegates attending from all over the world. The theme is 'The Future We Want from Perspectives of Indigenous Peoples'. The area where we will be having the conference is inhabited by two native matriarchal communities. One of the important issues that we are working on, together with McGill University and the National Institute of Nutrition of India, is looking at matriarchal communities and peoples and the role that they have played in terms of nutrition status. We are now a partner of this IFAD-funded programme in the hope that together we can unite our abilities to strengthen the diversity that is entrusted in these peoples.

Amadou Sidibe

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My name is Amadou Sidibe. I am from Mali, West Africa and I am the head of the Genetic Resources Unit of the Institut d'Economie Rurale (IER). On behalf of the Director General of IER, I have the pleasure to welcome you to the International Conference on *Agricultural Biodiversity to Manage Risks and Empower the Poor*. It is a great pleasure for me to participate in this Conference, with the possibility of carrying out a deep analysis of the negative effects of climate change and to identify how agricultural biodiversity can be used to address these effects. Food availability in West Africa in general, and particularly in Mali, depends mainly on pearl millet, corn, sorghum, rice, fonio, and coffee productions. Mali is considered as the centre of diversity of pearl millet and sorghum. On farm conservation and local seed systems are very important for the use enhancement of these species. Despite the importance of the local varieties of millet, sorghum, rice, and fonio, these crops are being severely affected by genetic erosion due to climate change and anthropogenic factors. It is of critical importance to safeguard the genetic resources at the farm level as these are the backbone of rural agricultural development and empowerment of all stakeholders. It is thus very much appreciated that Bioversity International, FAO and the International Treaty are committed to preserve and manage agricultural biodiversity, including neglected and underutilized species. Our country is very much interested in this Project and I am happy to say that IER through its Genetic Resources Unit has always been deeply engaged in the conservation of plant genetic resources for food and agriculture. For the last 15 years, my unit has been receiving technical and financial support from a number of agencies, including Bioversity International and IFAD to further our work on the conservation and management of agricultural biodiversity at the rural community level. In Mali we are deeply involved in studying agricultural biodiversity, conserving plant genetic resources and improving access to good quality seed. We do this work involving all stakeholders in the process. We have confidence that this meeting provides a continuity for ongoing work and adds further knowledge on ways to better manage risks associated to climate change.

Ashis Mondal

Director and Managing Trustee
Action for Social Advancement (ASA)
Bhopal, India

My name is Ashis Mondal and I represent Action for Social Advancement, which is an NGO working from Bhopal. It is a great pleasure to be here and I am thankful to Bioversity International and the partners for providing us this opportunity to be partnering with them. We are indeed very happy and proud to be associated with an institution like Bioversity International, and other esteemed organizations. ASA mainly operates in Central and Central-East India, covering four provinces: Madhya Pradesh, Chhattisgarh, Jharkhand and Bihar. This is a very important part of India in terms of agricultural biodiversity because the majority of India's indigenous people live here. Of the target group we work with, counting about 130,000 families or 1 million people, around 80% are indigenous. We call the work that we do “agriculture-based livelihood promotion”. We primarily focus on conservation and development of water resources. We also do biodiversity and agricultural biodiversity conservation work, organizing the community in different forms, capacity development, and linking with the market, trying to establish value chains. Conservation of agricultural biodiversity is very important in our work, because it means food security. The indigenous people do mixed cropping, which is one of the major strengths that they have today. In adverse climate conditions they can still manage their food security. What was considered a disadvantage some years ago is turning out to be a benefit. Our major realization is that not enough is being done to promote neglected and underutilized crops. We need to make this concept more robust, so that there is linkage among the individual partners to take it to the next level. We need to do more rigorous work. We need to have strategies and should target something like 10 years down the line and try to achieve it in a very systematic manner. We are people who come from different facets of life, we are researchers, extensionists, etc. Let us work for developing an agriculture which is robust enough to mitigate the effects of future changes.

Silvana Maselli

Professor and Researcher
Universidad Del Valle de Guatemala
Guatemala, Guatemala

My name is Silvana Maselli. I am a plant genetic resources teacher and researcher at Universidad Del Valle de Guatemala. We want to thank Bioversity staff in Italy and in Costa Rica, for inviting us to participate in this important project. We are very happy to be here, and we hope to contribute with our experiences to this Project.

Stefano Padulosi

Senior Scientist
Bioversity International
Rome, Italy

Welcome everybody, I am really excited for this Conference. We are coming from at least 15 years of work on neglected and underutilized species (NUS), and I am really thrilled by the opportunity to reach higher research ground with this Project.

This Conference intends to capitalize on the launching of this IFAD-EU NUS Project for sharing experience on the different topics it covers. The title of the Project ‘Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk’ captures all the important keywords and underlines the type of interdisciplinary collaboration this initiative intends to promote. We are very excited by the opportunity to develop methodologies, approaches and tools together with the partners and to reinforce collaborative networking around the different themes covered by the Project. This Conference aims to achieve a sharing of knowledge of lessons that we have learned in our work on how rural communities can be empowered through agricultural biodiversity to address the great challenges of the day, namely: climate change, poverty and food

insecurity. How can we strengthen the capacities of rural communities through agricultural biodiversity-based solutions? This is really the core of our business and why we are here.

Specific objectives of the Conference are: 1) Enhance the scientific understanding of the role played by agricultural biodiversity in resilient and nutrition-sensitive production and food systems. 2) Share experiences on approaches, methods and tools to do many things within a resilient framework: How to assess resistant crops? How to document and monitor them? How to conserve these resources? We heard earlier from our partners that traditional crops play an important role in making food production resilient so, how do we conserve these varieties and species? How do we manage them? And how do we link these traditional crops with markets? At the end of the day, it is not enough just to identify resilient species, they also need to generate income as this is the key to the whole livelihood system. We will discuss over these three days the 3) mechanisms and processes managed by communities for the conservation and sustainable use of agricultural biodiversity. Another key aspect of the Project and this Conference will be to look at 4) how to strengthen capacities of communities and particularly vulnerable groups for dealing with climate risks within a holistic value-chain approach - which I will come back to in a minute. We are looking to enhance the preparedness of farmers and other value chain actors to deal with climate variability and associated risks. We are particularly focusing on strengthening capacities of community-based organizations. In India, we have been involved in creating self-help groups, following an approach introduced 20 years ago by IFAD and which is working very well. We will also be having a special focus on gender. We are keen on this because we realize that women play a strategic role in making livelihood systems resilient. Women and gender aspects have been marginalized in research and we want to fill a gap of knowledge in this area. In the Project we will be developing methods, approaches and tools and we will test their success but, as Ann mentioned earlier, we also need to scale up. We will do this by 5) creating an enabling policy environment. The engagement of policy-makers right from the beginning is very important to have a wider reaching impact. Building capacity is another key action, which I have already mentioned. Networking is also key for bringing people together. A gap exists between knowledge that is held by the people and knowledge held by scientists, as they are working in different spheres. Bridging this gap and creating complementarity in these knowledge domains is very important, which we do through networking and creating platforms.

The novelty of this Project is the interdisciplinary - bringing together different disciplines. This is really important to get sustainable results and impact. We are linking production systems - work related to adaptation, seed availability, and selection of adapted varieties - to the food system. It is not enough to develop improved varieties if we do not have the connection to nutrition in terms of quantity (food security) and quality. So many underutilized crops have an excellent nutritional profile that we want to leverage. Our work has also demonstrated that these crops can be an instrument of empowerment for vulnerable groups, including women.

The Project will be following what we call “a holistic value chain approach”, that is focusing along and at each segment of the value chain of target crops in order to enhance cultivation, post-harvest and value-addition operations and technologies, to make traditional underutilized crops more attractive, especially to younger generations, to increase demand, and to raise awareness of consumers and decision-makers on the nutritional benefits and resilience of these species. In the end, this holistic approach is set to strengthen the five livelihood assets, namely human, natural, financial, physical and social. The Project will be exploring how to reinforce these five capitals to make the whole livelihood system more resilient and at the same time we shall work to harness the synergy among different but highly complementary disciplines like plant genetic resources, agriculture, nutrition, climate change and marketing so as to achieve a profound and long lasting impact.

NUS are central in our strategic approach. Their resilience to climate change and their high nutritional values have been long appreciated by rural communities and have finally also been documented in many scientific papers. We are also interested in other crops but for us it is a priority to work on NUS because these resources are fast disappearing due to their marginalization by mainstream markets. The rise in temperature will be highly challenging, especially for the poor. For instance in India by 2050 the rise of 2 degrees centigrade will mean that farmers will be unable to continue to grow rice in many areas. The crop for the future in those areas will be the so-called

minor millets. To that regard it is interesting to note that the Indian government has enacted a new Food Security Bill in 2013, which will allow farmers that grow millets to sell them to the public procurement programme, just as they do now for rice and wheat. This was made possible thanks to an amendment to the Public Distribution System. This new law is a huge opportunity for this country, but also for the Project because India is opening up its research and development to minor millets and we thus have a great opportunity to share best practices on how to safeguard, cultivate, market and promote these crops. We also hope that such a policy would inspire other countries to develop similar supportive mechanisms for promoting use enhancement of hundreds of nutritious and hardy species currently marginalised by mainstream agriculture and markets.

There are so many other linkages that we will be looking into with this Project, including links to culture. To that regard, I would like to stress that today we are not just losing crops, we are also losing culture, which is going to negatively affect the identity of people in every country around the world. Today more efforts need to be deployed in support of on-farm conservation and management of agricultural biodiversity. *Ex situ* conservation is widely covered today through a network of 1,740 *ex situ* germplasm collections. But the dynamic and highly adaptive process of *in situ* or on farm conservation is very poorly covered. This is a great limitation of research and development that we need to address.

At the end of all these interventions we are looking at a resilient system, not just resilient cultivations but also resilient livelihood system. It's a really big endeavour but in each of the thematic areas we have already several methodologies available which we will examine, improve and deploy in the Project target sites. At the end of three years we are very keen to see what has been the change we have made in these three countries and also the validation of the methodology that we are developing and testing out.

Expert Contributions

Session I

Agricultural biodiversity and resilience in livelihood systems

Innovative approaches in climate change adaptation

Jacob van Etten

Bioversity International (Costa Rica)

Globally, climates will remain unstable long after atmospheric carbon dioxide peaks. So climate adaptation in agriculture is not a one-time effort; agricultural practices will need to be updated recurrently. Climate-smart agriculture needs a quick-paced process of continuous, massive discovery of locally appropriate solutions. The good news is that, as mobile telephone coverage expands in rural areas, simpler, more data-rich and cost-efficient information-and-communications-technology-based systems become possible. Also, new sensor technologies can help to track local climates with more detail, which in turn helps to compare diverse options across different places, taking into account the diversity of agricultural systems and local cultures.

Bioversity International has developed a novel "farmer citizen science" approach, taking advantage of these technological possibilities. In this approach, each farmer tries and ranks a small number of technologies (for example, crop varieties or management practices), characterizes local conditions with cheap, reliable weather sensors, and shares information by mobile phone. The resulting information serves to create empirical, location-specific advice on climate-smart practices for farmers, helping them to constantly adapt to shifting climatic and social conditions.

The first results of experiences with this new approach show that farmers are highly motivated to participate, that the approach is relatively easy to implement and upscale and that the resulting information is of good quality. Remaining challenges are the ongoing construction of a user-friendly platform that standardizes data to make it globally comparable and accessible and the training of agricultural researchers, extension agents and farmers in using the approach.

Key words: climate change adaptation, crop improvement, information, management practices, participatory methodologies

Agricultural diversification for climate change risk management in smallholder agriculture systems

Maarten van Zonneveld[1]*, Abigail Fallot[2], Marie Turmel[1]

[1]Bioversity International (Costa Rica)
[2]Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD, Costa Rica)

Agricultural diversification is thought to be an effective measure to reduce production risks related to climate change for individual smallholders in order to improve overall production stability and keep up with global food demand under climate change. Although diversification of crops and production systems is an established strategy for many smallholders today, crop and system switching under the transformative characteristics of climate change brings in new practices and technologies and additional costs and risks. New crops require farmers and other value chain actors to overcome initial learning and investment. They can also introduce hosts of infectious diseases, or have uncertain markets. We carried out a review to understand under which agro-ecological and socio-economic conditions agricultural diversification will be an effective climate change adaptation measure for smallholders.

The realities of smallholders are complex and their production systems and access to resources differ according to local contexts. Rather than looking at specific adaptation options like agricultural diversification, climate smart agriculture policies and programs could be more effective when providing flexible options and alternatives to farmer households, enabling them to define the most appropriate measures. This approach allows combining agricultural diversification with other adaption options to develop integrated responses to climate change. We suggest that some of the factors limiting diversification can be overcome by providing smallholders and associated organizations access to information on management and seed availability of crops, trees, and production systems, and also by promoting a shared understanding of trade-offs and synergies within diversification strategies. Portfolios of local adaptation options can be prioritized using participatory action research involving different stakeholder groups. This approach enables the selection of crops and systems, considering farm household needs and ensuring that these choices are linked to local food systems and value chains. Crop and tree evaluation programs including on-farm experimentation enable further testing of potential species for specific locations.

Key words: climate change adaptation, diversification, information, participatory methodologies

Food and nutrition security, adaptive capacity and resilience to climate change in Central America: A comprehensive participatory approach

Leida Mercado

Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE, Costa Rica)

The effect of global warming on food production is resulting in severe food insecurity in regions across the globe. In Central America, for example, more than half a million households are suffering from food insecurity as a consequence of the 2014-2015 drought. Food-based approaches that focus on dietary diversification (e.g. promoting home gardens, poultry production, and capacity development) are effective strategies for improving food security and nutrition. However, dealing with climate change and variability demands more comprehensive approaches as well.

The Mesoamerican Agroenvironmental Program (MAP), a platform that links research, education and extension, seeks to improve food security and climate resilience of small landholders in Central America by: i) promoting innovations to increase productivity and diversification of home/community gardens and farms, including the use of trees, ii) strengthening capacities using farmer field schools, a participatory tool that facilitates integration of local and scientific knowledge, iii) improving HH planning capacity by developing home garden and farm plans, iv) fostering more participation of women and youth in production decision-making, v) advancing the sustainable use of agricultural biodiversity through the establishment of germplasm/seed banks and local mechanisms for germplasm exchange, and vi) strengthening capacity of value chains that link local farmers to a variety of stakeholders at different geographical scales.

The preliminary results of MAP´s approach in Trifinio and Nicaragua show a high level of adoption of the innovations promoted in order to intensify and diversify production, more vegetables and poultry available for consumption at the household level, a wider participation of different household members in the production of diverse and nutritious food, and strong relationships between farm size, and women's' participation in decision-making with food security.

Key words: value chains, capacity development, climate change adaptation, food security, nutrition, gender-responsive methodologies, home gardens, participatory methodologies

Big data on small farms: Sources and drivers of food security of smallholder farmers

Mark T. van Wijk

International Livestock Research Institute (ILRI, Kenya)

To formulate effective policies adequate information on how different policy options affect the complex issues surrounding food security and sustainable development is needed. One key complicating factor for generating this adequate information is the large variability in smallholder farm households across and within sites.

I have applied two steps that are essential to make progress in this research area: First, bringing together farm household characterization data from a wide range of regions has provided an immensely rich database to derive descriptions linking food security status and land use to the socio-economic and biophysical environment of smallholder farmers. Second, I have developed farm household performance indicators that can be calculated based on the diverse information available. I presented a food security indicator for the individual farm household level based on production data and applied it to assess the potential for agricultural based activities to supply enough energy to feed the family through food and/or cash oriented activities.

Results were shown on how these data and this indicator are used for:

- Quantifying the relative importance of on- and off-farm activities for household level food security across a wide range of farming systems and farm households in sub Saharan Africa
- Identifying and quantifying the effects of key determinants/drivers of food security
- Quantifying threshold values of these key drivers that determine the switch between food insecurity and food security

I also show how these analyses can be used for risk assessments and analyses of causes and effects of on-farm diversity of activities. This work has led to an integrated set of tools for rapid farm household characterization that, by combining survey tools and analyses in one integrated framework, drastically reduces the time needed for characterization, intervention analysis, and assessment of agricultural interventions.

Key words: value chains, farm production, food security, indicators, livelihood assets

Monitoring resilience & indicators

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Resilience in socio-ecological production landscapes (SEPLS) is defined as the ability of these systems to absorb or recover from various pressures and disturbances – in terms of both ecosystem processes and socio-economic activity – without lasting damage and at the same time use such events to catalyse renewal and innovation. Building on the premise that SEPLS are too complex for resilience to be measured in any precise manner, Bioversity International, in collaboration with the UN Institute for the Advanced Study of Sustainability (UNU-IAS), has developed a set of 20 indicators designed to capture different aspects of key systems: ecological, agricultural, cultural and socio-economic. These indicators do not aim to provide hard, quantifiable numbers to measure resilience, but rather focus on a community's own perceptions. By encouraging community members themselves to reflect on landscape and seascape resilience and how it can be improved, the indicators can give them a greater sense of ownership over management processes, hopefully leading to more lasting sustainability. Periodic use of these indicators enables monitoring of progress towards sustainable management objectives and identification of priority actions for local innovation and adaptive management. The indicators are

to be used flexibly and can be customized to reflect the circumstances of each particular landscape or seascape and its associated communities. The resilience indicators' framework has been tested in more than 20 countries around the world across different ecosystems. A couple of case studies were described during the presentation.

Key words: indicators, participatory methodologies, resilience, socio-ecological production landscapes and seascapes.

Documentation and monitoring agricultural biodiversity for adaptation to climate change

Stefano Padulosi[1*], Gennifer Meldrum[1], Wilfredo Rojas[2], Oliver King[3], and Sajal Sthapit[4]

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The simplification of agricultural production systems is highly concerning for the future of food and nutrition security for the Planet. Diversification of species and varieties is embedded in farmers' strategies to secure sustainable food production, create income options, fight pests and diseases, promote adaptation to abiotic stresses and support various ecosystem services. Scientific literature published in recent years has amply demonstrated that the narrower the crop diversity portfolio managed by farmers, the more vulnerable their livelihood. Documenting and monitoring diversity grown on farm is helpful to farmers to assess the spectrum of options they can rely on for building a robust climate change coping strategy. Whereas users have fairly good access to information related to *ex situ* gene banks, extremely poor is the understanding of what is currently conserved on farm and the extent of what is at risk or already lost. We argue that this condition requires the development of a new set of approaches, methods and tools to assess the status and dynamism of crop diversity on farm to prevent diversity from being lost and support its management for climate adaptation and other livelihood purposes. Over the last four years, Bioversity International and partners have been developing and testing a community-based participatory documentation approach with a special attention to neglected and underutilized species. The presentation will share the methodology applied in Bolivia, India and Nepal, present data and discuss lessons learnt. Authors will also offer their perspectives on how such a methodology could be leveraged for moving forward towards a global information system for agricultural biodiversity – that currently does not exist and that could be used to monitor the status and trends of these resources on farm to guide their proper conservation for the benefit of future generations.

Key words: agricultural biodiversity, documentation and monitoring, *ex situ-in situ* linkage, information, participatory methods, climate change adaptation.

Session II

Holistic approaches for sustainable and nutrition-sensitive food systems

Agricultural biodiversity to improve nutrition using a nutrition-sensitive food system approach

Gina Kennedy

Bioversity International (Italy)

One of the world's greatest challenges is to secure universal access not only to enough food, but healthy, safe, and high-quality food that is produced sustainably. Currently, more than 800 million people are hungry worldwide. More than 165 million children under five years of age are stunted. Of these children, 80% live in just 14 countries. Micronutrient deficiencies, otherwise known as "hidden hunger", undermine the growth, development, health and productivity of over two billion people. At the same time, across the developed and developing world, an estimated one billion people are overweight and 300 million are obese.

Moving towards sustainable diets is a key challenge of the 21st century. Sustainable food systems and diets need to be diverse and nutritionally adequate. Sustainable food systems can maintain or even enhance agricultural productivity. Such systems sustain the environment and ecosystem services, boost resilience, and guarantee the adequate intake of essential nutrient and non-nutrient health-promoting food elements. Such systems can make local food biodiversity affordable and available for low-income rural and urban households, all year round, in sufficient quantities, and in culturally acceptable forms – all critical ingredients to improving dietary quality. Maintaining the agricultural biodiversity resource base within local food systems is critical to achieving improvements in dietary quality and food system sustainability, especially given that 70% of the world still relies on locally-produced food. Lack of investment and attention to agricultural and tree biodiversity is a critical limitation for human nutrition and health, particularly in the developing world, where diets consist mainly of starchy staples with insufficient intakes of nutrient-rich foods, such as animal products, legumes, fruits and vegetables. Sustainably diversifying agricultural production and associated markets and processing systems, as well as raising consumer awareness to increase year-round supply and demand for nutrient dense foods is the goal of the nutrition-sensitive food system approach.

Key words: dietary diversity, local foods, nutrition, sustainable diets, value chains

Indigenous peoples, crop diversity and livelihoods

Phrang Roy

Indigenous Partnership for Agrobiodiversity and Food Sovereignty (Italy)

The *Rio+20 Conference on Sustainable Development* held in June 2012 called for the creation of a world that is “just, equitable and inclusive”. As the world searches for a meaningful way forward from the current climate change and food security crises, concerned citizens are turning a thoughtful gaze toward indigenous peoples. Today the world’s remaining biodiversity is concentrated on their lands. Developing a deeper understanding of the world view and practices of indigenous communities and forming a partnership with them can help the CGIAR system to favour those at the margins of mainstream society.

Over the years, development initiatives have learned of the need to ensure a greater participatory, listening and learning approach between the knowledge systems of indigenous communities and that of the scientific community. Bioversity International is currently hosting the Indigenous Partnership for Agrobiodiversity and Food Sovereignty (Indigenous Partnership), which aspires to build bridges between indigenous networks and the scientific community. It is supported by several well-known indigenous organisations, Bioversity International, Slow Food International, and the Centre for Agroecology and Food Security, Coventry University, UK. This presentation told the story of how the Indigenous Partnership and its partners are providing simple but innovative mechanisms for indigenous communities to rediscover their custodian farmers, revive their foraging of wild edibles, build agricultural biodiversity networks and promote diverse indigenous food systems as entry points for value addition, institution building and knowledge sharing at the local economy level. It concluded that a climate change risk management agenda that fully involves indigenous peoples (with their local knowledge and economies) has benefits that are not realized if only government, research institutions and/or the private sector are involved.

Key words: agricultural biodiversity, food security, indigenous peoples, local and scientific knowledge, networking, sustainability

The importance of agricultural biodiversity in promoting nutrition-sensitive agriculture

Juliane Friedrich

International Fund for Agricultural Development (IFAD, Italy)

IFAD is committed to make its investments in rural farm households more nutrition-sensitive, applying a nutrition lens in projects addressing agriculture and rural development. In times with growing complexities, there are no longer simple solutions and short cuts. Agricultural biodiversity is an essential tool to achieve dietary diversity as a corner stone for good nutrition – not only to reduce undernutrition but also overnutrition. There is still the expectation that increased production and increased income automatically improves the nutrition situation. Unfortunately, this automatism does not exist. We need to be intentional in what we are doing and this starts with assessing the causes for undernutrition. Eating habits and feeding patterns are not necessarily guided by nutrition concerns. Even in poor communities, we can observe that the little money a household has might be used for so-called junk food. There are various reasons for this: it is modern, which implies it is good, it is convenient, and it also satisfies the tastes people are tuned to, namely salty, sweet, and fat.

Food is more than a commodity to fill the stomach. Taking examples from indigenous peoples, food has also emotional, mental and spiritual aspects of health, healing and protection from disease. Nevertheless, traditional and/or local food is considered as inferior and turning to traditional food like wild fruits, roots and tubers in times of food insecurity is an indicator for being in a 'bad situation' without realizing that this food might have a higher nutritional value than the food consumed in 'good times'. In this presentation I will share stories from the field, including the example of quinoa. Whilst quinoa is now a very popular food among people looking for healthy food options in the North, quinoa is no longer available and affordable in the South, as I discussed for Bolivia. These examples underlined the importance of agricultural biodiversity for nutrition – one cannot go without the other.

Key words: agricultural biodiversity, indigenous diets, nutrition, nutrition-sensitive agriculture, traditional foods

Holistic approach for enhancing the use of traditional crops: Lessons from India

E.D.I. Oliver King

M.S. Swaminathan Research Foundation (MSSRF, India)

Despite significant progress in its Gross Domestic Product, India is among the countries with the most malnourished children, thus facing a significant nutrition challenge. Micro-nutrient deficiency in infants and young children can lead to impaired psychomotor development, coordination and scholastic achievement, as well as reduced physical activity. Small millets (*Eleusine, Setaria, Panicum, Paspalum*) are sources of micro nutrients such as calcium, iron, and folic acid, in addition to being climate hardy crops. The most popular minor millet across India is finger millet, which is cultivated over nearly 1.6 million hectares with annual production of 2.4 million tonnes and productivity of around 1,534 kg/ha. The area under other minor millets is slightly smaller (1.1 million ha) with notably lower productivity (635 kg/ha; 0.7 million tonnes/year).

The area under minor millet cultivation in India has significantly decreased since the 1950s, which is ascribed to a number of agronomic and socio-economic aspects: Lack of suitable improved varieties and cultivation practices, poor extension systems for yield enhancement and crop promotion, lack of specific post-harvest and processing technologies for small users, low economic competiveness, poorly organized value chains, lack of attractive, modern food recipes, and insufficient awareness of nutritional value and income opportunities.

With the support of IFAD and Bioversity International, these challenges were addressed in a holistic '7C' approach over the last decade, involving custodian farmer communities, State government, research and development institutions, and the private sector. This presentation documents the experience and the key outcomes of applying the 7C holistic approach:

- **Chronicling:** Document farming systems and traditional knowledge in Peoples' Biodiversity Registers; collect and characterize promising landraces and farmers varieties; establish community weather stations and village knowledge and resource centres.
- **Conservation:** Establish linkages between *in situ* conservation, community seed banks, and National gene banks; develop incentives (market and non-market) for conservation/cultivation, recognize the conservation of traditional varieties; encourage registration of farmers' varieties under the Protection of Plant Varieties and Farmer's Rights Act; strengthen the network of custodian farmers; conduct seed fairs.
- **Cultivation:** Build capacity of farmers in quality seed production; develop promising adaptable varieties with climate resistance and nutritional value; develop and disseminate improved agronomic practices through participatory research; promote small farm mechanization; ensure access to credit.
- **Consumption:** develop innovative new recipes through partnership with food and nutrition research institutions and the private sector; conduct nutrition assessment of important varieties; promote community food fairs; promote nutrition literacy and education; include millets in public distribution systems, integrated child development schemes and other nutrition programmes.
- **Commerce:** Establish diversified value chains in favour of neglected and underutilized species; develop and promote products based on nutritious traits; partner with socially responsible private sector actors; encourage the development of processing equipment with a gender-sensitive approach.
- **Collectives:** Mobilize millet farming communities as self-help groups, producer groups and collective entrepreneurs; encourage them to work with the private sector to meet required scale.
- **Communication:** Build media relationships and communication methods for popularizing millets and products to cater to the needs of various stakeholders.

Key words: agricultural biodiversity conservation, capacity development, holistic approach, neglected and underutilized species, nutrition, policy, value chain development

Green entrepreneurship: Beyond value chains to landscape approaches

Willy Douma

Humanist Institute for Co-operation with Developing Countries (Hivos International, The Netherlands)

Governments still adopt high input mono-cropping as a key strategy to food security. As a consequence, mono-cropping of commercial crops has increasingly replaced traditional and diverse diets, directly affecting rural consumers and producers.

Hivos' 'Green Food' programme aims to contribute to sustainable diets of food-insecure rural and semi-urban households (men and women) by developing scalable and replicable solutions. Key to finding solutions is creating a vibrant, sustainable and viable link between plates and farms. This is only possible if the policies are supportive and only viable if the market players have a shared interest. While developing inclusive value chains is important, we started to realise that diversity increases are limited and improvements in nutritious food security slow. For this reason, Hivos' strategies go beyond value chains towards developing 'landscape' level approaches, where stakeholders meet, their voices are heard and sharing observations leads to co-created solutions.

Our current programmes include 1) collaboration with the growing counter-movement of citizens, businesses and organisations opting for diversity, robustness and transparency 2) delivering proof of concept of approaches that increase local demand for diversity and remove barriers to more diverse production 3) influencing relevant policy frameworks based on growing knowledge and insights.

In India we co-initiated the Revitalizing Rainfed Agriculture Network, a coalition of over 180 civil society organisations, research institutions, policy-makers and donor agencies. This network co-creates proof of concept in 'comprehensive' pilots. In East Africa we innovate in coffee-based landscapes through a public-private partnership with ECOM coffee company to regain vitality in the coffee sector. Triggers for change include diversification through dairy and horticulture production, while also introducing biogas digesters to secure a sustainable energy and fertilizer supply. Worldwide we collaborate with the 'agricultural biodiversity community' to build open source seed systems (institutions) that aim to tackle the issue of farmers' access to preferred seeds. Initial results show promising changes towards more diversity, new functional institutional mechanisms and openness for next steps.

Key words: diversification, multi-stakeholder platforms, networks, nutrition, policy, private sector, seed systems, value chains

Communities' perspectives & participatory approaches

Silvana Maselli

Universidad del Valle de Guatemala (Guatemala)

In 2014, a longer than usual dry period (heat wave) took place in Guatemala during the expected rainy season (July-August). The Ministry of Agriculture and Famine Early Warning System of the United States Cooperation Agency reported losses of 80-90% of maize and 70% of the bean crop in nine Departments of Guatemala, where both crops are essential for food security.

We present results from the project entitled 'Establishment of a preliminary network of community seed banks in vulnerable regions of Guatemala to provide seeds in the event of natural disaster' that is supported by the Benefit Sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture. The results provide an example of how participatory approaches and community seed banks can improve communities' ability to face climate change and food security. During the project execution, three villages from Chiquimula and one from Zacapa suffered crop loss due to the heat wave. The Seed Bank Committee in Olopa, Chiquimula,

which was established and trained by the project, was ready to distribute seed among community members, who started their second bean sowing in September 2014 using the seed they had stored with the support of the project. Inter-institutional participation and coordination, as well as the trust gained with farmer´s groups were crucial for success.

Key words: conservation of plant genetic resources, capacity development, climate change adaptation, community seed banks, disaster recovery, drought, participatory methodologies, resilience

Gender and climate change and some thoughts on methodology

Seema Arora-Jonsson

Swedish University of Agricultural Sciences (Sweden)

The social effects of climate change have gained attention in academic and policy literature. In the limited literature on gender and climate change, two themes predominate: women as vulnerable or virtuous in relation to the environment. Two viewpoints are regarded as obvious: women in the South will be affected more by climate change than men in those countries and that men (in general and especially so) in the North pollute more than women. The debates are structured in specific ways in relation to the North and the South. In my talk, I will trace the lineage of the arguments about women's vulnerability or virtue to previous discussions about women, development and the environment and examine how they recur in new forms in climate debates. Following on some of these ways of thinking, I highlight how a focus on women's vulnerability or virtuousness deflects attention from inequalities on the ground and in decision-making. By reiterating statements about poor women in the South and the pro-environmental women of the North, these assumptions also reinforce north-south biases. Generalizations about women's vulnerability and virtuousness can lead to an increase in women's responsibility without corresponding rewards. There is need to contextualize debates on climate change to enable action and to respond effectively to its adverse effects in particular places. I ended with some thoughts on methodology.

Key words: climate change, gender, methodology

Session III

Managing conservation and use of agricultural biodiversity

Let the locals lead: Empowering the poor to manage agricultural biodiversity and adversity

Bhuwon Sthapit

Bioversity International (Nepal)

On-farm conservation efforts are not sustainable without local efforts and there are considerable gaps globally in how to consolidate local efforts on the ground. Roles of farmers as users, conservers, innovators and promoters are considered important for supporting evolutionary breeding and on-farm management of local crop diversity. We tried to 1) assess whether empowering community and local institutions helps realize the dual goals of on-farm conservation and improved farmer livelihoods; 2) discuss key principles and practices that empower community and local institutions and 3) identify key indicators of empowered community and local institutions. We analysed experiences of two long term on-farm projects: 'Strengthening the scientific basis of in situ conservation of agricultural biodiversity on farm in Nepal', and 'Conservation and sustainable use of wild and tropical fruit tree diversity in India, Indonesia, Malaysia and Thailand'. We found that community empowerment is the key driver to achieving the dual goals of conservation and development. This can be achieved through the community-based biodiversity management (CBM) approach - a set of principles and practices by which communities enhance knowledge of local intraspecific diversity and improve traditional practices through continuous engagement in platforms of social learning that are led by community organizations. These platforms could benefit from a set of good practices, tools and methods that engage both men and women, poor and rich in collective planning and learning processes. This presentation illustrates some of the good practices from the CBM approach that are essential for empowering communities, promoting *in situ-ex situ* linkages, and managing adversity by mobilizing available genetic resources and participatory crop improvement. The paper puts forward CBM as a key strategy to promote community resilience and contribute to the conservation of plant genetic resources.

Key words: agricultural biodiversity, community biodiversity management, participatory methods, empowerment, on-farm conservation

Rete Semi Rurali: Collective action for sustainable use of agricultural biodiversity in farming systems

Riccardo Franciolini*, Ricardo Bocci, B. Bussi, and C. Pozzi

Rete Semi Rurali (RSR, Italy)

Rete Semi Rural (RSR), the Italian Farmers' Seed Network, was established in 2007 and now in 2015 consists of 34 associations. The commitment of RSR consists of supporting farmers politically and scientifically in the creation and dissemination of self- and truly sustainable organic farming systems. Until now seed policies and programmes have been inconsistent with practice and have not taken into consideration the variations that exist in European agriculture. The principles of an integrated seed system are full integration and recognition of formal and informal systems, as well as seed sector development approached in a pluralistic manner. RSR works towards innovative farming systems based on agricultural biodiversity, where decentralized and

participatory research plays an important role. The associated organizations have established long-term active collaboration with farmers, producers, consumers and research networks. RSR also represents a seed network including different stakeholders. This presentation will share experiences from RSR related to the construction of such a seed exchange network and will offer suggestions for improving the functioning and structure of this kind of network. More and more processes have been actively addressing the development and strengthening of social systems related to seeds. The emergence of new informal seed systems and the sustainable use of agricultural biodiversity are closely connected to the emergence of new social relationships. The heterogeneous membership of RSR facilitates the connection and partnership of social actors and encourages the emergence of informal seed systems.

Key words: agricultural biodiversity, conservation, informal seed systems, institutions, seed network

Incentive mechanisms to conserve agricultural diversity for private and public benefit, communities' livelihoods, climate-change adaptation and other ecosystem services

Adam Drucker

Bioversity International (Italy)

A fundamental conundrum is experienced in most developing countries today: How to safeguard the biodiversity maintained in the fields of the rural poor—which constitutes a national and global good for adapting to climate change and maintaining future options, food security and ecosystem health—whilst meeting those same people's development needs and rights? As many of the benefits of agricultural biodiversity management are public goods, markets alone are limited in the extent to which they can adequately reward farmers for managing levels of diversity needed by society. This has led to a call for the development of positive incentive schemes being specifically mentioned by the Convention on Biological Diversity's Strategic Plan for 2011–2020, Aichi Target 3.

While value chain development can facilitate the maintenance of threatened genetic resources, such a strategy has limitations in how much it can achieve. Challenges include a tendency to focus on a narrow range of traditional crop species with high market potential but not particularly at risk, high initial investment costs and uncertain long-term success rates, as well as displacement of other threatened genetic resources where successful.

A recently tested innovative solution to the public good provision dilemma is implementing 'rewards/compensation for agricultural biodiversity conservation services' (PACS) incentive schemes. Through the use of competitive tenders and in-kind, community-level rewards, these schemes have been shown to be a potentially effective complementary instrument for promoting the cost-effective maintenance of threatened genetic resources. They are capable of building on (rather than undermining) existing pro-social collective behaviour, as well as accounting for participatory justice and social equity considerations – such as facilitating the participation of women, poor and younger farmers. Up-scaling nevertheless requires urgent consideration of accompanying prioritization protocols ("what to conserve?"), conservation goal setting ("how much to conserve?"), participatory monitoring schemes and identification of agricultural biodiversity-relevant ecosystem service indicators (including climate change adaptation and nutrition), as well as the establishment of a funding dialogue with potential private and public sector service purchasers and beneficiaries.

Keywords: incentive mechanisms, public good benefits, rewards for agricultural biodiversity conservation services, value chain development

Private sector engagement for agricultural biodiversity-based climate adaption, nutrition security, and poverty reduction

Klaas Koolman

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The successful implementation of adaptation strategies for climate change, including the fostering of agricultural biodiversity, requires human, natural, technical and financial resources. Private entities need to be involved and engaged to mobilize financial resources and technical capacities. Private companies and corporations have incentives to prepare their businesses for climate change. One of the strongest incentives is the fact, that because of climate change, some of today's agricultural or food business models may simply not survive in the future. Private actors may also be incentivized to act by the emergence of new business models, new product opportunities, and the differentiation of opportunities in existing markets. Successfully attracting private sector entities to engage in agricultural biodiversity-based climate change measures depends on success factors such as relevance, incentives, capacities, and perspectives. Further, apart from successful cultivation and functioning supply chains, market access is crucial. Demand for neglected and underutilized species products has to be triggered through communication and the right branding. Under all circumstances the promotion of these crops should comply with the principles of fair and equitable sharing of benefits. In this presentation I shared reflections on work linking Moringa (*Moringa oleifera*) producers from East Africa to the German/European food market.

Key words: neglected and underutilized species, marketing, private sector, value chains

Certification schemes and traditional crops

Michele Maccari

Instituto per la Certificazione Etica ed Ambientale (ICEA, Italy)

Over the past 20 years, voluntary sustainability certification programmes have developed as important tools to build producers' capacities to manage their production systems and businesses more sustainably and to empower them to access international markets, in many cases at more remunerative prices. These programmes have shown impressive growth for the past 8-10 years, often outpacing their conventional counterparts and have demonstrated their potential value to smallholder farmers. Certification can benefit farmers through increased returns and long term environmental improvement, which also benefit their communities and society as a whole. Certification can offer small farmers opportunity to stay in business through the support of consumers who are willing to pay a price premium. Despite many potential benefits, certification programmes also bring challenges, in particular for poorer smallholders, and in order to benefit, producers and agencies must properly understand and manage them. It is critical to identify and balance the investment required for certification with the market benefits and to work towards maximizing the social and environmental improvements. Particularly regarding environmental aspects, there is still work to be done to increase the relevance of elements such as the protection of biodiversity and on-farm conservation. These issues are scattered among different certification schemes, without providing concrete measurable benefits to smallholders. This presentation provided an overview of the most recognized certification schemes and programmes, putting emphasis on the environmental elements related to biodiversity, trying to investigate how those elements could be strengthened. The presentation also made proposals for possible interventions at technical and political levels to support the importance of biodiversity elements within certification frameworks.

Key words: agricultural biodiversity conservation, certification, marketing, value chains

The contribution of agricultural biodiversity and crop production to agricultural development

Mario Marino

The International Treaty for Plant Genetic Resources for Food and Agriculture (Rome)

Plant genetic resources for food and agriculture (PGRFA) are crucial in feeding the world's increasing population, which according to projections will reach 9.1 billion in 2050. They are the raw materials that farmers and plant breeders use to improve both the quality and productivity of our food crops. PGRFA are a vehicle of innovation for agriculture and a driver for change and increased food production. The sustainable use of PGRFA has the potential to increase agricultural productivity and sustainability, thus contributing to enhanced global food security and reducing poverty. In coming years, the integration of PGRFA with product development chains will be required to increase productivity in marginal areas with less reliable production conditions. Concrete impact for climate adaptation through the creation of climate-ready crops has been supported by the Benefit Sharing Fund of the International Treaty on PGRFA, which over the years has helped to breed new crop varieties and identify traits relevant to climate change. It is essential that additional conservation and plant breeding capacity is built up to support farmers and breeders to adapt agriculture to the changing environment. On the one hand, it is important to understand how new scientific and technological developments, such as gene discovery and genomic technologies, can be applied to implement the Treaty objectives. On the other hand, it is relevant to recognize the enormous contributions of farmers and local/indigenous communities to the conservation and sustainable use of PGRFA. Supporting the custodians of food crops may help advance the exchange of information on national measures affecting the realization of Farmers' Rights and concerted actions or recommendations to protect and promote them in harmony with other international instruments.

Key words: agricultural biodiversity conservation, climate change, custodian famers, policy, ex situ- in situ linkage

Building an enabling policy environment for upscaling and mainstreaming agricultural biodiversity to support nutrition-sensitive food systems

Danny Hunter

Bioversity International (Italy)

Despite considerable strides in feeding the world's growing population, food systems still fall short of doing so in a healthy or environmentally-friendly manner and are currently unable to address two sides of the same coin: malnutrition and obesity. Advances in agriculture have largely focused on increasing production of a limited number of staple crops and animal species rather than promoting cultivation of nutrient-rich species. In addition to nutrition problems, advances in agriculture have also had major consequences in terms of biodiversity loss and environmental degradation. Much of our food biodiversity has been neglected or lost yet it has huge potential to provide the natural richness of nutrients and bioactive non-nutrients humans require to thrive. Decades of unsustainable agricultural practices and nutrition-related interventions are now prompting calls for new thinking and approaches to better mainstream agricultural biodiversity for improved food and nutrition and to support sustainable food systems. This has also led to a resurgence of interest among donors, policy makers, researchers, practitioners and consumers, accompanied by numerous high-level intergovernmental meetings and conferences, in finding ways to reshape food systems that improve nutrition outcomes. A growing number of agencies and forums, including the Food and Agriculture Organization of the United Nations (FAO), the Convention on Biological Diversity (CBD), the World Health Organization (WHO) and Bioversity International recognize the important role of agricultural biodiversity in this growing momentum to reshape food systems. Most recently, the FAO Commission on Genetic Resources for Food and

Agriculture at its 15th Session in January 2015 endorsed a set of guidelines to facilitate the process of mainstreaming agricultural biodiversity into policies, programmes and national and regional plans of action on nutrition, which among other things provides useful guidance to support countries in developing sustainable and nutrition-sensitive food systems. This presentation explored some of these initiatives, with detailed examples from the Biodiversity for Food and Nutrition project funded by the Global Environment Facility. It examined the opportunities and challenges they present for upscaling and mainstreaming agricultural biodiversity for improved nutrition and other sustainability outcomes.

Key words: agricultural biodiversity, nutrition-sensitive food systems, mainstreaming, policy

Capacity development: What, where, how?

Per Rudebjer

Bioversity International (Italy)

Working in poor communities in Guatemala, Mali and India, the new IFAD-EU NUS Project will use agricultural biodiversity to manage risks and empower the poor. The goal of the Project is 'to strengthen the capacities of women and men farmers, including indigenous communities, and other value-chain actors to manage risks associated with climate change, poor nutrition status and economic disempowerment'. The Project will seek 'proof of concept' that better-managed traditional crops and landraces, linked to nutrition-sensitive value chains, can contribute to enhanced nutrition, income and empowerment, and safeguarding livelihood assets. For this to happen, decisions, actions and interactions of people and organizations would need to change, compared to the current state. The Project's theory of change i) describes the socio-economic and agro-ecological context in which the intervention is taking place, ii) analyses the actors, organizations and networks that participate in, or influence change, iii) outlines a desired change and describes a set of activities—at farm, community, national and international levels—that would trigger the anticipated change. Capacity development, both as a distinct activity, such as training, and as a process embedded in participatory action research, value chain enhancement, and policy influence, plays a central role in the Project and needs to be understood by Project staff and partners alike. Using the Organisation for Economic Co-operation and Development definition of 'capacity' as 'the ability of people, organizations and society as a whole to manage their affairs successfully', a capacity development framework is presented to guide the planning, implementation and monitoring of the Project's capacity-related activities. A literature review of capacity development and change processes in complex adaptive systems is presented, along with practical examples and lessons from earlier projects managed by Bioversity International on upgrading value chains of neglected and underutilized species, linking nutrition and agricultural diversity, and managing climate risks at farm level.

Key words: capacity development, neglected and underutilized species, policy, theory of change, training, value chains

Applying Outcome Mapping to research for development projects: The new IFAD-EU NUS Project

Elisabetta Gotor

Bioversity International (Italy)

Part of the challenge in monitoring and evaluating research for development initiatives comes from the multiplicity of interventions and actors that intervene and interact along the project pathway. Since 2013 Bioversity International is encouraging and supporting the use of Outcome Mapping[‡] among its scientists and project managers as a tool for establishing an integrated system for

[‡] http://www.outcomemapping.ca/

project and program planning, monitoring, evaluation and learning. Outcome Mapping is a project planning, monitoring and evaluation approach that helps build the bridge between ‘outputs’ (knowledge products) and ‘outcomes’ (changes in behaviour).

Generally, our thinking about research for development gets stuck at the question of how to get our knowledge products in use. Outcome mapping helps span the divide by focusing on the behaviours of boundary partners and thinking through ways in which we can work with those partners more effectively to achieve our development goals. The application of this methodology will help us to:

- Clarify intended interventions and desired outcomes
- Assess contributions to social change
- Bring partners and stakeholders into planning, monitoring and evaluation processes
- Foster organizational learning
- Strengthen partnerships and alliances
- Integrate monitoring and evaluation into projects or programs from the planning stage
- Balance monitoring and evaluation for both accountability and learning
- Provide tools and vocabulary for understanding the complexity of social change

This exercise is of critical importance to CGIAR Centers given the move to a performance-based funding system linked to delivery of development objectives.

Key words: indicators, evaluation, monitoring, outcome mapping, project planning, stakeholders

Indicators and Interventions for Multi-pronged Holistic Development

Working groups

Working groups were held in the afternoon of the second day of the Conference (April 28) to make recommendations on methods, tools and approaches to effectively make an impact and monitor the results of the Project. Four groups were formed that focused on the key thematic areas of the Project: 1) Food and nutrition security in the context of climate change[§], 2) Value chain upgrading, 3) Conservation of plant genetic resources and 4) Empowerment of vulnerable groups. Participants were divided into the four groups according to their expertise.

Each group was assigned a list of focus aspects for which the Project aims to have a positive impact, as shown in Table 1. Each group answered the following questions considering their focus aspects:

1. **Evaluate the proposed focus aspects and refine the list**
   [Are there other, related aspects that are central or perhaps more relevant to your theme? Can some aspects be refined? Which level and target groups should be evaluated?]

2. **What is the best approach to measure your focus aspects?**
   [What are the essential existing tools and methods for measuring your focus aspects? What are the minimum indicators? Rough timeline for measurements?]

3. **How can agricultural biodiversity and associated value chains be leveraged to generate a positive effect on your focus aspects?**
   [What are the causal links between agricultural biodiversity value chains and your focus aspects? How could these be leveraged for a positive outcome? What are existing tools and methods? Are there gender-responsive and participatory approaches? What are the risks and constraints associated with these methods/approaches and how can they be addressed? In addition to the baseline data, what supplementary information would be useful to identify suitable interventions?]

4. **What is the best approach to mainstream (scale up and out) these tools, methods and approaches to bring a greater positive change for your focus aspects?**
   [How can we create an enabling policy environment? What organizational/institutional dimensions will need attention, and how? What are the gaps in knowledge and capacity that should be strengthened by the Project? How can a model of continuous learning and feedback be sustained and shared?]

5. **What are the synergies between you theme and the other project themes that could be leveraged or built upon?**
   [How do your focus aspects relate to those of other groups? What mechanisms could the Project apply to leverage synergies between themes? Are there any conflicting interests or trade-offs that need to be addressed? Are there potential synergies between sites?]

The results of the working groups were presented and discussed in plenary on the third day of the Conference (April 29). The results from each working group are presented below, integrating the feedback from the plenary discussion[**].

[§] Two working groups were proposed initially to focus on climate change resilience and nutrition separately but these were combined to one group.

[**] Some discussion points brought up in the working groups were more related to other working groups. These points have been moved to the appropriate working group, indicating the original source of the information.

Table 1. Themes and focus aspects of the four working groups.

Group	Theme	Focus Aspects
1	Food and nutrition security under climate change*	• Vulnerability of farmers' livelihoods and production systems • Adaptive capacity • Resilience • Nutrition security for farmers and farmers' communities • Food security • *Nutrition-sensitive value chains*
2	Value chain upgrading	• Farmer income • Linkage to markets • Participation of poor and women in income generation activities • *Pro-poor value chains*
3	Conservation of plant genetic resources	• Inter- and intra-specific crop diversity • Associated knowledge • Threat level • Availability of suitable, adapted material • *On-farm management of agrobiodiversity* • *Linking ex situ and in situ conservation*
4	Empowerment of vulnerable groups	• Empowerment of poor and marginalized people • Empowerment of women • Empowerment of indigenous peoples

Working Group 1

Food and nutrition security under climate change

Participants: Gina Kennedy[1] (Chair), Oliver King E.D.I.[2] (Rapporteur), Jacob van Etten[3], Leida Mercado[4] , Mark van Wijk[5], Paolo Ceci[6], Nadia Bergamini[1], Gennifer Meldrum[1], Danny Hunter[1], Juan Pablo Sciurano[7], Samantha Collins[1]

[1] Bioversity International (Italy)
[2] M. S. Swaminathan Research Foundation (MSSRF, India)
[3] Bioversity Interntational (Costa Rica)
[4] Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE, Costa Rica)
[5] International Livestock Research Institute (ILRI, Costa Rica)
[6] The Food and Agriculture Organization of the United Nations (FAO, Italy)
[7] Istituto per la Certificazione Etica ed Ambientale (ICEA, Italy)

1. Evaluate the proposed focus aspects and refine the list

Proposed focus aspects:

- Vulnerability of farmers' livelihoods and production systems
- Adaptive capacity
- Resilience
- Nutrition security of farmers and farmers' communities
- Food security
- Nutrition-sensitive value chains

Refined focus aspects:

- Exposure**:** Frequency of hazardous climate events happening (e.g. how often is there drought)
- Sensitivity: How does the system respond when there is a hazardous climate event? What are the outcomes for food and nutrition security?
- Adaptive capacity: Ability of farmers to learn to use strategic crops for own benefit
- Availability (Food Security)
- Access (Food Security)
- Stability (Food Security)
- Utilization (Food Security): Is the individual's diet adequate for their needs? Micronutrients, food groups, bioavailability with methods of preparation for target crops?
- Nutrition-sensitive value chains

Resilience, vulnerability and adaptive capacity are big concepts that are difficult to operationalize in the field. These need to be defined and broken down to be more specific to the Project.

Nutrition security is a component of food security, especially relevant to the utilization component.

Target groups and levels:

- Livelihood resilience is the major focus.
- Cropping system resilience is also considered, as a component of the livelihood system.
- For nutrition, target groups are infants and children up to two years of age and women of reproductive age.
- Household level is the focus of most measurements but nutrition assessments are more disaggregated, focused on individuals.
- Nutrition-sensitive value chains need strategies for the local scale and the national scale.

2. What is the best approach to measure your focus aspects?

Indicators:

- Exposure**:** Variability in the short and long term, frequency of hazardous climate events (e.g. how many years of drought in a 10 year period).
- Sensitivity**:** Is there crop failure when there is a hazardous climate event? Do people go hungry? Responses to climate events in the short term (e.g. drought) are very important to consider.
  Related to: Which crops they grow, diversity of the system, livelihood assets, land use (e.g. allocation to cash crops), use of local imported/processed food in the communities (e.g. school feeding programs).
- Adaptive capacity**:** Learning around specific crops: Are they doing experiments, exchanging seeds of target crops? Do people change their practices? Have they adopted target crops and associated practices that we recommend in the Project for better biophysical resilience in the cropping system, e.g. water and soil conservation metrics to go with adoption of the crop?
  Related to: Education, assets, institutions
- Availability (Food security): Food availability score developed by Mark Van Wijk– based on production and what is sold to assess potential of the livelihood activities to generate enough food for the family (van Wijk, Rufino & Thornton 2012; abstract on page 15). Complete enumeration of crops, production functional diversity. Instead of in-depth measurements of the food system, we could identify coping strategies e.g. when hunger is going on they may send their children to eat at school or do food pooling at the community level.
- Access (Food security): Household food insecurity access score (HFIAS; Coates, Swindale and Bilinsky 2007), market functional diversity score, assessment of links between diet and market diversity.
- Stability (Food security): Number of months in the hungry season at household level.
- Utilization (Food security): Dietary diversity score at household or individual level (FAO 2013), consumption of nutritious target crops, bioavailability of nutrients in target crops and food recipes, land allocation to nutritious crops, market availability of nutritious crops, market functional diversity score, is there a school feeding program?

  We need to assess trade-offs with the diet e.g. are they taking meat out of the diet if they are eating more legumes? Evaluating the proportion of the target crop in the diet before and after the Project.

  Measuring production area of the target crop before and after the intervention will help assess if farmers start to grow a crop but then sell it and buy something else that is cheaper and less nutritious. Farmers produce for themselves and for the market – We need a two-pronged approach to assess the nutrition aspects.

  Children are in some cases most hungry in the harvest season because women are too busy with harvesting. Measuring time allocation can help reveal trade-offs.

  In more rural areas a lot of food also comes from uncultivated sources. In India the area that we are talking about is quite rich with forest resources. Especially the children supplement quite a bit of their nutrition requirements with minor indigenous species that they gather from the wild and that in many cases we are not aware of [from discussion].

Tools and methods (household-level):

- CCAFS baseline survey (CCAFS 2011)
- Surveys from the Mesoamerican Agroenvironmental Program (MAP) performed by the Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE) in Guatemala
- “Mini survey” for calculation of food security index (van Wijk, Rufino & Thornton 2012)
- Agricultural production assessment (templates from Humid Tropics CGIAR Research Programme work)
- Market survey (general, templates from Humid Tropics CGIAR Research Programme work)
- Diet survey: 24 hrs recall data (FAO 2013)

- Coping strategies index (Maxwell & Caldwell 2008)
- HFIAS (Coates, Swindale & Bilinsky 2007)
- See compendium and review of current metrics for measuring food security (Jones et al. 2013)

Tools and methods (community-level):

- Social ecological resilience assessment (UNU-IAS et al. 2014).
- Participatory mapping methods – gendered maps of farm and livelihood activities.
- Time use analysis.
- Toolkit on how to link climate change and gender in research. CATIE just translated in Spanish and has been doing training on these methods in Nicaragua (Jost, Ferdous and Spicer 2014).

Existing data:

- Review availability of secondary data from various sources e.g. Indian census, Guatemala household sweeps – yearly data, e.g. wasting, mortality. Demographic and health surveys in Mali. Climate data should be available for each country and target regions. Review data to see if any of them are meaningful to our Project.
- MAP data in Guatemala from CATIE. These capture useful information on diet diversity at household level in a one week period in both the rainy season and dry season, what people eat and what they buy, farm systems, home garden production and whether produce is also sold, coping strategies, how many months they have self-sufficiency from farm and if not, where people buy their food, number of months in hungry season.

3. How can agricultural biodiversity and associated value chains be leveraged to generate a positive effect on your focus aspects?

Promoting underutilized species through value chain development can improve food security, nutrition and resilience through several mechanisms:

Mechanisms	Interventions
Improved food availability and diet quality, especially in the lean season and in years of climate stress (e.g. drought)	• Promote crops that produce during the lean season. • Promote stress tolerant staples that can enhance food availability in bad years. • Promote crops with high nutrition value (targeting specific deficiencies in the population of focus). • Processing tools (e.g. dehydration, drying) and food reserves. Storage can improve ability to carry over food one year to the next and availability in the lean season. • Supporting small farmers to arrive in the markets improves availability of diverse, nutritious foods.
Generation of employment and extra income, especially for women <u>can</u> help in buying more food and more nutritious food, but not necessarily.	• Nutrition education supports behavioural change and influences purchasing decisions toward more diversified and nutritious diets – this is needed to complement value chain interventions. • If women control income from value chains, this will result in more direct benefit to household nutrition than if men control income.
Reduced drudgery in processing encourages consumption of target crops and increases time available to prepare nutritious food.	• Processing interventions reduce drudgery in processing target crops. • Need to make sure interventions do not increase drudgery, at a minimum.

Focusing on local markets could have better outcomes for nutrition and resilience of target communities. Export markets are more risky and volatile, but are often pursued in value chain development projects because they more easily generate flow of income. Marketing to cities in target countries is another option to generate flow of cash. A balanced design targeting local markets and home consumption is suggested, without being exclusive - keep opportunities open to link to export markets.

Development of a voucher system in communities was discussed as an option to promote local value chain development and improve the resilience of the value chain to market volatility.

Produce of targeted crops might be promoted for local cultivation and consumption, not necessarily for the market.

Having a home garden component alongside the commercial component could be important for improving nutrition.

Biodiversity/seed fairs complement the value chain work. They increase awareness of local agricultural biodiversity, providing a "marketing" role, while also helping ensure conservation.

Crop prioritization:
Identifying target crops is one of the most important points and is an interdisciplinary issue. There should be good reasons for selecting the target crops to pursue greater food security, nutrition and resilience outcomes.

Choosing stress tolerant crops can improve climate resilience of the system.

Choose the commodity for the value chain from a nutrition perspective – those that can fill micronutrient gaps and improve seasonal availability of nutrients are good targets. Fruits, vegetables, pulses and animal source foods are the most needed to fill nutrition gaps. Ideally we should go beyond staples. Staples are important but not enough to meet nutrition requirements, we need to add something. At least we should consider promoting local nutritious crops for household food consumption. If there are additional marketing opportunities for the crops, we can develop them further.

Consider pursuing multiple value chains from a nutrition perspective, because only one crop (e.g. millets) cannot deliver a balanced diet. It is useful to consider the whole portfolio of crops (the main crops and associated crops) that contribute to food security, nutrition and resilience and aspects of the farming system. However, we have to be pragmatic and we need to focus - choose a few crops for specific activities.

Use existing data to help in strategizing/selecting target crops. Look for 'low-hanging fruits' (e.g. crops with recognized potential) and develop a strategy to act on these to start in the Project. Then we can do some investigation during the Project to find other interesting species in the communities which might take longer to upscale or promote. It is recommended to take a general baseline about the crops, landscape, and food security in the target sites as an introduction to the system and then zoom in on target species.

In Guatemala, tepary bean is highly drought resistant and gives much higher production in dry years. Other advantages are that it is similar to the dominant crop in Guatemala (common bean) with practically the same agronomic practices. There is already a successful bean cooperative in the region where Bioversity International has been working in Guatemala, so there is an existing institution to build upon (from discussion).

Fonio is likely to be the target crop in Mali but we might consider putting two crops in addition. Maybe we focus on a staple like millet and fonio plus one other crop (a vegetable or a legumes) that would be helpful in filling the nutrition gap in the target areas. In fact, there are previous projects at the Institut d'Economie Rurale (IER) which have been already covering vegetables and pulses. With regard to fruit species, these would be new but can be added as well (from discussion).

The decision of minor millets as target crops in India is acceptable but could we also think about opportunities for diversification into other nutrient dense foods? In India the traditional agricultural system includes millets and associated crops such as pulses, beans and so on. Furthermore the traditional practices involve crop rotation, mixed farming, early cropping, etc. Also the communities are in transition towards agroforestry. In this mosaic of agricultural systems to include other fruit and vegetables is possible. We can have a mixed approach: specific value chain or adaptations on the millets and promotion of not just millets, but also fruits and vegetables, for example through home gardens (from discussion).

4. **What is the best approach to mainstream (scale up and out) these tools, methods and approaches to bring a wider reaching positive change for your focus aspects?**

Scaling up:

Identify existing policies which can be leveraged within the Project so as to get support for scaling up and out. It is important to do at least some quick analysis of policies in each of the three countries to understand which direction target countries are going with these big challenges.

- e.g. National Adaptation Plans of Action (NAPAs), National Biodiversity Strategies and Action Plans (NBSAPs), and Pacto Hambre Cero (Zero Hunger Pact) in Guatemala
- Within the Indian context there is big movement called Scaling up nutrition (SUN) present at the national level (from discussion).

Support and lobby the government for setting up and operationalizing/implementing policies that promote the role of target crops in better food security, nutrition, and resilience. Influence policy makers at Municipality, District, State and National and International Levels.

- Target programs for food and nutrition to integrate target crops and broaden the food basket in the national food procurement programme, e.g. integration of millets in the National Food Security Act in India, promotion of nutrient-dense foods in Brazil's procurement programs (PAA) (from discussion).
- Consider the Convention of Biological Diversity (CBD) guidelines for mainstreaming genetic resources for climate change adaptation, and mainstreaming food and nutrition strategy plans.
- Consider the Go Local Guidelines for scaling up.
- We would need a sort of nutrition champions to support our advocacy.
- Explore the possibility to do an event during the governing body of the International Treaty on Plant Genetic Resources for Food and Agriculture or the CBD. For the first time the CBD has endorsed resolutions on biodiversity and health including nutrition so it is very much up in their agenda. We could have good opportunities to organize side events covering these issues (Montreal, first two weeks of November) (from discussion).

Scaling out:

Work with other organizations: NGOs and community based organizations.

- Share knowledge and best practices, build their capacities to carry out similar work in other areas.

Certification: Include biodiversity, nutrition, and resilience in certification schemes to assure the product is supporting these aspects.

5. **What are the synergies between your theme and the other project themes that could be leveraged or built upon?**

Synergies:

- Diet diversity is supported by on-farm conservation.
- Diversity fairs promote awareness and encourage crop consumption locally, which has benefits for conservation, nutrition, and value chain development.
- On-farm conservation supports climate adaptation (WG3).

Trade-offs:

- Income from value chain development is not necessarily going to lead to better nutrition outcomes unless you have specific interventions to educate people about a more diversified diet. The key point is how to make different choices with that income that could lead to more nutrition. There may need to be a work package in the Project outside of the value chain development to encourage better nutrition outcomes in target communities, which would involve nutrition education, home gardens, diversity fairs, etc.
- We can consider introducing new crops to the region with potential to improve nutrition or resilience but this will not contribute to the conservation initiative.

Analysis of on-farm and off-farm risks for value chain development should be done early in the Project.

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Working Group 2

Value chain upgrading

Participants: Per Rudebjer (Chair)[1], Maarten van Zonneveld (Rapporteur)[2], Dietmar Stoian[3], Michele Maccari[4], Willy Douma[5], Klaas Koolman[6], Ashis Mondal[7]

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1. Evaluate the proposed focus aspects and refine the list.

Focus aspects:
- Farmer income
- Linkage to markets
- Participation of poor and women in income generation activities
- *Pro-poor value chains*

The focus aspects were not modified.

Target groups and levels:
- Individuals within households
- Specific groups within villages/communities
- Link enterprises

2. What is the best approach to measure your focus aspects?

Indicators:
- Income of households and specific groups
- Market uptake
- Participation in production
- Production area (acreage) of target crop
- Ratio of food consumption/market selling of target crop
- Productivity in traits of interest (yield, nutritional properties, traits important for consumers, processing, specific uses, trait stability)
- Variety change

Tools and methods:
- 5Capitals tool (physical, natural, financial, social, human) for the baseline at the beginning and impact assessment during and after the Project (Donovan & Stoian 2012). A gender-sensitive version is in development to be tested in the Project.
- Participatory Market Chain Approach of the International Potato Center (CIP) to develop value chains (Bernet, Thiele & Zschocke 2006).
- Link methodology of the International Center for Tropical Agriculture (CIAT) to develop business models (Lundy et al. 2014)
- Self-assessment by stakeholder groups
- Assessment with different stakeholders

3. How can agricultural biodiversity and associated value chains be leveraged to generate a positive effect on your focus aspects?

Holistic value chain framework for neglected and underutilized species (NUS) (WG1)

- Used for millet promotion in India and Latin America in the last phase of this initiative (Padulosi et al. 2014, 2015). The M. S. Swaminathan Research Foundation calls this the 7C approach (abstract page 19):
- Action to promote the value chain at many points: quality seeds, processing machinery to reduce drudgery, encouraging local consumption and bringing surplus to market, capacity building of women and men for quality, consistency and scale. The value chain starts before the farm gate, it starts from the seed.
- Managing on-farm and off-farm constraints:
  - On farm: Best practices on how make production more effective, e.g. irrigation, rainwater harvesting, irrigation from river, kitchen wastewater (WG3).
  - Off-farm difficulties, e.g. processing, milling, de-husking, value addition.
- Packaging helps to sell but it needs to suit the market - need to perform a market analysis (WG3).

Crop Improvement: Selection and breeding for traits of interest. Participatory Variety Selection (PVS) to determine farmer preference (WG2). The speed of participatory plant breeding speed will depend on crop biology. With some species we can make quicker progress (WG1).

Stakeholder meeting (private sector, media, etc.) at the beginning:

- The value chain accommodates different players: Primary producer, processer, procurer, "value adder" (WG1).
- Revise the Theory of Change with key actors.
- Identify how we influence the market site? Which key actors? How can we influence them?
- Create ownership in actors in different part of the impact pathway.
- Identify public and private policy with the most potential and low-hanging fruits to develop a strategy to act on.
- Identify credit and other financial partners and options from the beginning.
- Identify different credit and payment schemes (e.g. contract farming).
- Identify scaling opportunities (e.g. biscuit companies and school feeding programs).

In linking producers with purchasing entities, the challenge is to find a buyer.

Consider public food distribution and use of local foods in public sector institutions (schools, universities, hospitals, armed forces) as a potential buyer (WG3).

Need to find means of reducing transaction costs because neglected and underutilized species are typically produced in marginal, remote locations where reaching mainstream markets has high transaction costs. Providing suitable assets to the community (e.g. aggregation points, improvement centres) that are supported by suitable institutions is a viable approach (WG1).

Transportation of agricultural products to markets is a major issue (WG3). Consider the possibility of infrastructure development, e.g. transportation/improvement of roads (WG1).

Cooperatives and Collective Action:

- Increase bargaining power, control, and lifting people in the value chain level by adding value and building collectives, e.g. farmer producer companies at different levels (e.g. region, state).
- Cooperatives can help in overcoming issues with quantity and quality of supply (WG3).
- Look at existing institutional structure and build from there, as it is much easier than starting from scratch (WG1).

If we are building the value chain from scratch, it will be better to start with a smaller number of families. We can have different levels of intervention. Target more families for cultivation of crops that are better developed or easier to mainstream. Target fewer

families for cultivation of less developed crops or ones that need more intensive capacity development (WG1).

Alternative currencies (e.g. internal voucher system with no interest) are an option to explore for buffering the value chain from market volatility and reducing issues with liquidity. Alternative currencies can stabilize the system where there are products but shortage of currency. For value chain development, it facilitates calculation of the precise efficiency of different stages. This is a trust-based institution that depends on institutional integration and carries a certain level of risk or potential to fail. The relevance would need to be investigated in each country. The Social TRade Organisation (STRO) is an example of this kind of work (WG1).

4. **What is the best approach to mainstream (scale up and out) these tools, methods and approaches to bring a wider reaching positive change for your focus aspects?**

Market research: where are the markets with highest potential?

Advertisement and marketing, e.g. Movie stars promote neglected and underutilized species.

- There is a challenge in India to spread concepts like balanced diet, good diet, and nutritious food. We can do something to promote these concepts especially among the vulnerable groups we will be targeting through the Project [from discussion].

Engage the private sector, e.g. biscuit companies

- We have to reflect not only on public policies but also on private ones. We need in fact a mixed approach, because the private sector contributes a lot to the development of the civil society [from discussion].

Engage with seed companies (WG3)

- Seed companies are not so well organized and are often unaware of the importance of genetic resources or landraces.
- Need tools to engage with them as research organizations and for them to engage with NUS-related activities. They need something they can rely on that will provide them with a competitive advantage or niche.

Engage with national food programs

- Identify public policies with the most potential for scaling up, e.g. school feeding programs.
- At present farmers are growing millets mainly for home consumption. Now there is a new policy situation in India, where these crops are included in the national food security program, so there is a new driver out there that the producers can take advantage of. This is a new opportunity and we can take advantage of it by creating value chains and working on the demand side, to increase marketing and hence income generation from these underutilized species [from discussion].
- Influencing policy is easier when we have demonstrated certain results on the ground [from discussion].
- It is very important to pursue the country's specific policy agenda. We need to have an agenda specific for each country and their consumers. We cannot talk about policy makers in general, because each country is unique, and each country will have its own leverage points within the system, and will have its own ways of responding [from discussion].

Work with higher education, connection to academia

- Work with school children who are the next consumers
- Involve MSc students to develop case studies

Engage other NGOs and community organizations

- Promote NUS through local theatre, food fairs, etc.
- There should be an analysis of whom we are going to collaborate. We need to identify robust organizations in the area and work with them, because we cannot set up, or build everything from scratch. We should look at the institutional landscape and make these

selections quickly. We need a more or less unified set of criteria to guide this process (from discussion).
- Linkage with other projects: There are lots of opportunities to leverage existing work (from discussion).

Build in upscaling mechanisms from the start.

5. What are the synergies between your theme and the other project themes that could be leveraged or built upon?

Synergies
- Value chain development of neglected and underutilized species can generate income for the rural poor, which can support empowerment of vulnerable groups who are involved in the activities.
- Improvement of the asset base can strengthen resilience and adaptive capacity (Tinch et al. 2015).
- Production development of neglected and underutilized species can improve nutrition and health.
- Improving the money earned at the farm level by target crops can mean that they are valued and grown more, supporting agricultural biodiversity conservation (from discussion).

Trade-offs
- Not all crops/varieties can be brought to the market – alternative strategies are needed to ensure conservation of those which don't have this potential (e.g. community seed banks, rewards/compensation for agricultural biodiversity conservation services (PACS), etc.).
- We must be careful on how we will be developing products from NUS. For instance, if we promote a biscuit using NUS, which is made with trans-fat, we are going to be highly criticized later in India because this product will be seen as contributing to the spreading of cardiovascular diseases and deaths due to heart attacks. So we should avoid trans-fats in NUS products and again do our best to improve the micronutrients content. It is important to work on the nutrition aspects and on food product development (from discussion).
- If millet production could dramatically increase we might get also a deforestation impact from such a situation (from discussion).

  Analysis is needed about how NUS value chains will change market and production risk management within farmer systems. We may incur negative impacts. It is important to think about these potential negative impacts that we might face from the start.

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Working Group 3

Conservation of plant genetic resources

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1. Evaluate the proposed focus aspects and refine the list.

Focus aspects:
- Inter and intra specific crop diversity
- Associated knowledge
- Threat level
- Availability of suitable, adapted material
- *On-farm management of agrobiodiversity*
- *Linking ex situ and in situ conservation*

The focus aspects were not modified.

Target groups and levels:
- The Project needs to strike a balance between inter/infra-specific levels. Few crops and then focus on infra-specific level

2. What is the best approach to measure your focus aspects?

Documentation of genetic resources, including farmer characterization

Integrated conventional and participatory monitoring

For threat level need articulation of standards/criteria

Indicators:
- Crop and variety richness at household and community levels and regional/national level
- Evenness of crops and varieties at community level and regional/national level
- Trait diversity
- Relative area cultivated to a crop/variety/specific trait
- Number of households cultivating a crop/variety/specific trait

Existing tools:
- Five Cell Method: Grown by few or many households in small of large Areas (adapted from the four cell method (Sthapit, Shrestha & Upadhyay 2006) to capture details on lost crops/varieties in a fifth cell)
- Why is the status observed?
- Inclusion also of indigenous knowledge
- Community biodiversity registers (Sthapit, Shrestha & Upadhyay 2006)
- Farmers' "willingness to participate" in conservation activities survey, couched in cultural importance terms.

3. How can agricultural biodiversity and associated value chains be leveraged to generate a positive effect on your focus aspects?

Use/promote a broader range of diversity in markets. Link conserved material to markets.

Where conservation goals are modest then local demand may be sufficient to achieve conservation through use goals. However, it is noted that product development can negatively affect on farm biodiversity**.** Consider having a work package in the Project outside of the value chain development with activities to support conservation e.g. diversity fairs, diversity kits, community seed banks, rewards/compensation for agricultural biodiversity conservation services (PACS) (WG1).

Crop prioritization:
Need to ensure that our Project crop selection criteria results in choices that are not just based on those species/varieties with market potential, but also important public good values.

Prioritize crops for value chain interventions using the baseline assessment and a Weitzman prioritized approach (Weizman 1992, Weitzman 1993).

Criteria for conservation:
- Neglected and underutilized species
- Threat status
- Genetic diversity and structure (implementation for strategy), considering degree of dissimilarity and environmental gradients

Other criteria to consider for prioritization:
- Importance to poor/areas with high levels of poverty for income, nutrition and food security
- Contribution to resilient production systems (important to adaptation)
- Cultural value
- Logistical/access and costs issues
- Where can we deliver and work well e.g. areas where contacts/relationships exist

4. What is the best approach to mainstream (scale up and out) these tools, methods and approaches to bring a wider reaching positive change for your focus aspects?

<u>Explore policy options</u>
- E.g. Link Guatemala's "commitments" under the Plan de Acción Estratégico para la Conservación y el Uso de los Recursos Fitogenéticos Mesoamericanos para la adaptación de la agricultura al cambio climático (PAEM), noting this is not really a commitment at the government level.

<u>Engage with policy-makers</u>
- Raise awareness that existing varieties (within a seed company) also depend on landraces

<u>Certification/labelling</u>
- Give recognition to conservation work.

<u>Capacity building of farmers and technicians and engagement in continuous learning</u>
- Involve students and university/schools in agricultural biodiversity related courses.
    - "Licensure" in Biology has an obligatory genetic resources course in its last year (5th) in Guatemala;
    - Training available for professionals from the West and Central African Council for Agricultural Research and Development (CORAF) in Mali.
- Promote continuous learning and feedback
    - Website with regular updates
    - Community of practice around specific webinar/virtual training events

5. What are the synergies between your theme and the other project themes that could be leveraged or built upon?

Synergies:

- On-farm conservation contributes to better climate resilience of production to support food security.
- On-farm conservation also contributes to better nutrition by enabling diverse diets.

Trade-offs:

- Product development negatively affects on farm biodiversity. Consider having a work package in the Project outside of value chain development with activities to support conservation e.g. diversity fairs, diversity kits, community seed banks, PACS (WG1).

Strengthening on farm conservation and linkage with *ex situ*

- How to support effectively custodian farmers is a challenging task - we need to capitalize on them and their networks and leverage their expertise. We also need to build collective action within the communities, e.g. through community gene banks. This resilient conservation system should leverage not only individuals but also community-based institutions (from discussion).
- Institution strengthening: Support community seed banks, local seed regeneration, and seed fairs. Also strengthen capacity of national genebanks.
- Strengthen linkages between *ex situ* and *in situ*: support exchange visits between farmers and genebanks, participation of genebank and farmers in seed fairs, regeneration of seed from genebanks by communities (in exchange for payment for this service), farmer characterization, scientists and farmers learning from each other. It is very important to work towards the complementarity between *in situ* and *ex situ* conservation. *Ex situ* is static and *in situ* is dynamic - we need both. The dynamic adaptation (so important for climate change adaptation) takes place in the field. But it is the gene bank that can provide material to farmers if that has been lost. It's an important service.
- We must see how to institutionalize conservation practices at the village level, beyond a person or a project.

Rewards/compensation for agricultural biodiversity conservation services (PACS)

- Development of payment schemes for conservation within value chain development.
- Identify potential agricultural biodiversity ecosystem service beneficiaries and purchasers amongst private/public sector entity funding dialogue. For example, tax link enterprises like Farmer Producing Companies for conservation and (pre-) breeding.
- Couch the “willingness to pay” question in terms of cultural heritage, not offering financial reward.

  Discussion in plenary:
- In some local contexts it could be appropriate to pay, as it is happening in some countries. For instance in Mali 90% of farmers that grow fonio say that they receive cash payments from the government, payments for consultation services or for projects.
- However, there is a very big social science issue about the concept of spheres of exchange. It is an ethical question that divides opinion, that is: To pay or not the custodian farmers or just give them a formal recognition and use their material for commercial purposes which will eventually realize economic benefits to them.
- We should maintain and promote free exchange of the plant and agro-resources instead of adopting a pay system.
- Maybe we could pay seed multiplication, but give the seeds for free?
- There is also a practical matter. If we pay the custodian farmers we need to check and monitor their work and this is a quite a big burden. So the sustainability of the paying system and ensuring continuity of the work are issues.
- We should not go for particular incentives without studying the context first hand - study the local norms and then think about incentives in a broad sense.
- It is important to think broader. The questions are: why are people doing and what are they not doing? So with proper questions it is possible to get better understanding of the

trends underlying those motives and then we can find a way for monetary incentives and the right place for other kinds of incentives.
- Higher conservation level results from the balance of two forces: farmers that do conservation without incentives and farmers that are attracted by the incentives.
- Regarding the positioning of PACS in the context of rewarding, we have now different kinds of rewarding mechanisms: individual rewarding and collective rewarding. So we need to have a basket of rewarding mechanisms that includes individuals and also the collective. The context is important.
- Prioritization is needed to determine which varieties to conserve.

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Working Group 4

Empowerment of vulnerable groups

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1. Evaluate the proposed focus aspects and refine the list.

Focus aspects:
- Empowerment of poor and marginalized people
- Empowerment of women
- Empowerment of indigenous peoples

The focus aspects were not modified.

Target groups/levels:
- Rural communities and smallholder custodian farmers living in diversity rich areas
- Indigenous communities
- Women
- Youth
- Returnees (from migration)

2. What is the best approach to measure your focus aspects?

Indicators (changes to bring about amongst vulnerable groups):
- Have a voice within community and formal institutions;
- Capacity to establish their own agenda, priorities, define needs, future;
- Ability and right to exchange information and materials;
- Knowledge on institutional innovations;
- Access to biodiversity areas, natural resources;
- Develop/promote both their own and newly introduced technologies;
- Access to financial and institutional resources. Is there a gendered control or access for resources and assets?

An empowered community is one that is more organized, inclusive and that takes positions. For instance, in Guatemala the number of women that participate in all the activities is an indicator. Indeed, from our experience, there is a place where the men were engaged in the fields when we had some activities and they could not participate in the workshops. Nevertheless, the women were interested in the topics that we were training them on, so the husbands let them go. We can measure the women that are not allowed to express themselves or how many women are talking. Maybe another region is not the same but it is something that you can take into account as an indicator of empowerment (from discussion).

Maybe it comes down to institutions functioning. If some local institution is functioning without external support doing the things we want, that is just perfect. If they have the knowledge and we have built capacity, it does not necessarily mean that they will continue. It has to be self-running at the end (from discussion).

Tools and methods:
- Changing Equations: Gains and Losses (MSSRF 2007)
- Five Capitals (Donovan & Stoian 2012) (WG2)

- Vulnerability assessment.
- Indicators of Resilience in Socio-Ecological Production Landscapes and Seascapes (UNU-IAS et al. 2014)
- Network analysis (to measure, for example governance effectiveness and activities who what);
- Stakeholder analysis CLIP: Collaboration/Conflict, Legitimacy, Influence, Power, include gender aspects
- Venn Diagrams to understand institutional linkages (DeBoeuf & Thijssen 2007)
- Access, control and benefit assessment (WG1)
- Women Empowerment in Agriculture Index (WEAI) (IFPRI 2012) (from discussion)

The WEAI has five different domains: 1) Decisions about agricultural production, 2) Access to and decision-making power over productive resources, 3) Control over use of income, 4) Leadership in the community, and 5) Time use. It is really comprehensive but it does not meet the criteria of being simple to administer or reducing time burden of the respondent. You could maybe pick and choose from that index what could be interesting for the Project. Maybe you do not collect it in quantitative way but a qualitative way [from discussion].

In an activity linked to the CGIAR Research Programme on Policies Institutions and Markets, Bioversity International scientists are taking the WEAI and some other pieces on board for the gender responsive version of the 5Capitals (Donovan & Stoian 2012). With the five capitals we are looking at the household level and beyond at what we call the linked enterprise, trying to figure out what kind of asset building is happening there. We would assume that the enterprise level leads to increased assets and to viable business (from discussion).

Why not just throw it back to the communities and get them to make the assessment? There are very good methodologies for doing that which OXFAM has developed. It is very interesting to apply that in the framework of the holistic nature of this Project. With OXFAM's approach you just throw it back and you get different surprises in all these communities about the process, etc. If we introduce this crop maybe the women will increase their income or increase their availability of these foods. Maybe many of those indicators will actually already be in the food security assessment etc. This method was followed in a number of other projects and you end up with a set of very powerful testimonials from different community members that appeal very strongly to donors (from discussion).

3. How can agricultural biodiversity and associated value chains be leveraged to generate a positive effect on your focus aspects?

<u>Use participatory approaches in value chain development</u>

- Make sure that marginalized groups are engaged and involved! Special importance of social inclusiveness (women, youth, indigenous peoples, etc.) and the participatory aspect of the methods and approaches.
- Review and dialogue with existing institutions (e.g. farmer organizations, village councils, Panchayats, self-help groups, women groups, youth, traditional customary institutions, ceremonies, crops, etc.) - Make sure no group is excluded.
- Active involvement of farmers in the value chain activities and dissemination of results (WG3).
- Women are involved in value chain activities e.g. processing (WG3).
- Participatory market chain analysis: Match the existing biodiversity with the market chain and different actors involved.
- “Free prior informed consent” - explain the project and arrive at common understanding.
- The cultural aspects of the products are crucial! Products tell stories.
- Use methods to valorise the local biodiversity e.g. seed diversity fairs, biodiversity farm forums, fruit (and other) catalogues.

<u>Strengthen existing institutions and introduce new institutions managing agricultural biodiversity for improved livelihoods</u>

- Identify factors that might be eroding the capacity of the existing local institutions.

- Introduce new management and collective action institutions: biodiversity farm forums, document and monitor existing biodiversity, monitor investments and returns to agricultural biodiversity.
- Use of informal or new networks to link custodian famers or different farmer groups.
- Strengthen the local indigenous communities' capacity to create linkages/partnerships with external research and development bodies/agencies, extension agents, NGOs, National Agriculture Research Systems, policies.

Strengthen the capacity of the local indigenous communities to develop and formulate their own "community vision" and a communication strategy.

- It should include a work-plan with specific activities and a "Future Vision".
- It will constitute the framework under which external linkages such as scientific-based development projects, initiatives, partnerships, etc. should take place.
- Desired research topic or aspect to be covered by partnering with development agencies.

4. What is the best approach to mainstream (scale up and out) these tools, methods and approaches to bring a wider reaching positive change for your focus aspects?

The linkages developed during the implementation of the process (between different communities, stakeholders) will ultimately lead to the promotion (i.e. scale up and out) of the best practices and lessons learned.

Scale out

- Link to other IFAD and other development projects.
- Platform of product fairs and trade fairs.

5. What are the synergies between your theme and the other project themes that could be leveraged or built upon?

Synergies:

Capacity building to empower communities to negotiate and make decisions will make more communities more capable to:

- Adapt to Climate change
- Realize nutrition and food security
- Engage in value chains
- Conserve agricultural biodiversity

Trade-offs:

- Value chain development and empowerment can also be in alignment to a certain point where value chain becomes very successful and may be some change in interest/stakeholders/competition (WG1).
- Need land for value chain development, which can be a constraint for the most vulnerable (WG1).

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Discussion on indicator selection and data management

Managing the complexity of monitoring the holistic approach

- Many aspects are covered in the Project, so finding connections between frameworks will be necessary and useful to clarify conceptual linkages between the Project themes: e.g. sustainable livelihoods framework, food systems framework (production, market, and consumption), food security framework, value chain framework. The livelihoods approach is the main framework and then we complement that with elements that are appropriate to the particular interventions of the Project
- It is very important to be very critical about the key aspects where we really want to make a change or to just focus on.
- The methods must be simple and lean. We must select those items that are most relevant to the resilience that we want to tackle from our perspective. It will be challenging but otherwise this Project will be just about a baseline. It is desirable that the Project has less documentation and is more action-oriented.
- We will have to be very much aware that there is an inherent contradiction between the robust system with very strong indicators and something light, low cost, and easy to apply in the field. We will probably have to find a middle ground.
- We embraced this holistic approach. If we are able to develop a methodology, the baseline, and answer the different questions from the different disciplines we have made a tremendous step forward. This discussion will also be used by other people so there will have an impact beyond the Project.
- A lot of the tools mentioned are more complex and maybe you could do some ground truth and come up with a minimum set which will act as a reasonable approach to approximate what you would get if you applied the bigger more complex tools.
- Maybe in this Project we are uncomfortable to decide on quantitative or qualitative indicators. In reality it could be pretty good to have a combination of quantitative and qualitative indicators.
- We measure quantitatively certain factors - the quantitative stuff is really maybe two, three indicators that are hypothesis driven. The rest you do with the focus group or with a more qualitative approach and then we maybe get interesting surprises.
- Some questions at community level don't need to be asked in every household. The community assessment can give context. The household survey would give rigorous assessment of key indicators (WG1).
- We can reduce detail for overall production but document greater detail for target crops.
- We must explore also how we can do monitoring and data gathering in a cheaper way. This raises questions about how we can actively engage communities in monitoring and getting data in an effective way. We need to know what kind of incentives they face in order to do that. Maybe some of that data is useful to them too and this would certainly be an incentive for their involvement and commitment in the long term.
- There are same possibilities to actively involve school children. For instance we could teach them: how to draw maps, how to use GPS, how to upload information and use it very actively together with the community members.

Common approaches and data management across the three countries

- We would like to follow the same format or baseline in the three countries. Common guidelines to make surveys are one of the most important things recognized for the Project.
- We are trying to develop a central system for data collection and entry so that the data format is compatible across countries and can be used together for a broader analysis.
- A cloud-based system that generates questionnaires, used remotely could be interesting to use (e.g. Open Data Kit – ODK). With this type of system, data is collected on a smart phone or ipad, which can be important in reducing error and time in data entry and providing intermediate results faster. It is interesting as the people see the progress in real time. In this way the partners, and the donors can have an immediate sense of our work.

Indicators selected for monitoring in the IFAD-EU NUS Project

Based on the working group discussions in the Conference, the following indicators were selected for monitoring the impact of the IFAD-EU NUS Project on multiple dimensions of the livelihoods of targeted farmers: 1) food and nutrition security, dietary diversity and consumption of target crops, 2) climate change coping/adaptive capacity, 3) income and value chain development of target crops, 4) conservation of target crops and 5) empowerment.

These indicators will be measured in the first year of the Project using baseline investigations that involve focus group discussions (FGD; Annex III) to establish contextual information about the communities and household surveys (HH Survey; Annex IV) that capture the quantitative indicators. Some indicators, will be evaluated by the researchers through interviews and observations in the communities.

Food security, dietary diversity and consumption of target crops

Baseline HH Survey or FGD	Evaluated by Researchers
• Household Food Insecurity Access Scale (HFIAS) (Coates, Swindale & Bilinsky 2007) • Dietary Diversity Score (FAO 2013) • # of households consuming target crops • Frequency that households consume target crops	• Inclusion of target crops in school feeding programs

Farmer income and value chain development of target crops

Baseline HH Survey or FGD	Evaluated by Researchers
• Yield (kg/ha) of target crops • Income from target crops (raw and processed/value added) • Wealth: Progress out of Poverty Index (country-specific) (Grameen Foundation 2016) • Access to credit • # of households engaged in selling target crops for income • # of households engaged in processing/value addition of target crops for sale • Price of target crops (raw and processed/value added) • Diversity of products made from target crops for the market	<u>Market Assessment</u> • Availability of target crops in the market (year round or in target season) • # of varieties of target crops available in the market • # of products made from target crops available in the market • Preference of consumers for target crops (raw and processed products)

Conservation of target crops

Baseline HH Survey or FGD	Evaluated by Researchers
• # of households cultivating target crops • Area planted to target crops at household and community levels • Variety diversity of target crops at household and community levels (richness, evenness)	• # of varieties of target crops conserved in *ex situ* gene banks • # of varieties of target crops conserved in community seed banks • # of community seed banks in target location • # of custodian farmers of target crops identified, acknowledged, rewarded

Climate Change Adaptive Capacity*

Baseline HH Survey or FGD	Evaluated by Researchers
Vulnerability matrix (shocks, trends, seasonality) • Self-assessed risk level of major livelihood sources in community to climate hazards (CARE 2009) Livelihood Assets** (natural, financial, physical, human, and social) • Total # of income sources at household and community levels (considering farm based and non-farm based income) • Crop species diversity at household and community levels • Area cultivated to adapted varieties of target crops at household and community levels Institutions and Entitlements • # of households with members who participate in institutions supporting risk management decisions for climate change adaptation Innovation • # of households who have tried new crop varieties in last year • # of households who have tried new farm practices in last year • # of adaptive practices applied by households and their relevance***	Livelihood Assets • Availability of adapted varieties of target crops (existence and recognition of varieties with preferred traits in the community) Knowledge and Information • Availability of information on crop resources in community/landscape • Availability of information on climate patterns in community/landscape and projections for change • Existence of a documentation system for traditional ecological knowledge in the community Institutions and Entitlements • # of institutions in the community that support risk management decisions for agriculture under climate change (integrating information on the market, climate and crop performance/availability) • # of members in institutions that support risk management decisions for climate change adaptation Flexible and forward-thinking decision making and governance • Qualitative assessment of institutions: informed decision making (collaborative, flexible, learning based), transparency and prioritization

* Elements taken from the Local Adaptive Capacity Framework (Jones 2011).

** Assess the assets to be affected by project interventions and most linked to climate resilience using a 5Capitals approach (Donovan & Stoian 2012): Natural: Agricultural biodiversity (plants/animals), water and irrigation sources, land holdings/access, soil quality, use of natural areas, e.g. collection of non-timbre forest products; Physical: tools and infrastructure related to target crops, Human: Training and skills related to target crops and the Project, migration; Social: Institutions, Financial: Income indicators, credit access.

*** Rank relevance of practices in focus group discussions later in the Project.

Empowerment*

Baseline HH Survey or FGD	Evaluated by Researchers
Chain Empowerment Matrix • # of women engaged in different activities in value chains of target crops • # women making decisions on production/processing of target crops • # of women controlling income from target crops • Women's satisfaction with available time for leisure activities Institutions and Information • # of women who received information on climate and adaptive practices • # of women participating in community institutions • # of women with leadership roles in community institutions • Social inclusiveness of institutions (decision making, resource access)	• Social inclusiveness of institutions (decision making, access to resources) • Social barriers to adaptation (norms, rules and behaviour in community) • Involvement of women in management (decision-making) of the value chain • Community vision and plan formulated and expressed, external linkages, partnerships and inputs harmonized with community priorities and future vision • Linkage of community groups to external agencies, policies, extension, local government, financial resources • Ability and right to exchange information and materials in the community

* The selected indicators take elements of the Chain Empowerment Framework (Agri-ProFocus 2012) and the Women's Empowerment in Agriculture Index (WEAI) (IFPRI 2012). Domains of empowerment in the WEAI are: Production, Resources, Income, Leadership, and Time.

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Roundtable on Certification for Agrobiodiversity Conservation

Certification for the conservation of agricultural biodiversity

Stefano Padulosi, Michele Maccari, Gennifer Meldrum, Gaia Gullota and the Conference participants

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Introduction

Various certification schemes exist to indicate to consumers that a product was generated through specific environmentally and/or socially responsible ways, including organic, fair trade, humane society certifications for livestock products, etc. These labels raise consumer awareness for specific issues in agricultural production and allow them to vote for improved production practices, often paying a price-premium. In addition to greater income, farmers can benefit from the positive effects on their social and ecological environment.

While several environmental issues (e.g. use of chemical inputs, canopy cover for bird conservation, etc.) are addressed by existing labels, current schemes do not adequately or explicitly address the conservation of agricultural biodiversity. This workshop explored two options to address this gap:

1. Establishment of a new dedicated standard: Creating a new label that indicates products were produced from threatened plant (and possibly livestock) genetic resources by custodian farmer communities

2. Integrating on-farm conservation into existing certification systems: Include and/or reinforce biodiversity standards and on-farm conservation practices through already existing certification schemes

The feasibility of these options was discussed in the roundtable session. Michele Maccari and Stefano Padulosi introduced the topic and the Conference participants then debated the advantages and challenges of both options, considering their effectiveness for supporting conservation of agricultural biodiversity.

Discussion Points

The main points raised in the discussion are described below and the pros and cons of both approaches are summarized in Table 1.

1) Establishment of a new dedicated standard

The new certification scheme would ensure that a product is produced and is maintained by custodian farmers. Behind there is the livelihood narrative with the sustainability, maintenance and safeguarding of our common heritage. The idea is to create something that is reasonable and can attract the consumer attention, because as of today there is no system to support on-farm conservation.

With a labelling approach we would put emphasis on the person or the family, with their traditional knowledge and the genetic resources (varieties) that are cultivated and conserved using that knowledge. It would be one package - the diversity is part of the identity of rural communities that we want to celebrate around the world. The certification would involve a participatory approach built up by local people.

The new label could be a very powerful way to raise awareness of consumers over the need to support on farm conservation.

Interest in old varieties (eg. wheat) is rising and the new label can appeal to these consumers.

It could be linked to the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture and the UN framework. We could also involve the multipliers - that is the big agri-food value chains. The food industry would pay to put a special sticker on their products that says it supports the conservation of agricultural biodiversity. But in this approach we would face a problem: who will ensure the respect of rules?

In situ conservation should be focused on the agriculture cradles (the centres of origin and domestication), but it should also consider other areas where there is a high diversity, even if it is not a centre of origin.

Centres of origin are often in the developing world and organic certifications are difficult in those areas for a number of logistical, administrative and financial reasons.

New emerging consumers are looking at neglected and underutilized species (NUS), so NUS by itself could be a label but we are interested also in the landraces of maize, wheat, rice, etc.

The narrative contained in a certification of on-farm conservation brings attention to saving the environment as a collective effort. The organic agriculture business instead is largely driven by personal health considerations. People buy organic basically to eat healthier. A challenge for a dedicated standard for conservation will be to motivate consumers to think more about the bigger picture, beyond themselves.

At the same time the consumers of organic products are the ones that are more sensitive to conservation, so we will be competing with the organic label by creating a new label.

Setting up a new label would be a very intense process, demanding a large amount of resources needed to set up the regulations and make visits to farms for certifying the products. These costs could be minimized by using a participatory guarantee process but the skill of farmers and community members to recognize the relevance of plant genetic resources would remain a concern.

2) Integrating on-farm conservation into existing certification systems

Organic

There are no schemes that bring together organic and conservation. It is an interesting option. The combination of the two perspectives could make a difference.

There is already a very large established consumer base for organic certification and by bringing biodiversity conservation into the organic certification scheme we could have a much wider impact.

By integrating conservation with organic, consumers would not have to choose between competing 'good causes'. It makes it a simpler choice and they can feel confident in their purchase.

There are many countries where organic agriculture is being practiced and there are also different regulations. The strongest and oldest one is that of the European Union. In the USA, organic certification is very strong and continues to grow.

In the same 'organic' label there are the big farms that are in the border of the regulation and small farms. The current regulated approach for organic agriculture does not give special recognition to smallholders but this is where the greatest conservation still operates. The organic production system/labelling could include a special focus on smallholders as key actors in conservation.

The organic label is in many cases highly bureaucratic and costly for the producers, which is a barrier to access the benefits. Many organic producers are not certified because of the costs or

because some particularities of the regulations. For example, in India the millets are NUS crops that grow in a mosaic condition. The farmers are not cultivating consistently in the same parcels so in this context the organic certification will not work.

To get biodiversity considerations into an organic certification framework may be very difficult due to politics and bureaucracy, which would have to be navigated in the various certification institutes.

Organic agriculture does not necessarily mean that there is on-farm conservation. You do not need to be organic to be interested in conservation of biodiversity and you do not need to be interested in conservation of biodiversity to be organic.

The International Movements of Organic Agriculture (IFOAM) is moving forward to go beyond the limited legislation of organic agriculture, towards a more articulated concept of organic certification (the so-called Organic 3.0).

Other Existing Certification Schemes and Alternative Approaches

As a starting point organic agriculture may be too narrow.

Another option to consider is the Fair Trade movement. The world of Trade Fair is also a very good match with our narrative of fair conservation goal.

The solution could also come from a territorial approach, which represents the new developing frontier.

The Slow Food scheme, focused on marketing final products (the so called *praesidia*) and other similar schemes work well to match people that make conservation and markets, without requiring certification.

ProSpecieRara Foundation in Switzerland, promotes the cultivation of varieties that are disappearing such as ancient potatoes varieties, providing also a trademark that helps the marketing of these products and raises consumers' awareness.

In India, Participatory Guarantee Systems is emerging and it is helping to resolve some problems related to NUS. It is focusing more on the regional use of a label. It's a different way to empower the people and to reduce the costs.

Synthesis

During the discussion the challenges for certification in the centres of origin of crops has been addressed from different perspectives. The participants highlighted the importance for conservation, not only of the centres of origin, but also in all areas rich in agricultural biodiversity

1) Establishment of a new dedicated standard

This option would guarantee to define the contents and create a single scheme and related logo that would immediately identify a product with the required characteristics. The main threats of this option is the specific skills required and high costs associated to the introduction (and promotion) of a new standard in the market of standards and certification schemes, which is already highly competitive.

2) Integrating on-farm conservation into existing certification systems

Considering the existing international certification scenario, 'organic' was seen as the most feasible certification scheme that could incorporate agricultural biodiversity conservation. After a very stimulating discussion on the meaning of organic and non-organic systems, the workshop highlighted that organic could be a starting point even if very limited. It is important also to consider the entire narrative behind organic and the standards used for its certification. Organic standards are in fact numerous and regulated by different bodies in different places. The existing standards

for organic agriculture and biodiversity conservation are not necessarily compatible, as organic does not require conservation and conservation does not require organic production. However, the process ongoing now by IFOAM to define a more articulated concept of organic certification could be an interesting chance to participate and explore the possibility to include specific references on biodiversity within the existing portfolio of organic standards.

Alternatives to the organic certification have also been mentioned, including geographic indications, the involvement of the food industry and the big agro-food value chains, participatory guarantees, Fair Trade, the Slow Food scheme and other consumer-facing solutions such as trademarks and brands.

Table 1. Summary of pros and cons.

	Establishment of a new dedicated standard	**Integrating conservation of agricultural biodiversity into the organic label**
Advantages (pros)	• Dedicated to the specific cause • Raises awareness for the importance of agricultural biodiversity conservation • Interest in old varieties (eg old wheat) is rising • Can be tailored to the needs of smallholder farmers in centres of origin of plant diversity, with awareness of their farm and cultural practices.	• Large established consumer base of organic means joining conservation with this label would have a wide impact for safeguarding agricultural biodiversity • Reduces the burden on the consumer to choose between 'good causes'
Disadvantages (cons)	• Competes with organic and other established labels, which have high market share • High cost of setting up a new label and regulatory mechanism, securing the expertise required to guarantee the importance of the conserved plant genetic resources • Don't need certification as can focus on traits in labelling.	• The cost of the certification is a barrier to entry for many small producers, especially in poor countries, which are often the most important for conservation (centres of origin) • Different organic certification schemes would mean that we need to work with different regulatory bodies. • Conservation doesn't depend on organic production and organic producers may not only want to use rare/threatened crop resources.

Proposal for a scoping study

The workshop ended with the recommendation of following up through a study that would shed more light on pros and cons of the two options identified, along with suggestions for concrete opportunities for development. We can consider engaging an expert that could interview different stakeholders in the countries involved in the IFAD-EU NUS Project to gather more views and get a better understanding of the issues involved, needs and challenges.

The Istituto per la Certificazione Etica ed Ambientale (ICEA) could offer the following assistance in this process:

- Technical Guidance: ICEA provides services related to regulated standards and has also the necessary expertise to develop new certification schemes. ICEA can provide guidance in the implementation of a technical analysis about the components related to biodiversity already included in the main standards (Organic, Fairtrade and others). ICEA could coordinate a working group with representatives of Bioversity International and interested organizations participating in the programme.

- Networking with stakeholders in certification and standards: ICEA could facilitate the networking with the main organizations (standard setting and certification bodies) and

raise their awareness about issues related to biodiversity. ICEA could also lobby to facilitate the adoption of criteria related to biodiversity within their standards schemes and support the process of inclusion.

- Public-Private Partnership for marketing products: Starting from main products identified by the IFAD-EU NUS Project, ICEA could select some interested private companies and facilitate the development of commercial partnerships. ICEA could also facilitate relations with the consumers associations and facilitate the participation in dedicated fairs and events (i.e. BIOFACH, SANA, etc.).

Defining the IFAD-EU NUS Project

Global framework

The IFAD-EU NUS Project

Linking agricultural biodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk

Stefano Padulosi
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Introduction

The three-year Project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk' aims to empower women and men farmers and other value-chain actors, to build resilient livelihoods through agricultural biodiversity-based solutions. The Project, whose main geographical focus will be in Guatemala, India and Mali, will build capacities of community-based organizations to collect information, share experiences and make self-directed decisions to foster knowledge-building and local innovation. Beneficiary groups are vulnerable smallholder farmers, including indigenous peoples and women, who will be able to exchange data regarding weather, markets, the performance of varieties of crops and their nutritional benefits. Data generated through the mechanisms established by the Project will enhance the preparedness of farmers and other value-chain actors for climate variability and help them to manage the associated risks. Data on crops and varieties (e.g. prices, demand) will guide farmers and other value-chain actors to make informed choices regarding production of crops that are more aligned to market needs and emerging trends. Existing networks will be strengthened and new ones will be created to help communities to better document, monitor, exchange, and manage their traditional crops. National and international platforms and fora will be used to voice the concerns and aspirations of communities for more sustainable, inclusive and nutrition-sensitive food and agricultural systems.

The choice of target countries, Guatemala, India and Mali, has been made on the basis of a number of considerations, most importantly the potential for agricultural biodiversity to be leveraged for improved livelihoods, as these countries have high levels poverty and malnutrition and rich native crop diversity. The choice of sites in three distinct regions of the world will enable inter-regional knowledge-sharing. Finally, the choice was also made to leverage strong research partnerships and existing efforts by Bioversity International and other CGIAR Centres.

The Project capitalizes on Bioversity International's long engagement in the area of neglected and underutilized species (NUS) (Padulosi & Hoeschle-Zeledon 2004, Padulosi, Bergamini & Lawrence 2012, Padulosi, Thompson & Rudebjer 2013). The novelty of the Project is to bring together different disciplines, stakeholders, and sectors of society under the shared objective of strengthening peoples' resilience to climate change through agricultural biodiversity in relation to:

- Production systems (adaptation, seed conservation and availability)
- Food systems (quantity and quality, sustainability, buffering shocks)
- Market systems (diversity, technology, buffering shocks)
- Other aspects (culture, empowerment of women and indigenous people)

At the onset, the Project will be focusing its attention on gaining a better understanding of livelihood assets for resilience at both household and community levels. This information will then be used to guide the deployment of Bioversity International's 'holistic value chain approach' (Figure 1) (Padulosi et al. 2014, 2015) for teasing out and strengthening the many benefits from local agricultural biodiversity and NUS, that are currently poorly leveraged in terms of adaptation to climate change, nutrition security and income generation. Such an approach is characterized by being highly participatory, multi stakeholder, interdisciplinary, inter-sector and gender-sensitive.

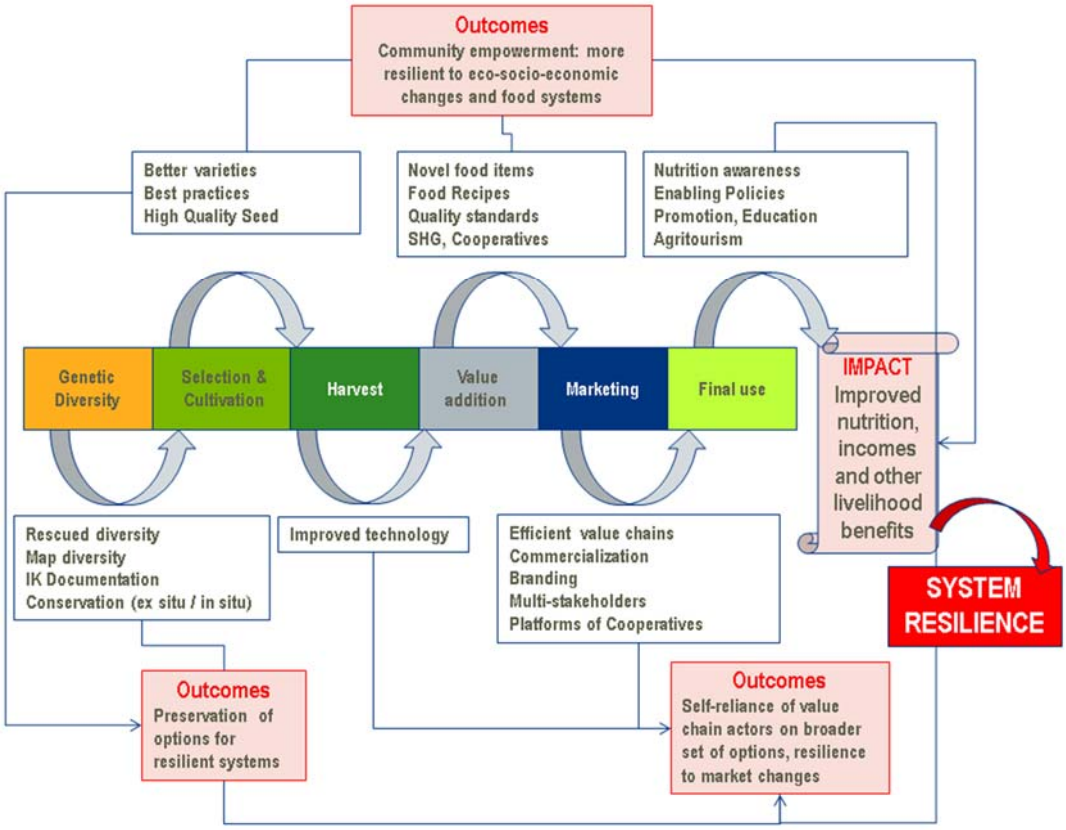

Figure 1. Bioversity International's 'holistic value chain approach' and its expected outcome in terms of resilience of the livelihood system as a whole.

A special focus on neglected and underutilized species (NUS)

The portfolio of thousands of edible plant species - wild, semi-domesticated and cultivated (Padulosi & Hoeschle-Zeledon 2004) - represents a strategic asset for communities, and particularly those affected by marginalization, poverty and food insecurity (Padulosi et al. 2013). Bioversity International has been leading work on NUS at the global level for over two decades and this Project represents its latest contribution to demonstrate to the research and development community the benefits of these 'orphan' crops with regards to:

- Nutrition: Neglected and underutilized grains, pulses, vegetables, and fruits are a diverse set of nutrient-dense species whose role is increasingly appreciated by science.
- Market: There are emerging opportunities to market NUS appealing to nutrition and health conscious consumers at all latitudes.
- Adaptation: The resistance of NUS to abiotic stresses is yet to be duly exploited. The marginalization of these crops from mainstream agriculture is depriving communities of strategic assets for their future.
- Conservation: The NUS are a large portfolio of crops that are not conserved in *ex situ* gene banks but only *in situ*/on farm. By supporting the on-farm conservation of NUS the Project has importance supporting 'evolutionary agriculture' through continuous adaptation.
- Culture: NUS are a reservoir of immense gastronomic diversity and they often embody the identity of peoples and territories. Their conservation and promotion can contribute to strengthen cultural identities.
- Empowerment: NUS are a vehicle for empowerment of women and vulnerable groups including Indigenous People who are typically their key custodians.

A special focus on women

Women are often the nexus between conservation and use at both household and community levels. The Project will devote a special attention to promote women's empowerment through agricultural biodiversity-based solutions. The focus on women is strategic for a number of reasons:

- Women play a vital role in supporting global food security.
- Women constitute 40% of the labour force of the agricultural sector in developing countries.
- Although women reach an average production levels 20-30 % lower than those of men, it is estimated that if they had equal access to resources, agricultural production in the world would grow by 2.5-4 %. This would help saving an estimated 100 to 150 million people from starvation.
- Women actively participate in the conservation and use of food.
- Women account for 2/3 of the poorest small holder farmers.
- Understanding women's participation, roles and needs linked to target crops is essential to ensure effectiveness of any policies directed to supporting them.

A special focus on Indigenous Peoples

Another social group that will be receiving special attention in this Project is indigenous peoples who are key custodians of agricultural biodiversity and knowledge for sustainable management. Complementing this knowledge with innovative methods and approaches developed by other communities and researchers can support them in facing climate change and responding to ever-evolving opportunities and threats that may affect their nutritious crops.

Impact pathway and theory of change

Thanks to the Project interventions over a period of at least three years, women and men farmers and other value-chain actors will be able to identify diverse, stress-tolerant, adapted crops with market potential. The development of climate-resilient and adaptive practices, combined with the availability of high quality seed of stress-tolerant varieties, will strengthen the capacities of farmers to cope with change. Greater participation of women and men's farmer groups in income generation activities, supported by better skills in cultivation, value addition and marketing and accompanied by activities designed to raise demand for nutritious products from traditional crops, will contribute to enhanced nutrition, income and empowerment of vulnerable groups.

By understanding better the pros and cons of diverse configurations of local crops, and their interactions with management of animals on farm, the targeted communities will have improved capacities to manage weather-associated risks and improve their livelihoods. Involvement in participatory systems to document and monitor the potential of local plant genetic resources, weather information and market intelligence systems, will help women and men farmers to better commercialize underutilized local resources and generate more benefits. Increased market opportunities will create incentives for farmers to continue to conserve indigenous local crops on farm, which will contribute to safeguarding important livelihood assets. The strengthening of indigenous agro-ecological networks will allow participants to share their knowledge and learn from others.

After the three years, the Project will carry out an assessment on the outcome and impact that its activities have created in target sites in terms of strengthening the resilience of the livelihood system as a whole. The evidence-based analyses that will be carried out through systematic reviews and modelling of climate–nutrition linkages will be used to raise the awareness of decision makers about policy options in support of the better conservation and enhanced use of nutritious and stress-tolerant crops. Close synergy with other important programmes and initiatives (e.g. CCAFS and ASAP) combined with policy options promoted by the Project at national and international levels will help scale up climate resilient and weather adaptive practices.

Project outputs and activities

The Project framework is presented in Table 1, which documents the goal, objectives and outputs. The activities are organized in four focus areas: 1) Cultivation, conservation and risk management, 2) Value-addition and marketing, 3) Institution building and knowledge sharing and 4) Enabling policies and public awareness. An international expert consultation will be held at the onset of the Project so that partners from target countries and key agencies, including representatives of the EU and IFAD, can discuss the methodologies to be developed and used in the target sites. The initial framework will then be refined during country-level meetings with stakeholders in Guatemala, India and Mali. Detail on the planned activities is provided in the following paragraphs.

Area 1: Cultivation, conservation and risk management

Surveys on stress-tolerant crops and assessment of conservation status, erosion threats, degree of use and nutritional value will be carried out in the first year. The survey results will guide the design of other activities to be conducted for the target crops together with the target communities, involving indigenous people and women's associations. Indicators on the resilience of the system as a whole (agro-ecosystem, value chains and food system) will be developed together with communities, tested and used to generate needs assessments, make recommendations for policy interventions and guide countries towards adoption of innovative integrated monitoring frameworks.

Interventions will include: Supporting custodian farmers and community genebanks for the conservation of target crops and their associated knowledge, strengthening networking among farmers, identifying best practices for cultivating target crops, developing weather information systems to support risk management by farmers, and participatory documentation and monitoring, including development of indicators for resilience of the cultivation–marketing–nutrition system as a whole. Training sessions will be carried out for partner agencies, who will then disseminate approaches, methods and tools to participating communities. Information systems on weather conditions for risk management will be designed and tested in Guatemala along with training of women and men farmers, development practitioners and other actors on how to operate these tools. Seeds of stress-tolerant crops identified in the Project will be multiplied and distributed to farmers.

Area 2: Value addition and marketing

Stress-tolerant crops identified in Area 1 will be prioritized as the main focus of value addition and marketing initiatives. Participatory analyses of the value chains of the target crops will be carried out to understand constraints and opportunities and to identify entry points for nutrition. The participation of more vulnerable and marginalized groups such as indigenous peoples and resource-poor women in these processes will ensure that the viewpoints of all stakeholders are taken into consideration. Solutions to bottlenecks along the value chains using a blend of traditional and scientific approaches will be explored in multi-stakeholder meetings. These will be then replicated in Mali and India. Concurrently, in all three countries, farmer-led market intelligence systems will be explored and tested in manners and forms suitable to the local context and building on the Project partners' experiences.

Area 3: Institution building and knowledge sharing

This area will deal with the strengthening of the capacities of local organizations and institutions (self-help groups, community based organizations, women's groups, etc.) to develop farmer-led platforms to collect local information, share approaches, methods and tools and to facilitate access to information relevant to climate change, nutrition and markets. The Project will develop a framework to empower rural communities, including indigenous people, to enhance their knowledge and practices as conservers, innovators and promoters of agricultural biodiversity in their own landscapes. It will build on traditional knowledge and practices—of women and men—by supporting the generation and exchange of information through community-based documentation and monitoring of agricultural biodiversity and the benefits of its use (seed fairs, food festivals, participatory video, community biodiversity registers, etc.). Groups involved will be

empowered to develop locally driven plans, leveraging local innovation through stronger dialogue, networking and participation among local and indigenous peoples and between them and scientists. The Project will strengthen the connection between the scientific community and rural people and will use national and international platforms and fora dealing with local and indigenous peoples to voice their concerns and aspirations for more sustainable, nutritious and inclusive food and agricultural systems.

Area 4: Enabling policies and public awareness

This area of work will analyse how current policy and legal frameworks affect the use of crop diversity by farmers. Activities will explore policy options for enhancing the efficiency of incentives aimed at promoting the use of diversity of crops for climate change coping strategies and nutritional benefits. It will also contribute to raising awareness—especially among decision makers—about the advantages that agricultural biodiversity can offer to local farmers and other value-chain actors in building more adapted and resilient agricultural and production systems. These efforts will be complemented by systematic reviews and modelling studies that will help consolidate the evidence base and make the argument for policy change in support of greater use of agricultural biodiversity more incisive and robust.

This area of work will pay special attention to the role that local and indigenous communities play as generators and users of diversity with regard both to major and minor crops, and will develop mechanisms for strengthening their capacities to better benefit from them. A solid communication framework will be organized to support dissemination of methods, approaches and tools among practitioners and reach out to stakeholders, including research organizations, NGOs, policymakers and donors.

Scaling up and out

The resulting methodology and evidence generated on multiple benefits will be used to promote up-scaling of agricultural biodiversity-based solutions by community-based organizations, governmental organizations, NGOs and national agricultural research systems. The evidence base from the Project will be supported by a systematic review and modelling work. The results will be used to advocate for policy change for further enhancing use of local crops for their better conservation and management on farm for the food and nutrition security of both rural and urban people.

Linkages with CGIAR CRP efforts and IFAD

The Project is housed within the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Links are also made to the CGIAR Research Programs on Agriculture for Nutrition and Health (A4NH) and Policies, Institutions and Markets (PIM). Links with IFAD loan programs will be explored in each target country, including the '*Tejaswini rural women's empowerment programme'* in India and the '*Programme d'amélioration de la productivité agricole au Mali* (PAPAM)' in Mali. Furthermore, the Project will work closely with the Adaptation for Smallholder Agriculture Programme (ASAP) and the Indigenous Peoples Assistant Facility (IPAF) to scale out the approaches, methods and tools tested in the initiative.

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Table 1. Logframe for the IFAD-EU NUS Project

Objectives hierarchy	Objectively verifiable indicators*	Means of verification	Assumptions
Goal			
To strengthen the capacities of women and men farmers and other value-chain actors, including indigenous communities, to manage risks associated with climate change, poor nutrition status and economic disempowerment.	• Food and nutrition security levels for farmers and farming communities in project sites. • Income levels in project sites. • Levels of vulnerability of local production systems to climate change in target communities.	• Baseline data for ex-post impact assessment.	• Favourable political environment. • Policymakers and partners contribute to the research and dissemination processes.
Objectives			
1) Strengthen capacities of indigenous and local women and men farmers and development practitioners to assess, document, monitor, conserve and manage stress-tolerant varieties of traditional crops for their effective deployment in value chains and resilient livelihood strategies.	• 25% more farm households, over baseline, are using traditional varieties in managing adaptation to climate change in their production systems. • 25% more production, over baseline, of traditional crops in areas challenged by climate change (aggregated measure). • 3-5 stress tolerant crops per country, with approx. 10-20 varieties per crop, conserved by target communities on farm. • 3-5 stress tolerant crops per country, with at least 20 varieties per crop, conserved by *ex situ* genebanks in partner countries.	• Farmer and household surveys linked to data from the field. • Field fora and training records • Market surveys. • Surveys involving CCAFS and other partners. • Genebank annual reports. • National agricultural development strategies and plans. • Surveys targeting policymakers.	• Favourable political environment for research and training to take place. • Committed community organizations assist with the dissemination of innovative approaches and practices. • Possible risk: not sufficient national or local political will to facilitate the uptake of the research results.
2) Strengthen community based organizations, mechanisms and processes managed by rural communities (including indigenous people) to share with peers and partners (including researchers) best practices for the sustainable conservation and use of agricultural biodiversity.	• Participants earn 25% more than baseline from traditional crops and products, disaggregated by gender. • 3-5 stress tolerant crops per country, with 5-10 varieties per crop, sold in local and national markets linked to target areas.		
3) Strengthen capacities of national agriculture research systems to deal with climate risks within a holistic value-chain approach and promote scaling up of successful approaches through collaborative linkages with rural	• 500-800 farmers per country, of which at least 40% women 30% indigenous, trained in practices for managing risk through agricultural biodiversity. • 30 national agriculture research system experts trained in use of agricultural biodiversity to manage		

Objectives hierarchy	Objectively verifiable indicators*	Means of verification	Assumptions
communities, and major national and international agendas. Part of the capacity-building process will be to promote an enabling environment for national agriculture research systems.	climate change risks in crop production and value-chain enhancement (disaggregated by gender). • 300-500 farmers per country, of which at least 40% women, participating in decision-making fora related to climate change.		
4) Enhance the scientific understanding of the role played by agricultural biodiversity in resilient and nutrition-sensitive production and food systems and advocate a policy change for its sustainable use.	• At least 3 to 5 linkages with national and international projects per country, including to IFAD loan programs and to ASAP. • At the end of the program, the three participating countries, plus, through the collaboration with ASAP and CCAFS, an additional three to five countries, will have increased research and development attention on agricultural biodiversity for more resilient and sustainable production and food systems.		
Outputs			
1) Improved crops, methods, approaches and tools for coping with climate change.	• 3-5 improved, stress-tolerant crops per country with market potential identified and used by women and men farmers and other value-chain actors in target communities. • Amount of high quality seed of stress-tolerant varieties (in kilos, target to be established during inception) managed and produced by women and men farmers in target sites. • At least 3-5 farmer-led intelligence systems to support local producers. • At least 3-5 weather information forecast systems used by rural communities in target areas.	• Field surveys in target sites. • Fact sheets on stress-tolerant varieties produced and disseminated by national agriculture research systems and NGOs. • Annual Reports by Bioversity and other partnering agencies. • Project research data. • Project reports.	• Crop genetic diversity with respect to climate change is available in project sites. • Community members and value-chain actors agree to provide information regarding markets of traditional crops.
2) Strengthened market access for stress-tolerant and nutritious crops.	• Level of production of stress-tolerant traditional crops and varieties (increased yield to be established at inception based on the target crops selected). • At least 30% increase in demand, over baseline, for nutritious crops/products of stress-tolerant crops in local markets linked to target sites.	• Field surveys in target sites. • Annual Reports by Bioversity and other partnering agencies. • Project research data. • Project reports.	• Community members and value chain actors agree to provide information on market demand.

Objectives hierarchy	Objectively verifiable indicators*	Means of verification	Assumptions
3) Enhanced capacities of farmers and other value chain actors in conserving and using agricultural biodiversity sustainably.	• 5-10 farmers' networks (including indigenous ones) strengthened per country. • 3000-5000 farmers per country, of which at least 40% women, enabled to access information on climate change for better management of their agricultural production. • 300-500 farmers per country, of which at least 40% women, from target communities enabled to document stress tolerant crops for their better use in their production systems. • 40-50 practitioners/ researchers in national agriculture research systems per country (with gender proportion to be established) trained by the Project in holistic value chain approaches. • Amount of high quality seed of stress tolerant crops produced by women and men farmers in target communities (in kilos, to be established at project inception based on crops selected). • Three participating countries, plus an additional three to five countries, are using agricultural biodiversity documentation and monitoring tools promoted by the Project. • At least 3 to 5 projects adopting methods and tools developed by the Project (including to IFAD loans and ASAP).	• Field surveys in target sites. • Annual Reports by Bioversity and other partnering agencies. • Project research data. • Project reports.	• Secured level of commitment of research partners.
4) Proof of evidence of role of agricultural biodiversity in nutrition, income and adaptation to climate change provided along with recommendations for supportive policies for its enhanced use.	• 5-10 highly-visible scientific papers that provide further evidence of how agricultural biodiversity strengthens people's livelihoods. • 10-20 policy recommendations to decision makers promoting the greater use of local diversity, at national and international levels. • Collaboration with ASAP and CCAFS established and operational for promoting linkages between local producers and national and international agendas dealing with adaptation to climate change.	• Annual Reports by Bioversity and other partnering agencies. • Press news and other media. • Project research data. • Project reports.	• Decision makers are open to the adoption of agricultural biodiversity-rich approaches in addressing climate change, nutrition and income generation. Solutions.

* All targets will be reconfirmed and verified during the multi-stakeholder launching meeting at project inception. The logframe presents indicators and targets for the 3 Year Project.

Site-specific work plans

The IFAD-EU NUS Project in Mali

Promoting fonio (*Digitaria sp.*), Bambara groundnut (*Vigna subterranea*) and nutritious underutilized vegetables in Sikasso and Ségou regions of Mali

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Introduction

The Project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk' will be implemented in Mali by the Institut d'Economie Rurale (IER), which is the main research institute in the country in charge of agricultural research and development. IER's mandate is to undertake and facilitate research activities that contribute to better performance of crop, animal, fish and tree resources to ensure food security and income generation for the people of Mali. The institute puts farmers at the centre and uses participatory approaches in all their activities related to plant and animal breeding, soil and water analysis, pathology and entomology, sustainable cropping systems, integrated agricultural development, capacity building, gender and development, natural resource management, agricultural enterprises, food technology, and animal nutrition and genetic resources management, conservation, and sustainable use

Through its Genetic Resources Unit, IER has worked in close collaboration with Bioversity International since 1999. In the course of the joint implementation of several projects, the partnership has strengthened the capacities of actors involved in the conservation and sustainable use of plant genetic resources in Mali and developed approaches for seed diversity fairs, diversity fields, diversity kits, community seed/gene banks and costing the benefits of conservation of genetic diversity for major crops. The IFAD-EU NUS Project will build and expand on these efforts, promoting use and cultivation of underutilized crops with high potential to strengthen food and nutrition security and livelihood resilience of rural communities facing climate change.

Context

Mali is a landlocked country in the heart of West Africa. The majority of its land surface is characterized by a hyper-arid to arid climate. 51% of the land area falls in the desert eco-zone (annual rainfall 0 to <250mm) and 26% in the Sahel zone (250-550mm) (Coulibaly 2006). The climate is more benign, with higher levels of rainfall, toward the south: the Sudanese zone is characterized by a semi-arid to sub-humid climate (550-1100mm) and the pre-Guinean zone is characterized by a sub-humid climate (>1100mm). These more humid southern zones are only a small amount of Mali's land area (17% and 6%, respectively) but the population is concentrated in these regions.

Peoples' livelihoods are closely related to the land in Mali. The national economy is largely (35%) based on the agricultural sector and the majority of the population is rural (78%) with livelihoods based on farming or pastoralism (IFAD 2011). Different ethnic groups have distinct livelihood strategies: the Bambara, Senoufo, Mianka, Foulany, Bobo, Malinke, Sarakole, Dogon and Songhay are mostly settled farmers (agriculturists or agro-pastoralists), the Fula, Touareg and Maure in the northern regions are mostly herders, and the Bozo are fishers primarily settled along the Niger River (Minority Rights Group International 2015). Farmers' landholdings are typically small, with

85% having less than 10 hectares and the average plot size being 4.7 hectares (FAO & SICIAV 2010). 87% of national agricultural production is for home consumption (CFSVA 2005) and almost all the farmland is rainfed (IFAD 2011), making the production highly vulnerable to climate hazards.

Food insecurity and malnutrition are major issues in Mali, which are more pronounced in rural areas. The country experiences severe food shortages generally one year in three (CFSVA 2005) and faces a lean period every year from July–September before the crops are harvested. Stunting, wasting, and underweight are prevalent, estimated at 38%, 15% and 27% respectively in children under 5 years of age (FAO & SICIAV 2010). Micronutrient deficiencies are also highly prevalent. Anaemia, often linked to iron deficiency, is a critical issue: 81% of children aged 6-59 months were found to display anaemia and 10% severe anaemia in 2007 (FAO & SICIAV 2010). A strong urbanization has occurred in recent years and obesity and overweight cases are increasingly recorded among the urban middle class that is consuming foods high in carbohydrates and fats (FAO & SICIAV 2010). In Bamako, the prevalence of overweight and obesity is 31%, which is a trend linked to risk factors of diabetes, cardiovascular disease and cancer (Fanou-Fogny 2012).

The most food insecure regions of Mali are the north (Kidal, Gao, and Tombouctou - especially the lake area), the south of Kayes and Koulikoro, the north of Ségou, and specific areas in Mopti (the Dogon plateau, Niger delta, and Douentza Cercle) (CFSVA 2005). Sikasso and Ségou have lower rates of food insecurity than the rest of the country but still 25% of households are food insecure or highly vulnerable (CFSVA 2005). Despite having relatively better access to food and being the main cereal basket of Mali, Sikasso actually has the highest rates of chronic malnutrition in the country (CFSVA 2005). Diets are more diverse in Sikasso and Ségou, as households more commonly consume fruits and vegetables, but low consumption of milk and meat in these regions is linked to higher rates of vitamin A and iron deficiency than other regions (FAO & SICIAV 2010). Only 33.6% of the Malian population is literate (IFAD 2011) and a major barrier in proper nutrition is mother's education, which is related to the adequacy of child feeding practices. Stunting was found to be double for children of uneducated women compared to those with secondary education or greater (FAO & SICIAV 2010). As half of rural households in Mali live below the poverty line (IFAD 2011), the lack of purchasing power is also a barrier to food security for many households, particularly in north where there is greater dependence on purchased foods (FAO & SICIAV 2010, CFSVA 2005).

Climate is a fundamental constraint for food security in Mali (CFSVA 2005). The climate features a long dry season (October/November to May/June) and a short rainy season (June to September) (FAO & SICIAV 2010). Frequent drought and drying of water bodies underlie a state of chronic food insecurity in the northern regions and are the most important hazards for food security in the south because of high dependence on subsistence agriculture (CFSVA 2005). With already harsh conditions for agriculture, climate change is a major threat to food security in Mali. Variation in precipitation patterns have occurred in recent years, including delayed onset of the rainy season, irregularity of rainfall, early cessation of rains, and less precipitation overall. Rainfall declined 20% from 1951 to 2000 and a general shift of climate zones southward has occurred, raising alarms about desertification. With heat and drought already major constraints to food production in Mali, the increasingly arid conditions could have severe consequences for food security unless action is taken to adapt.

The major food crops in Mali are pearl millet (*Pennisetum glaucum*), rice (*Oryza sativa* and also to a smaller degree native *O. glaberrima*), sorghum (*Sorghum bicolor*), and maize (*Zea mays*). The important cash crops are cotton, tobacco and peanut, the latter which is also grown as a food crop [2]. Other important minor food crops are cowpea (*Vigna unguiculata*), Bambara groundnut (*Vigna subterranea*), and fonio (*Digitaria exilis*, *Digitaria sp*.). Popular vegetable crops are lettuce (*Lactuca sativa*), onion (*Allium cepa*), bell and chili peppers (*Capsicum annum*, *Capsicum frutescens*), tomato (*Lycopersicon esculentum*), and cabbage (*Brassica oleracea*), which have their origins outside of the region. Many other native and naturalized vegetables also continue to be cultivated on a smaller scale (Box 1). Cultivated trees in Mali include mango (*Mangifera indica)*, papaya (*Carica papaya)*, guava (*Psidium guajava)*, sugar apples (*Annona squamosa)*, and various *Citrus* species (oranges, lemons, grapefruit, etc.). Cereals make up 72% of arable land in Mali, while cash crops make up 19% (FAO & SICIAV 2010).

Production of rice and maize has expanded in Mali since the 1990s displacing traditional crops like pearl millet and sorghum (FAO & SICIAV 2010), Diallo 2011). Rice cultivation expanded as a result of government investment in irrigation, notably in Ségou region (Ministry of Agriculture 2009). Its production has not kept pace with rising consumer demand, however, as rice has become the predominant staple in urban areas and is increasingly consumed in rural areas (Fogny-Fanou 2012, Ministry of Agriculture 2009). There is consequently high dependence on imported rice in Mali, which comes mostly from Asia with volatile prices (Ministry of Agriculture 2009). Production and consumption of maize has also increased in Mali as a result of government research and promotion, particularly in Sikasso region, where fast-maturing varieties of maize (as short as 65-75 days) are a critical lean season food (Diallo 2011, Laris 1995). Maize is promoted because it has the highest yield potential of the coarse grains but a major constraint is that it depends on good rainfall, which is increasingly unstable in Mali (Diallo 2011). Maize is also expensive to due to the cost of seed and dependence on fertilizer, which is a barrier for farmers to cultivate this crop (Diallo 2011).

An important aspect of traditional agricultural practice in Mali is the correspondence between the varieties cultivated and the soil and climate conditions. Many varieties are disappearing, however, due to agricultural modernization (shift to extensive agriculture) and climate change.

Box 1. Native and naturalized vegetables cultivated and collected in Mali and Dry West Africa. Source: Shackleton, Pasquini and Drescher (2009).

Field crops and gathered forbs
Abelmoschus esculentus (common okra) and *Abelmoschus caillei* (West African okra); *Amaranthus sp.* (wild spinach), including native *Amaranthus graecizans* and introduced species *Amaranthus cruentus, Amaranthus caudatus,* and *Amaranthus viridis; Cleome gynandra* (spider plant; leafy vegetable); *Corchorus olitorius* and wild relative *Corchorus tridens* (jute mallow; leaves); *Cucurbita maxima* (pumpkin; fruits), *Cucurbita pepo* (pumpkin; leaves and fruits), and *Cucurbita moschata* (pumpkin; fruits); *Hibiscus subdariffa* (roselle; young calyxes); *Ipomoea batatas* (sweet potato; leaves; naturalized from Americas); *Luffa cylindrica* (spongegourd; fruits) which grows wild in West Africa but its use is limited as people prefer to use *Luffa acutangula* that was naturalized from Asian origin; *Solanum aethiopicum* (eggplant; fruit), *Solenostemon rotundifolius* (fra fra potato; tubers); *Trichosanthes cucumerina* (snake gourd; naturalized from Asian origin); *Vigna unguiculata* (cowpea; leaves)

Trees and shrubs
Adansonia digitata (baobab; fruit and leaves), *Balanites aegyptica* (desert date; fruit, seed, leaves), *Bombax costatum* (leaves and flowers, fruit), *Daniellia oliveri, Ficus* sp., *Grewia mollis, Khaya senegalensis, Moringa oleifera* (drumstick; leaves), *Rodognaphalon brevicuspe, Parkia biglobosa* (seeds), *Senna* sp., *Strychnos spinose, Tamarindus indica, Vitex doniana, Vitelaria paradoxa, Zaban senegalensis*

Target Crops

With increasing aridity in Mali due to climate change, increasing the availability and performance of heat and drought tolerant crops will be key in strengthening food security. Traditional West African crops, which are well-adapted to the harsh growing conditions of the region, have received scant research and promotion in comparison to rice and maize but are critical assets to secure livelihoods and nutrition of Malian people in the face of climate change (Tadele & Assefa 2012).

Sorghum, pearl millet and cowpea are native dryland crops that are vital to food and production systems in Mali. Two other traditional crops, fonio and Bambara groundnut, are also important in Malian production systems on a smaller scale. These highly drought tolerant crops, tied to traditional food cultures and risk management strategies, have great potential to improve food security under climate change. However, due to the low of research attention, these crops face many constraints that must overcome to enhance their role in food and nutrition security.

The IFAD-EU NUS Project will focus on Bambara groundnut, fonio and traditional vegetables to build understanding of their constraints for production and use and work to overcome these bottlenecks to support development of more nutrition sensitive and resilient food and livelihood systems in Mali.

Bambara groundnut

Bambara groundnut (known as *voandzou* in Mali) is widely cultivated in semi-arid sub-Saharan Africa. It is the third most important legume in Africa, and Mali, after peanut and cowpea and has an advantage over these crops in terms of its adaptation to poor fertility soil, drought tolerance, and resistance to pests and disease (Table 1; Hillocks, Bennett & Mponda 2012; Brink & Belay 2006).

The seeds of Bambara groundnut, which mature underground, are eaten fresh, dried and boiled, roasted, or ground as flour. Nutrient values differ between varieties and locations but the crop is considered a 'complete food' with an adequate complement of protein, carbohydrates and fat (Azam-Ali et al. 2001). Some studies report that Bambara groundnut has higher protein value than groundnut or cowpea (Azam-Ali et al. 2001, while other sources report slightly lower levels (Table 2). Lipid content is similar to cowpea but inferior to peanut (Azam-Ali et al. 2001). Indeed, Bambara groundnut is believed to have been displaced in West African production systems when peanut was introduced from the Americas for the high export potential of peanut oil (Azam-Ali et al. 2001). Red seeds are higher in iron than cream-colored seeds and could be important in reducing iron deficiency (Bamshiaye, Adegbola and Bamshiaye 2011; Hillocks, Bennett and Mponda 2012). The black seeds have an additional cultural value in Mali, because they are considered a protection against the spirits.

Table 1. Growing preferences for the primary pulses and cereals of Mali. Source: FAO EcoCrop Database, data are not specific to Mali.

Crop	Annual Rainfall (mm)			Temperature (°C)			Soil Fertility		Growth cycle (days)
	Min	Optimal	Max	Min	Optimal	Max	Optimal	Absolute	
Peanut	400	600-1500	4000	10	22-32	45	High	Moderate	90-150
Cowpea	300	500-1500	4100	15	25-35	40	Moderate	Low	30-240
Bambara groundnut	300	750-1400	3000	16	19-30	38	Low	Low	90-180
Sorghum	300	500-1000	3000	8	27-35	40	Moderate	Low	90-300
Pearl millet	200	400-900	1700	12	25-35	40	Moderate	Low	60-120
Fonio	400	900-1600	2800	18	22-27	31	Moderate	Low	9-130

Table 2. Nutrient values of some commonly consumed pulses and cereals of Mali in West Africa per 100g of edible portion. Source: Smith (1995).

Food	Energy (Kcal)	Protein (g)	Thiamine (mg)	Niacin (mg)	Calcium (mg)	Iron (mg)
Peanut	549	23.2	0.79	15.5	49	3.9
Cowpea	342	23.1	0.75	2.5	101	7.6
Bambara groundnut	365	18.8	0.47	1.8	62	12.2
Sorghum	340	9.4	0.25	3.7	45.0	8.8
Pearl millet	341	10.4	0.3	1.7	22.0	20.7
Fonio	332	7.1	0.24	1.9	40.0	8.5
Rice	346	7.0	0.17	5.4	6.0	2.4
Maize	357	9.4	0.33	2.2	16.6	3.6

Bambara groundnut is cultivated primarily by women subsistence farmers and could be an important income opportunity for these producers. Currently, the majority of Bambara groundnut production is destined for home consumption (Bamshiaye, Adegbola and Bamshiaye 2011). However, it is a popular snack food, with a fairly high market price and studies have suggested that demand often exceeds supply (Azam-Ali et al. 2001; Hillocks, Bennett and Mponda 2012).

There are several constraints to increase production and use of Bambara groundnut that have been noted in the literature, including poor germination (INERA 2012), late maturation (Tadele &

Assefa 2012), poor uniformity (INERA 2012), difficulty in mechanical harvesting, that hinders large-scale production, disorganized value chains with poor aggregation of producers, laborious processing due to difficult de-hulling, and long cooking times, that demand more fuel and water than competing legumes like cowpea (Hillocks, Bennett and Mponda 2012). Bambara groundnut is generally under-researched and the most important constraints in Mali are not well documented. The bottlenecks to increase production and use of Bambara groundnut could be overcome given some research attention to develop and introduce appropriate technologies and strengthen the supply chain.

Fonio

Fonio (*Digitaria sp*.) has been cultivated widely in the Sahel and Sudanese zones of West Africa for thousands of years for human consumption. In semi-arid and sub-humid regions of West Africa, the crop occupies 12-23% of cropping area - the third largest area after millet and sorghum (Vall et al 2011). Fonio is a staple or forms a major part of the diet for many rural communities in Mali, contributing 17-21% of cereal requirements (Koreissi 2015, Vall et al. 2011). Ségou and Sikasso are the major fonio growing regions in Mali, which provided 70% of production in 2006-2007 (Koreissi 2015).

Because of the short time to maturation for some varieties (<100 days), fonio holds a central place in the food security strategy of rural families during the lean period before millet and sorghum are harvested (Vall et al. 2011). In the semi-arid zone it is almost exclusively consumed in the lean period (Vall et al. 2011). In the relatively more food-secure semi-humid zone, in addition to using the crop in the lean period, it is also commonly stored and used throughout the year to diversify the diet (Vall et al. 2011). Predictions for climate change in West Africa suggest that the most severe impacts on agriculture will be the result of the reduced length of the growing period, as the rainy season starts later and ends earlier (Tadele & Assefa 2012). Crops with shorter growth cycles, such as fonio, will be increasingly important to secure food production.

Fonio is a fairly nutritious crop, rich in starch and glucidic energy (Koreissi 2015). It stands out for its content of essential amino acids methionine and cysteine, which are deficient in rice, wheat, maize, and sorghum, and generally limiting for the protein quality of West African diets (Tadele & Assefa 2012; Adoukonou-Sagbadja et al. 2006; Annegers 1974). Fonio holds second place after sorghum for iron and zinc in the Table de Composition des aliments du Mali (TACAM; Koreissi 2015). However, traditional processing methods (involving husking, de-hulling, washing and milling) have been shown to significantly reduce the iron content to levels below other cereals commonly consumed in Mali (Fogny-Fanou 2012, Koreissi 2015). The phytate content in fonio also interferes with iron absorption and is not fully eliminated with processing and cooking (Fogny-Fanou 2012, Koreissi 2015). These issues limit the value of fonio in improving iron in Malian diets. However, the crop still shows value as a source of carbohydrate, protein, and zinc. Another appeal is that it is a gluten-free grain and has low glycaemic index, making it suitable for diabetics.

Fonio is considered one of the best tasting African cereals, appreciated by all levels of society (Adoukonou-Sagbadja et al. 2006). For some communities in Mali it is considered the fanciest grain served to guests and at celebrations (Adoukonou-Sagbadja et al. 2006). It has strong traditional significance, holding a central role in women initiation ceremonies, baptism of newborns, and requesting a woman's hand in marriage (Adoukonou-Sagbadja et al. 2006). The Dogon's consider it 'the grain of the world' (Cruz, Beavogui & Drame 2012). The central role of the grain in traditional practices hints to the greater importance that it once had in the food security and culinary traditions of Mali and West Africa and is an appealing characteristic for consumers. In Bamako, in contrast to rural areas, the cereal has generally no importance as a staple grain but it is still consumed popularly as food during feast days, for important guests, and a snack (Fogny-Fanou 2012). The grain carries a high market price in part because of its high esteem but also because of low yield and supply (Foltz 2010). The high price represents an income-earning opportunity for producers on marginal lands but also a barrier to use for cash-limited consumers.

Fonio is highly drought tolerant and grows on marginal soils with no inputs (Vall et al. 2011). Because of its capacity to thrive under low nutrient conditions, it is often the last crop in the rotation cycle before the land is left to fallow (Adoukonou-Sagbadja et al. 2006). As it requires no inputs

the cost of production for the crop is very low, which makes it an accessible income-earning and risk management strategy to resource-limited producers (Vall et al. 2011). In terms of labour, the crop is considered to be relatively low maintenance up until the harvest stage but harvest is arduous due to high seed shattering, which is most severe in the short-maturing varieties (Vall et al. 2011, Foltz 2010). In the semi-arid zone farmers often will harvest only a small patch at a time to meet short-term needs, while spreading out the intensive work for harvesting and processing over time (Vall et al. 2011).

The small size of the grain and numerous seed coats makes fonio very tedious and time consuming to process and cook (Foltz 2010). This work is the responsibility of women who must juggle their domestic and productive responsibilities and who are increasingly opting to use more convenient-to-prepare grains that have become more available. Reducing the time and labour involved in processing could be key in increasing the appeal to consume and commercialize fonio and its products.

Traditional vegetables

Increasing the use of climate-hardy crops such as Bambara groundnut and fonio can strengthen food security by ensuring greater availability of food, especially in drought years and under a contracting growing season. The nutritious properties of Bambara groundnut and fonio can also enhance diet quality bringing important micronutrients to diets dominated by few staple crops. It is acknowledged, however, that these crops cannot provide all the essential nutrients required for a balanced diet. Promoting other nutrient-dense underutilized foods such as vegetables and fruits would also be strategic to address malnutrition in the target sites.

There are many neglected and underutilized vegetable species grown and gathered by communities in Mali (Box 1) that with greater promotion can be important sources of essential micronutrients like iron, zinc, vitamin A or vitamin C. The vegetables cultivated, collected and consumed by communities will be documented early in the Project to identify species with high potential to improve nutrition, income and climate resilience of target communities.

Target sites

The study will focus on two regions of Mali: Ségou and Sikasso (Figure 1). Ségou is in the Sudanese zone that receives 400-600 mm rainfall annually and the main crops are sorghum, millet, cowpea and fonio. Sikasso is in the Pre-Guinean Zone which receives comparatively more rainfall (800-1000mm annually) and has more diverse cropping systems with the main crops being sorghum, maize, millet, cowpea, cotton and fonio.

Six villages are being targeted with the project activities: three in Sikasso region and three in Ségou region (Table 1). The total population of these villages is 10,789, with 1,703 households. Two additional villages have been surveyed, one in Ségou and one in Sikasso, with a reduced set of questions to provide a counterfactual. The treatment and control villages were selected based on similar criteria and they have socio-economic and agronomic characteristics typical of their regions. Villages where the target crops (fonio, Bambara groundnut and vegetables) are cultivated and where women are involved in income generation from these crops were selected. Willingness of the villagers to undertake activities was also an important criteria for selection of both control and treatment villages.

Bolimasso and Boumboro in Ségou region were part of a previous project by Bioversity International supporting on-farm conservation. N'Goutjina in Sikasso region was surveyed for its level of agricultural biodiversity in a previous Bioversity International Project. This project will build on these past efforts. By having a more continuous effort in these communities, there is better trust and commitment and also the possibility to leverage knowledge and capacity built through the past work.

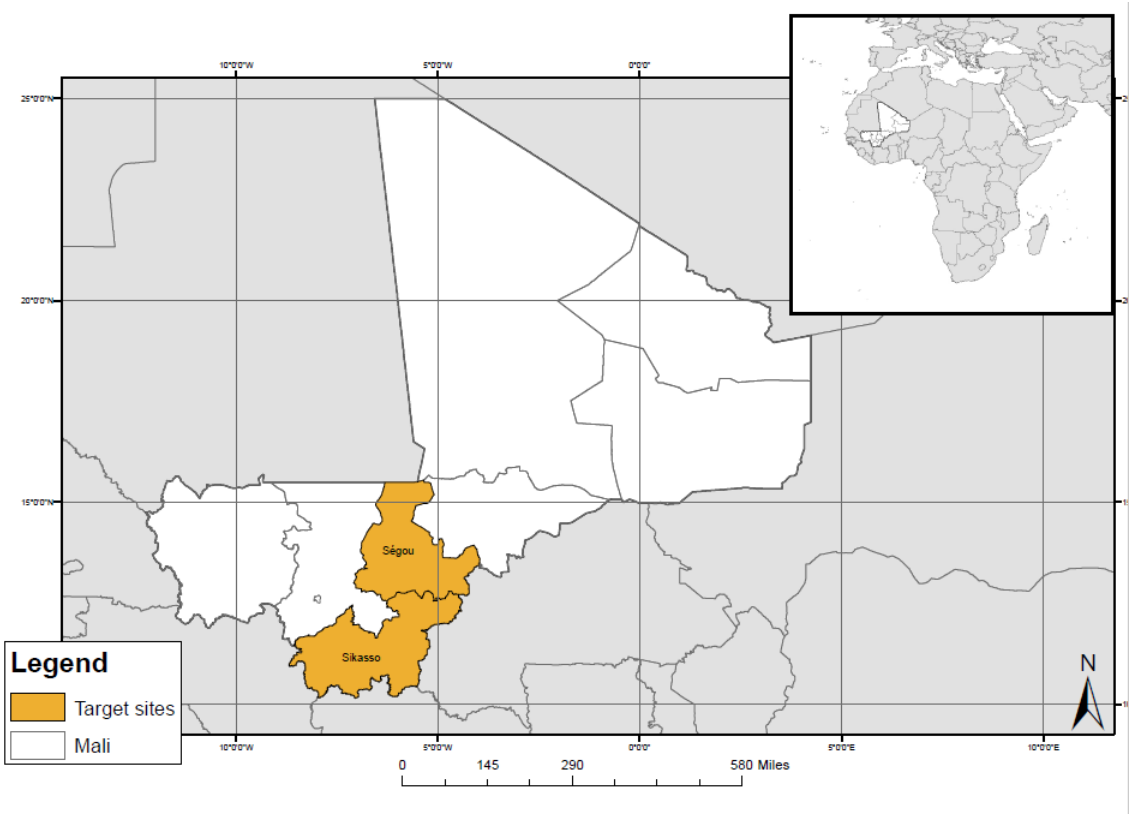

Figure 1. Target sites in Mali

Table 3. Target communities of the IFAD-EU NUS Project in Mali.

Region	Cercle	Commune	Village	Ethnicity	Pop	% Female	#HH
Sikasso	Sikasso	Fama	Siramana	*Senufo*	2127	52.1	302
	Koutiala	N'Goutjina	Finkoloni	*Miniaka*	1980	51.7	279
	Koutiala	N'Goutjina	N'Goutjina	*Miniaka*	3372	50.7	437
	Koutiala	Sincina	Kaniko*	*Miniaka*	2210	51.6	284
Ségou	Tominian	Mandiakuy	Boumboro	*Dafing*	312	51.9	46
	Tominian	Bolimasso	Bolimasso	*Bobo*	478	46.4	104
	San	Somo	Somo	*Bobo*	2520	50.6	535
	San	Somo	Boutenisso*	*Bobo*	908	50.8	199

* Control communities where only surveying will be performed

Major Activities

The IFAD-EU NUS Project will promote the cultivation, consumption and conservation of Bambara groundnut and fonio to strengthen food and nutrition security and livelihood resilience of target communities in the face of climate change. Investigations will also be made, starting with baseline household surveys and focus group discussions in the first year, to understand the current use of indigenous vegetables in target communities and identify species that could be promoted to address critical nutrition gaps and generate income for target communities.

High quality seed

The yield and consistency of production of fonio and Bambara groundnut are major constraints for their use. The Project will work to improve the production characteristics of these crops by identifying high quality varieties through participatory variety selection. Collections will be realized in the target villages and nearby villages and the seeds of at least 10-20 local and improved varieties of fonio and Bambara groundnut will be multiplied. This process will support adaptation

of the farming systems to climate change, as selected varieties may be shorter duration or more tolerant of drought, pests, disease or other pressured faced by the communities. Preferred varieties will be produced and made available to help raise productivity and the contribution of these crops to family food security and income.

Value chain analysis and interventions

A multi-actor analysis of the fonio value chain will be realized involving farmers, private sector and researchers to identify key constraints to the use of fonio and Bambara groundnut that should be addressed in the Project. The washing step, which uses a large amount of water and may be the key step responsible for loss of iron content, is an area we would like address, but there may be other steps identified in the analysis that are more relevant to the target communities. The value chain analyses carried out with multiple stakeholders research will investigate the viability and effectiveness of promoting Bambara groundnut and fonio, as opposed or in addition to other underutilized native crops, to achieve the Project aims.

The capacity of existing farmers' networks or associations will be strengthened and the creation of new associations and networks will be encouraged as required. The capacities of these associations will be strengthened through training on best practices in production and processing of the target crops (post-harvest activities, threshing and shelling, steaming food technology, fortification, and packaging).

The organization of the market sector, pricing mechanisms and market information systems for target crops will be studied. Farmers access to information on the market will be enhanced, which along with access to agro-meteorological information, will support farmers' decision-making processes.

Women's Empowerment

Bambara groundnut is a crop typically cultivated by women. The gender roles in fonio cultivation are more variable. In Ségou region fonio is grown on communal plots controlled by men (Sogoba et al. 2013), while in Sikasso region it is commonly grown by women on their individual plots (Collins & Foltz 2013). In any case, the processing of both crops is the responsibility of women and is highly time consuming and labour intensive, which is a barrier to increasing the use of these nutritious and hardy species. Previous value chain development projects implemented in Mali have supported women's groups in purchasing fonio from male dominated producer associations and processing it for commercialization, mainly in local markets (Sogoba et al. 2013).

The holistic value chain approach taken in the Project will support various dimensions of women's empowerment. It will contribute to raising the income (financial capital) that comes under women's control, by enhancing the value-addition and marketing of the target crops in a context where income streams are gendered and where women's income can be 3-4 times smaller than men's (McGlinchy 2006). It will also focus on increasing women's decision-making and leadership in the community and their social capital by strengthening collective action via consolidation of crop processing groups. Training on best cultivation and processing methods and provision of new and adapted tools (physical capital) for cultivation, harvesting and processing will enhance yields, reduce drudgery and save time in processing. Women's capacities (human capital) to produce high quality products and run collective enterprises - skills which can be applied to the pursuit of other livelihood activities - will additionally be enhanced through a range of capacity strengthening initiatives.

Conservation

Sustainable agricultural value chains and production systems depend on availability of quality genetic resources and seed. Actions will be taken in the Project to conserve the genetic diversity of minor millets to ensure continued availability and adaptability of materials in a changing climate.

The Project will support the creation of community seed banks where they do not already exist and it will strengthen the capacity of existing community banks. Seed fairs will be organized to

encourage exchange of seed, share information, improve the linkage between villages and sensitize people on the importance of agricultural biodiversity.

An inventory on threatened and/or extinct species and varieties, especially for target species will be established using the five cell analysis. A red list will be compiled based on this initial inventory and confirmed by assessing the presence of varieties in the communities and the region.

Community biodiversity registers will be established in villages where they currently do not exist and where they have already been established, the Project will encourage them to be updated. The possibility to take advantage of a fellowship program for rural people in Segou and Sikasso will be explored. Seed fairs will be organized as an important occasion for different actors to exchange seeds and knowledge.

Traditional and novel practices for managing climate risks

In West Africa, farmers and fishermen have developed a wealth of knowledge and a great flexibility to manage environmental fluctuations. This knowledge is a resource that must be protected, applied and enhanced. Traditional agriculture in Mali involves practices to conserve water resources by avoiding water runoff, such as the Zaï practice, contour ploughing, and ploughing cycle end, which are practices that also support soil conservation.

Recognizing that rural communities are repositories of important knowledge to sustainably manage resources and adapt to changes and risks that affect their food security, the Project will document and support this knowledge, especially focusing on the role of agricultural biodiversity in these strategies. The Project will promote the recovery of traditional practices, where they can be favourable against the negative effects of the climate changes. New methods and approaches used by other communities and researchers will also be shared to improve productivity and encourage adaptation of farming systems to changing conditions. An inventory of traditional and modern practices will be made and those most relevant for the local context will be identified through a participatory process. Training will be provided to farmers on practices for adaptation to climate change, including practices using the target species, where farmer field fora will be promoted as a collective learning process between researchers, developers and farmers. Resilience-building activities, such as exchange of seed, will be emphasized.

Lobbying for supportive policies

Policies can be key in realizing or hindering the benefits of fonio and Bambara groundnut and other indigenous crops for nutrition, income, climate resilience and empowerment of women. A study will be made on seed usage policies of local varieties of targeted crops and opportunities to increase their consumption/use through positive changes in seed legislation and other forms of legislation (health, education, and environment). The Project will develop policy options that encourage better use through the connection between community banks and the national bank, encouraging multifaceted cooperation between actors and groups of actors. It will also work to strengthen dialogue between stakeholders through meetings with key partners on the role of target crops.

Acknowledgements

This paper was compiled based on the presentations and discussions in the National Stakeholder meeting in Bamako, Mali 15-16 June 2015 and follow up literature research on key points. Gaia Gullota assisted in assembling key facts and produced the map of target districts. Information presented by Nadia Fanou-Fogny, Lamissa Diatkite, and Paolo Ceci provided key facts and guided the decision-making process. Plans for the Project were proposed by the authors and refined through discussion with the stakeholders at the meeting (Appendix V). Input was provided by Marlène Elias on the women's empowerment strategy.

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The IFAD-EU NUS Project in India

Promoting kodo (*Paspalum scrobiculatum*), kutki (*Panicum sumatrense*) and other nutritious underutilized species in Mandla and Dindori districts, Madhya Pradesh

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Introduction

The Project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk' will be implemented in India by Action for Social Advancement (ASA). This NGO was involved in the previous phase of this initiative[††] (2011-2015), in which they worked with farmers in Mandla and Dindori districts of Madhya Pradesh to strengthen on-farm conservation for better climate resilience. This phase of the initiative will build on these efforts and other work by ASA to enhance soil quality, water resources development for minor irrigation, forward and backward linkages of farmers with the market for agri-business, credit, insurance and other services, etc. to enhance income, livelihood resilience and nutrition of farmers in the region.

Context

India is host to a large share of the world's malnourished people: 60 million in the country are undernourished and 9 million suffer from severe acute malnutrition. In Madhya Pradesh, nutritional status is below the country average as 60% of children under 5 years of age are underweight in the State as compared to 43% at country-level (IIPS & Macro International 2007). Infant mortality and nutritional status of children are critical in Mandla and Dindori districts, where the rate of underweight is 56.5-61.7% (Brahmam et al. 2011ab). There are many factors contributing to under-nutrition in India. A leading issue is the nutritional status of women during adolescence, pre-conception and pregnancy. Poor infant and young child feeding practices and poor intake of essential calories, proteins, fats, micronutrients and vitamins (especially vitamin A) are also important factors (IIPS & Macro International 2007, IIPS 2010).

Madhya Pradesh is a strongly indigenous state, with more than 20% of households identified as 'scheduled tribes' in the National Census (2001). The districts of Mandla and Dindori are predominantly inhabited (~60%) by indigenous peoples, including Gond, Baiga, Dhoba and Ahir. The Baiga, found especially in Dindori district are recognized as 'Particularly Vulnerable Tribal Groups' by the Indian government (Ministry of Tribal Affairs).

Agriculture is the major livelihood source in Madhya Pradesh. Mandla and Dindori districts are characterized by subsistence production, with nearly one third of farmers considered small or marginal. Collection of non-timber forest products is another important livelihood source in the district, while the livestock sector and small-scale enterprise/service sector are also important. Seasonal migration is common in the region. Major constraints to the farmers in the area include climate and soil issues, as well as poor availability of capital, dependency on wage labour, disorganization, primitive agronomic practices and poor access to government sponsored schemes.

Almost 70% of the crops in Madhya Pradesh are rainfed. In Mandla and Dindori, only 6-10% of crops are irrigated. Rainfall is highly seasonal, occurring from June to September with the number of rainy days ranging from 70 to 80 days and an average total rainfall of 1250 mm. The rains feed

[††] The project 'Reinforcing the resilience of poor rural communities in the face of food insecurity, poverty and climate change through on-farm conservation of local agrobiodiversity' was supported by IFAD from 2011-2015.

many perennial/seasonal water bodies in the Dindori and Mandla area, including the Narmada, Johila and Son rivers. The dependence of rain water makes the agriculture in this region highly vulnerable to climate change. Rising temperatures, declining rainfall, reduced irrigation potential, extreme climatic events, and increased pest and disease pressure are being experienced already and will affect the region already suffering from malnutrition. From the end of the century, temperature increases are predicted to reduce rice yields in India (Burney & Ramanathan 2013).

Madhya Pradesh has very rich agricultural biodiversity that stems from its geographic diversity, including 12 agro-climatic zones, 6 crop zones and 26 prominent soil types. The diversified topography and variable climatic conditions provide the basis for a rich biodiversity and indigenous knowledge. Mandla and Dindori districts form a contiguous terrain and ecozone with consistent forest cover, situated in one of 22 Biodiversity Hotspot of India known as the "Malwa Plateau and Central Highlands". The major crops cultivated in Madhya Pradesh include cereals (paddy, maize, wheat and sorghum) and legumes (chickpea, pigeon pea, lentil, peas, soybean, and groundnut). Other major cultivations are cotton, linseed, mustard, sugarcane and niger. Neglected and underutilized species cultivated in Madhya Pradesh include minor (small) millets, colocynth (*Citrullus colocynthis*), chhota bargad (*Ficus cutulat*a), sickle pod (*Cassia tor*a) and hairy senna (*Cassia hirsuta*). Other underutilized species of India are shown in Box 1.

The major crops in Mandla and Dindori are similar to the State-level, with some distinctions. In the *rabi* (winter) season, wheat, chickpea, lentil, peas, linseed, mustard and niger are grown. In *kharif* (monsoon) season, paddy (including many indigenous varieties), maize, blackgram, and pigeon pea are the major cultivations. Minor millets are cultivated on dry lands which are not suitable for the major crops, with the most popular being kodo (*Paspalum scrobiculatum*) and kutki (syn. little millet *Panicum sumatrense*), and to a lesser degree finger millet (*Eleusine coracana*). Madhya Pradesh is one of the few regions of India where kodo millet is cultivated, with some cultivations also in Tamil Nadu.

Box 1. Some neglected and underutilized species apart from millets in India. Source: Bhag Mal (2007).

Pulses
Dolichos uniflorus (horse gram), *Psophocarpus tetragonolobus* (winged bean), *Vigna aconitifolia* (mat bean), V. umbellate (ricebean)

Oilseeds
Amoora rohituka (pithraj Tree), *Azadirachta indica* (neem), *Aesandra butyracea* (Indian butter tree), *Calophyllum nophyllum* (Alexandrian laurel)

Vegetables
Amaranthus polygonoides (tropical amaranth), *Bambusa tulda* (spineless Indian bamboo), *Bambusa spinose* (kauayan), *Bambusa vulgaris* (common bamboo)

Fruits
Aegle marmelos (bael), *Artocarpus lakoocha* (monkey fruit), *Carissa congesta* (conkerberry), *Emblica officinalis* (Indian gooseberry)

Spices and condiments
Amomum aromaticum (Bengal cardamom), *Amomum xanthioides* (false cardamom), *Anethum sowa* (Dill), *Areca triandra* (Triandra palm)

Target Crops

Minor millets are traditional crops in Madhya Pradesh but their production area has declined more than 50% in the last 20 years (Jain & Singh 2008-2010; FAOSTAT). Preliminary research has found that the kodo varieties currently grown in Mandla and Dindori are improved varieties developed by researchers, but four landraces used to be cultivated in the region. Six landraces of kutki have been preserved by indigenous farmers in the region but the scented *Jawaphul* variety is believed to be extinct. Before 1978 there were 6 landraces of finger millet of which only two are now left. Four landraces of foxtail and two landraces of barnyard millet are maintained by the farmers in

Mandla and Dindori but these crops are grown only sparingly. Pearl millet and sorghum have almost disappeared from the area.

Minor millets are generally suitable for dry and marginal lands, requiring less water and maturing early. Kodo millet in particular is among the most drought-tolerant of the minor millets, meaning it has strong potential to support climate adaptation of rainfed farming systems. The minor millets also have strong nutritional value compared to the more common cereals like rice. Indeed these crops are appreciated for high fibre content, protein quality, mineral composition, and nutraceutical values. Kodo millet especially stands out for its iron content (Table 1). Millets are also useful for diabetic patients because of their low glycaemic index. Because of their accessibility to the poor, minor millets can play an essential role in providing nourishment to people across all income categories, especially pregnant women, lactating mothers, and children.

The value of millets has been increasing on the market in recent years. Millets were also recently included in the Public Distribution System (PDS) of India with the National Food Security Act (2013), in which they are referred to as 'coarse cereals'. Procurement and sale of millets through the PDS programmes in most State has not yet started but the policy development is opening up opportunities for millets to make a stronger contribution to household income and food and nutrition security.

Minor millets, particularly kodo and kutki, will be the primary focus of the Project in India. Cultivation and consumption of these crops will be promoted to benefit climate resilience, nutrition, food security and income of the target communities. Increasing the use of these climate-hardy crops can strengthen food security by ensuring greater availability of food, especially in drought years. The nutritious properties of millets can also enhance diet quality. It is acknowledged that millets cannot provide all the essential nutrients for a balanced diet. Promoting nutrient-dense foods such as vegetables, fruits, pulses and animal source foods would also be strategic to address malnutrition in the target sites.

There are many neglected and underutilized fruit and vegetable species grown and gathered by the communities in the target area, including moringa (*Moringa oleifera*), taro (*Colocasia esculenta*), and amaranth (*Amaranthus* sp.). These will be documented early in the Project to identify species with high potential to improve nutrition, income and climate resilience of target communities.

Table 1. Nutrient composition of millets vs fine cereals. Source: Gopalan, Rama Sastri & Balasubramanian (1996).

	Nutrient per kilogram (all values for 1000 gms)									
Grains	Protein (g)	Minerals (g)	Fibre (g)	C (mg)	Ph (mg)	Fe (mg)	B-car (µg)	Thiamine (mg)	Riboflavin (mg)	Folic acid (µg)
Sorghum	104	16	16	250	2200	41	470	3.7	1.3	200
Pearl millet	116	23	12	420	2960	80	1320	3.3	2.5	455
Italian millet	123	33	80	310	2900	28	320	4.7	2	150
Finger millet	73	27	36	3440	2830	39	420	4.2	1.9	183
Little millet	125	19	22	140	2060	8	0	2	1.8	-
Kodo millet	77	15	76	170	2200	93	0	3	0.9	90
Rice*	64	7	2	90	1430	10	-	2.1	0.5	110
Wheat**	118	15	12	410	3060	53	640	4.5	1.7	366

* Parboiled and milled
** Whole

Target Sites

The Project is focused on Mandla and Dindori in Madhya Pradesh (Figure 1). 30 villages are being targeted by the Project, which include 4,518 households. These villages are listed in Table 2 and a map of the targeted villages is shown in Figure 2, also showing the other villages that ASA works with in the region. The knowledge and data from those villages will be used to establish a context analysis and counterfactual.

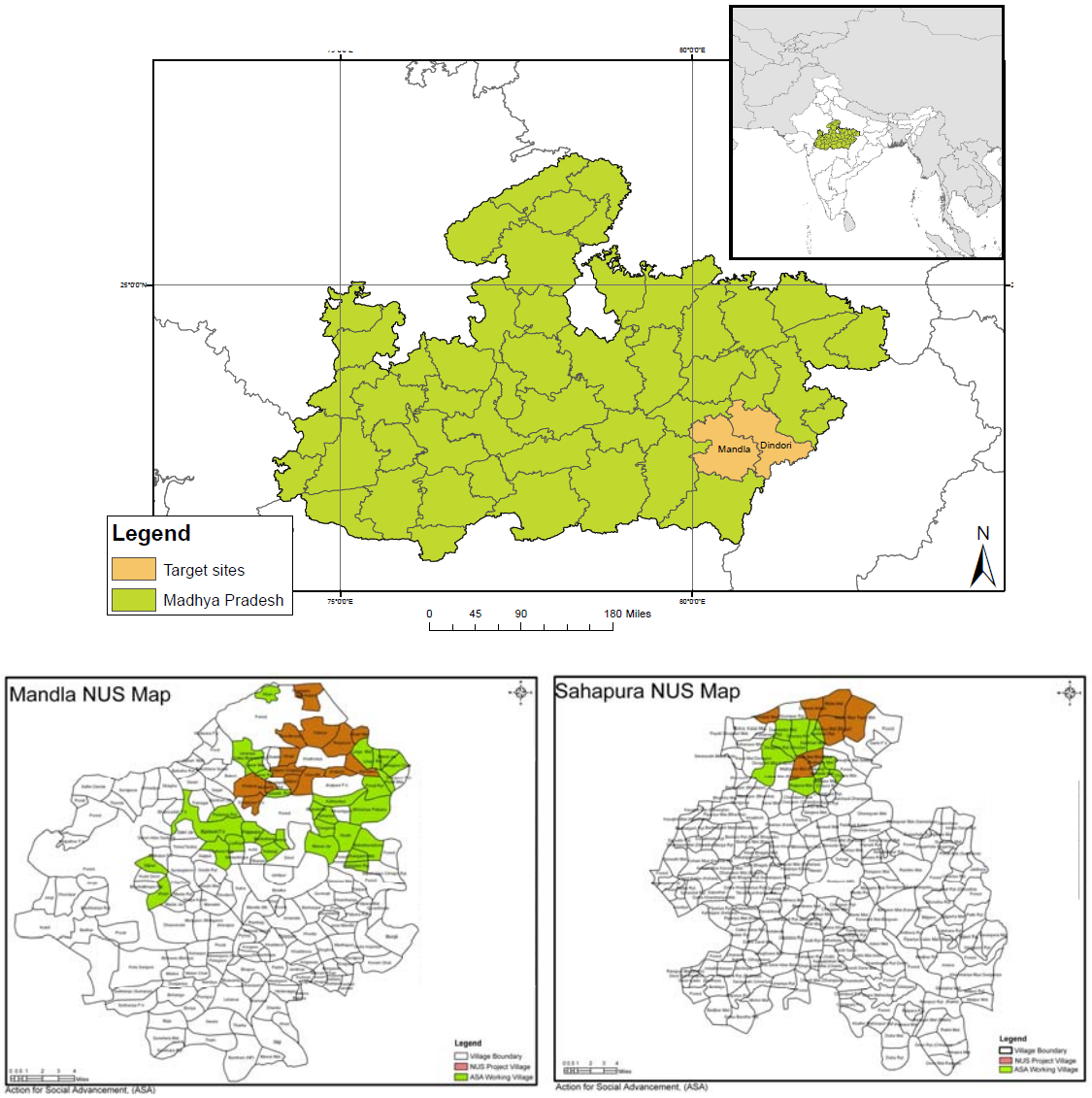

Figure 1. Target districts of the Project in Madhya Pradesh: Mandla and Dindori (Top). Villages targeted in each district are indicated in red, with other working villages of ASA indicated in green (Bottom).

Table 2. Villages targeted by the IFAD-EU NUS Project in India in Mandla and Dindori Districts

Village	Total Households	Village	Total Households
Mandla District		***Dindori District***	
Singarpur	115	Magar Tagar	257
Salaiya	104	Salaiya	295
Khiri Mal	123	Bhelai	230
Kodopani	242	Khursipar	149
Tikraberpani	73	Dhiravan	262
Piperpani	87	Majgaon	91
Khari	90	Dobhi	143
Hardua	148	Chanta Mal	234
Jhalpani	75	Chirpoti Mal	148
Silpuri	124	Bagli	115
Umardeah	166	Barrai	345
Patparsingarpur	168	Khamariya	87
Muddeah	121	Devragarh	192
Khuksar	121	Parapani	167
Dungaria	46	Kathotiya	663

Major Project Activities

Low productivity, poor seed availability, weak market opportunity and low price are major constraints for farmers to continue cultivating minor millets. These crops have been relegated to less fertile areas of farmers' land, resulting in lower yields and their further marginalization in the family food basket and national economy. Through the Project, ASA aims to improve productivity and remuneration from millets cultivation to enhance their production and supply.

A holistic approach will be used for the value chain development of minor millets that will give attention to production-supply issues and market-demand issues to achieve livelihood and sustainability benefits. A participatory, pro-poor, gender sensitive approach will be followed to support the empowerment of vulnerable groups through strengthened use and conservation of their traditional crops. Multi-stakeholder platforms will be held early in the Project to analyse constraints to millet cultivation, marketability and consumption and foster productive collaboration and collective action to organize and upgrade the value chain.

High Quality Seed

Identification of high quality varieties of kodo and kutki through participatory variety selection will be a major action to raise their productivity. Abandonment of millet production has been associated with erosion of genetic diversity in the area. New varieties will be introduced from other areas of India and from genebank and research organization collections, which will be evaluated alongside the locally available varieties. Identification of preferred varieties that are well-suited to the local environmental and cultural conditions will support adaptation of the farming systems to climate change, as selected varieties may be shorter duration or more tolerant of drought, pests, disease or other pressured faced by the communities. Preferred varieties will be produced at a large scale and commercialized through farmer producer companies, making quality seed more available in the target area, which should help raise productivity and the contribution of millets to family food security and income.

Training on Farm Practices

Productivity of millet will also be improved through training on good agricultural practices for cultivation. ASA has developed a package of practices inclusive of good agricultural practices, responsible environmental and social practices for farming. All these together the package of practices is called the ‘responsible crop initiative’. Besides internal evaluations done time to time during the season, the protocol involves a third party verification of compliances by the farmers. Additional farm practices will be promoted to support coping and adapting to climate change conditions. Practices to be covered include intercropping, integrated pest management, production and use of organic fertilizers, rain water management, etc. Weather data will also be made available to the farmers to help guide their planting decisions.

Farmers’ field schools, farmer field trial, farmers’ field days, mobile-based communication, etc., will be used to train farmers on the package of practices. Particular emphasis will be given to the women farmers who are actively engaged in farming but have very little recognition as farmers and the new skills and training are seldom imparted to them.

Collective Marketing

Minor millets are currently marginal on the market in India due in part to inconsistency in quantity and quality of production. Collective action and institution building are necessary to help farmers achieve scale in millet production.

ASA has already established over 200 self-help groups with majority women members in the target villages who will be the main entry point for the implementation of Project activities. Three farmer producer companies have also been established in the target area since 2013 (with a fourth currently being formed) that will be involved in millet commercialization (Table 3). The shareholders in these companies are members of the self-help groups and all profits are being distributed among them. The farmer producer companies have store-fronts, warehouse facilities, etc. already

established which will be leveraged for kodo and kutki millet commercialization. With the support of the Project they will enhance their warehouse capacity, introduce intermediary processing machinery (graders), and make efforts to scale up their business for kodo, kutki millet.

Table 3. Farmer producer companies and self-help groups

District	Name of Farmer Producer Company	# Shareholders
Mandla	Mandla Tribal Farmer Producer Company	1060
Mandla	Mahesh Mati Tribal Farmer Producer Company	640
Dindori	Dindori Keshan Producer Company	1020

In the first year of the Project, plans are to organize the aggregation of millet production to achieve a large quantity that can be sold at a higher price for farmers by reducing the number of middle men between the farmers and bulk buyers. Novel market information systems, including the National Commodities Exchange (NCDEX), Indian Farmers Fertilisers Cooperative Limited (IFFCO), Sanchar and other platforms, will be leveraged to increase farmers' awareness of market opportunities and help them secure the best possible prices. The IFFCO system will relay to farmers information regarding millet price in the three major markets (*mandi*), monitored by the ASA team, along with weather information via daily SMS messages. The NCDEX web platform connects sellers and buyers from throughout India and will be investigated as a means of securing a higher price for bulk sale of millets from the producer companies.

The income benefits of value-addition (e.g. product development), as well as restaurants and eco-tourism will be explored. Synergies with IFAD's Tejaswini Rural Women Empowerment Programme, which has established millet-producing self-help groups in several districts in Madhya Pradesh, including Mandla and Dindori, will also be explored. The identified varieties by our Project could be highly relevant for enhancing productivity in the area, including villages involved in the Tejaswini Programme. Furthermore there is the prospect to collaborate for collective marketing or linking our producers as suppliers for value addition work carried out in Tejaswini communities and training programmes related to best practices for millet cultivated, marketing, conservation and culinary preparation.

Consumption

Beyond increasing productivity and profitability of millets, interest among consumers is also a major constraint in upscaling millets. Activities to raise awareness will be undertaken in the Project to increase interest in millet consumption among rural communities and urban consumers. Millet promotion over the next three years will involve schools and village exhibitions, national and international fora, food fairs and other forms of communication. Seed and food fairs will be organized to promote awareness of the values and tastiness of millet-based foods, as well as to encourage seed exchange. A three-day Tribal Farmers' Food Festival will be organized in Bhopal in January 2016 with special focus to millet crops. Self-help groups will be sensitized on the role of millets and other local crops in balanced diets, taking the results of baseline investigations of diet diversity into account. Nutrition training will be also be one area of complementarity explored with the Tejaswini Rural Women Empowerment Programme

Conservation

Sustainable agricultural value chains and production systems depend on availability of quality genetic resources and seed. Actions will be taken in the Project to conserve the genetic diversity of minor millets to ensure continued availability and adaptability of materials in a changing climate.

Custodian farmers will be identified, recognized by their communities for exceptional knowledge on local agricultural biodiversity and as reliable seed keepers and seed sources. Networking and capacity building of custodian farmers will be promoted through exposure visits to the genebank in Raipur University and community seedbanks in other regions of India.

Documentation and monitoring of local agricultural biodiversity will be promoted by mobilizing village-level Biodiversity Management Committees and People's Bioversity Registers in accordance with the regulation of India's 2002 Biodiversity Act and the National Biodiversity Authority. The format promoted by the Madhya Pradesh Biodiversity Board will be adopted and adapted to include neglected and underutilized species (crops and non-timber forest products). Surveying in the Project will also lead to preparation of a red list of threatened crops and varieties for which conservation action will be taken.

Lobbying for Supportive Policies

Policies can be key in realizing or hindering the benefits of minor millets for nutrition, income and climate resilience. A policy analysis group will be established with qualified professionals to analyse key policy issues and make recommendations for policy changes and implementation strategies that can help realize the livelihood and sustainability benefits of millets. Key areas of focus will be seed legislations, intellectual property rights and integration of *ex situ* and *in situ* conservation methods. Other key programs of focus will be the PDS, mid-day meal schemes, Nutricereal and Nutrifarm schemes in Madhya Pradesh and the National Food Security Mission (NFSM)[‡‡].

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‡‡ Previously Initiative for Nutritional Security through Intensive Millets Promotion (INSIMP).

The IFAD-EU NUS Project in Guatemala

Promoting drought-hardy tepary bean (*Phaseolus acutifolius*) and Mayan spinach (*Cnidoscolus aconitifolius*) in the dry corridor of Guatemala for better climate resilience and nutrition

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Introduction

The Project 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk' will be implemented in Guatemala by the Universidad Del Valle de Guatemala (UVG). The Biology Department at UVG is one of the key institutes, working on the conservation and use of agricultural biodiversity in Guatemala. They have an explicit focus on plant genetic resources in their academic programme. They have contributed to the Second State of the World's Plant Genetic Resources (FAO 2010) and to the State of the World's Forest Genetic Resources (FAO 2014) on behalf of Guatemala.

UVG, in collaboration with Fundación Manos de Amor, with technical support from FAO, and funding support from the Benefit Sharing Fund of the International Treaty for Plant Genetic Resources for Food and Agriculture, implemented a project to establish a network of communal seed banks and custodian farmers. Five seed banks were established in communities of four Departments of Guatemala: Alta Verapaz, Chiquimula, Zacapa and Solola. The seed banks together with capacity building activities related to good farming practices, seed bank management, and agricultural biodiversity conservation, benefited 1,340 families. Through the project, UVG documented local maize and bean diversity, characterized the morphological diversity of ears of the communities primary maize landraces, and the eco-geographic distribution of this agricultural biodiversity. UVG has also carried out research on morphological and molecular characterization of maize land races. The IFAD-EU NUS Project will build and expand on this work, promoting use and cultivation of underutilized crops with high potential to strengthen food and nutrition security and livelihood resilience of rural communities facing climate change.

Context

Guatemala is a rugged Mesoamerican country rich in cultural and biological diversity. The majority of the population is indigenous or of mixed indigenous and European ancestry (Minority Rights Group International 2015). Most are of Mayan descent, including K'iche 9.1%, Kaqchikel 8.4%, Mam 7.9%, Q'eqchi 6.3%, and other Mayan groups 8.6% (2001 census; Minority Rights Group International 2015). A total of 21 indigenous languages are spoken in Guatemala, while the official language is Spanish. This cultural diversity exists among rich biological diversity in this highly forested (37%) country characterized by high rates of species endemism (13%) (CBD, 2015).

Guatemala faces a serious situation of extreme poverty and hunger according to the Global Index for Hunger 2015 (IFPRI 2015). Around half of children under five are affected by chronic malnutrition (49.8%), while 1.4% are affected by acute malnutrition (ENSMI-2008/09). Some regions are more affected by these burdens. In particular, more than 20% of the population suffers extreme poverty in the departments of Alta Verapaz, Zacapa, Totonicapan, Izabel, Suchitepequez, Sololà, Baja Verapaz, and Chiquimula (INE 2011). Chronic malnutrition is higher in rural areas than urban areas and is high to very high (60-83%) in the departments of Totonicapan, Solola, Quiche, Hehuetenango and Chiquimula (ENSMI-2008/09). The prevalence of chronic malnutrition in children under five years of age is higher among subsistence farmers, indigenous children and children of mothers without access to education (ENSMI-2008/09, UNICEF, ICEFI & SUECIA

2013). Seasonal famine influences the livelihoods of many people in Guatemala, especially in the dry corridor, including areas of Quiche, Baja Verapaz, Chiquimula, Zacapa, El Progreso, Jutiapa and Jalapa departments. Malnutrition cases among children less than 5 years of age occur in conjunction with exhausted cereal reserves during the period from April to August, the end of the temporary work periods for the harvest of coffee, sugar and cardamom (November to March), and the rainy season, which is associated with issues with safe drinking water and infectious diseases (May to September).

In addition to issues of stability in food availability and access, there are also cases of deficiency in micronutrients and vitamins in Guatemala. 34.9% of children under 5 years of age have a deficiency in zinc, 12.9% in vitamin B12 and 26.3% in iron (ENMICRON 2009/10). Micronutrient deficiency is also seen in women of reproductive age, among whom 18.9% have a deficiency in vitamin B12, 18.4% in iron and 7% in erythrocyte folate (ENMICRON 2009/10). One of the consequences of these deficiencies is anaemia, which affects 48% of children under five, 29% of pregnant women and 21% of non-pregnant women (Encuesta Nacional de Salud Materno Infantil 2002, ENSMI-2008/09). At the same time, there are also cases of overweight, which affects 5.6% of children under five years of age (Encuesta Nacional de Salud Materno Infantil 2002) and is especially important in the capital city (Encuesto de Salud Escolar 2009).

The major staple crops in Guatemala are maize and beans, while other widespread cultivations are cassava, sweet potato, squash, amaranth, pepper, papaya and avocado. Major export crops are coffee, banana, and sugar cane. Nearly half of farmers in Guatemala are subsistence producers (46.8%) and a similar amount are infra-subsistence producers (45.2%) (MAGA 1998). These farmers, while representing a majority of the population, cultivate only around one-fifth of the land (18.7% and 3.2%, respectively) (MAGA 1998). Most of the agricultural land in Guatemala is held by very few commercial and extensive farmers, who respectively cultivate 65.5% and 12.7% of arable land area (MAGA 1998).

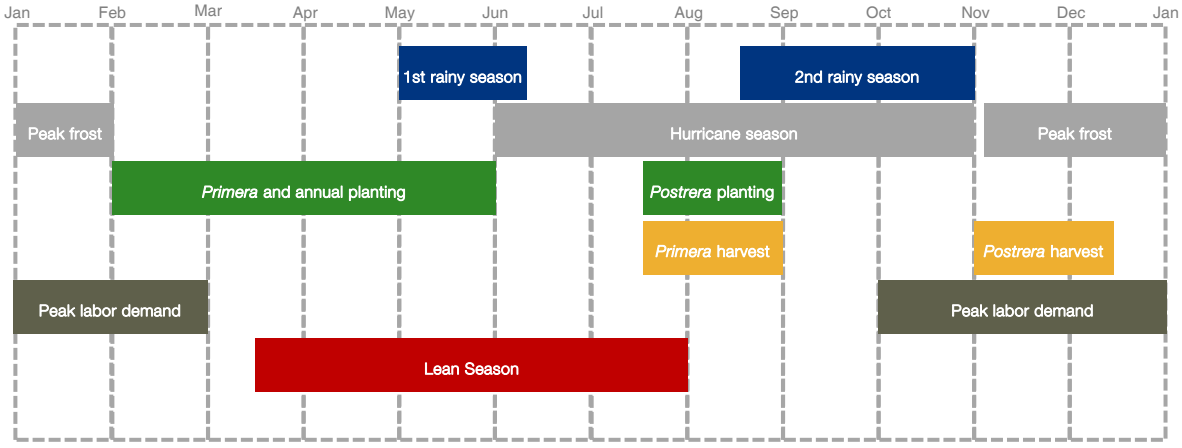

Figure 1: Agricultural calendar of a typical year in the Guatemalan highlands. Modified from: Famine Early Warning Systems Network (FEWS NET 2013).

The agricultural calendar in Guatemala is marked by seasonal weather events. The first rainy season from May to June precedes a heat wave and drought period referred to as the '*canicula*', which is followed by a second rainy period from September to October (FEWS NET 2013). Hurricanes can hit from August to December, while there is high frost risk from January to April (Figure 1). Changes have been occurring in this calendar in recent years. In particular, the beginning and the end of the rainy seasons have been shifting, making it difficult to predict when rain will come. In 2012, a two-month delay of the second rainy season resulted in famine (SESAN et al. 2013). In general the total annual rainfall has been the same, but the intensity and timing of the events has changed. Natural climate variability derived from phenomena such as El Niño and La Niña, are being amplified by climate change, bringing more severe droughts. In the past decade extreme events have been increasing in Latin America and the Caribbean, including extreme temperatures, wildfires, drought, storms and floods (ECLAC 2010). Guatemala is one of the ten countries most affected by extreme weather events in the last twenty years at the global level and

in 2010 the country was ranked second in the Global Climate Risk Index. The expected future scenario (by 2100), will involve an increase of temperature from 2-6 ºC and a decrease in rainfall between 10-20% (IPCC 2014).

Drought and climate variability, including extreme events like hurricanes, severely affect agricultural production in Guatemala. In 2014, due to prolonged drought between July and August, 80% of corn and 63% of the bean crop were lost affecting 266,000 families across the country, especially in the eastern region (SESAN 2014). Climate variability has caused damage to the agricultural sector in the range of 40-70%, affecting infrastructure and productivity of strategic crops. Yield declines, harvest losses, a higher incidence of pests and diseases and erosion of soil in intense rainfall events are part of these losses, with the most affected cultivations being corn, beans, coffee and certain vegetables.

Many factors contribute to the limitations and adaptation to the climate changes in Guatemala. Poverty greatly limits adaptation by preventing access to necessary resources. Vulnerable groups are affected by a low purchasing power. They often have poor land tenure rights and low access to basic services like health, water and infrastructure. Lack of education and knowledge on climate change adaptation also contribute to limited progress. The absence of climate change adaptation in government agendas, low prioritization for funding allocation, focus on short-term and medium-term planning, and corruption limit policy support.

The socio-cultural context is a decisive factor for climate adaptation and food insecurity as it affects eating habits and other behaviours. The socio-cultural context differs from community to community but studies have shown a lack of prioritization of the nutritional value of food against the economic and taste values. At the same time, there is often prioritization of other domestic activities and an influence by cultural beliefs and perceptions in their food habits. The social context of vulnerable groups is often characterized by a devaluation of women's role, where decision-making power is differentiated. Education on sexual and reproductive health is often deficient and there is low family planning. Violent episodes in the families are often reported, which can be linked to alcoholism, which is yet another important social issue. The perspectives and actions of community leaders, religious groups, community, and health providers have a notable influence on the socio-cultural context.

Target Crops

Guatemala is an important centre of origin and diversity for common bean (*Phaseolus vulgaris*) (Bittochia et al. 2011). This crop is a fundamental staple for the population, providing an important source of protein and carbohydrates that is complementarity to the nutrient profile of cereals and vegetables (Scheerens et al 1983). Common bean was domesticated in more humid regions of Central America, the Andes and the Amazon basin and heat and drought conditions cause major losses of this crop when they strike (Gaur et al. 2015, Blair et al. 2012). Such crop failures have devastating effects for the farming communities that depend on common bean for subsistence.

Tepary bean (*P. acutifolius*) is a relative of common bean in the same genus. Its precise centre of origin is not confirmed but it is thought to have been domesticated in dry regions of Central Mexico and the south western USA (Blair et al. 2012). The species is well-adapted to arid conditions, exhibiting a high level of drought, heat and cold tolerance, as well as early maturation (Blair et al. 2012, Beebe et al. 2013). Tepary bean is underutilized, grown at a limited scale in dry parts of Mesoamerica, but it shows potential to support climate change adaptation of farming systems in this region and other drought-prone areas through greater use and crossing with common bean (Blair et al. 2012, Gaur et al. 2015). Tepary bean is fairly high yielding and outperforms common bean in hot environments (Beebe et al 2013). The beans are comparable or superior in nutritional content compared to major pulses, with protein content between 17-32% (Nabhan & Felger 1978, Scheerens et al. 1983). Tepary beans were widely used by Sonoran peoples before the arrival of the Spanish but are now used on a much smaller scale (Scheerens et al. 1983). Two general types exist: white-seeded and brown-seed types, the latter characterized by a stronger and more distinctive flavour (Scheerens et al. 1983). The culinary properties of tepary bean are distinct from common bean (pintos) and Mexicans reportedly have used different recipes to prepare these pulses (Scheerens et al. 1983). Some people in the south western USA have been known to prefer

teparies to common beans and use them as a prized soup ingredient (Scheerens et al. 1983). Evaluations of organoleptic quality by students in Saudi Arabia have also revealed them to be moderately to highly acceptable (Tinsley et al. 1985). Nevertheless, their “unfamiliar” taste was believed to have contributed to a failure of early commercialization attempts for tepary beans in USA, while others contend the failure of these attempts was due to poor timing of the interventions (Nabhan et a.l 1978, Scheerens et al. 1983).

Mayan spinach or chaya (*Cnidoscolus aconitifolius*) is a domesticated shrub that has been cultivated since pre-Hispanic times in the Mayan region (Ross-Ibarra & Molina-Cruz 2002). It was likely domesticated in the Yucatan but is used commonly throughout Mesoamerica, in Guatemala, Belize, southeast Mexico, and parts of Honduras (Ross-Ibarra 2003). There are four cultivated varieties, which are all grown in Guatemala (Ross-Ibarra & Molina-Cruz 2002). Chaya grows up to six meters tall and is used as a hedge and its leaves are consumed for food and medicine (Ross-Ibarra 2003). It is often planted in gardens, in cornfields or with other field crops (Ross-Ibarra 2003). The leaves are highly nutritious, containing significantly higher amounts of crude protein, fibre, calcium, potassium, iron, ascorbic acid and β-carotene than spinach (Kuti & Kuti 1999). Cooking slightly reduces the nutritional composition but is essential to inactivate toxic hydrocyanic glycosides (Kuti & Kuti 1999). Although the nutritive and agronomic potential of this shrub has been recognized for decades, and appreciation for its good taste, there has been little research and promotion of its use (Ross-Ibarra & Molina-Cruz 2002). The species has strong potential to enhance nutrition in communities in the dry corridor but also more widely in Guatemala and in distant markets. Promotion of chaya as a superfood could be an important income generation opportunity and its greater use can also valorise local culinary traditions in celebrating this food that was an important feature in the pre-Columbus diet.

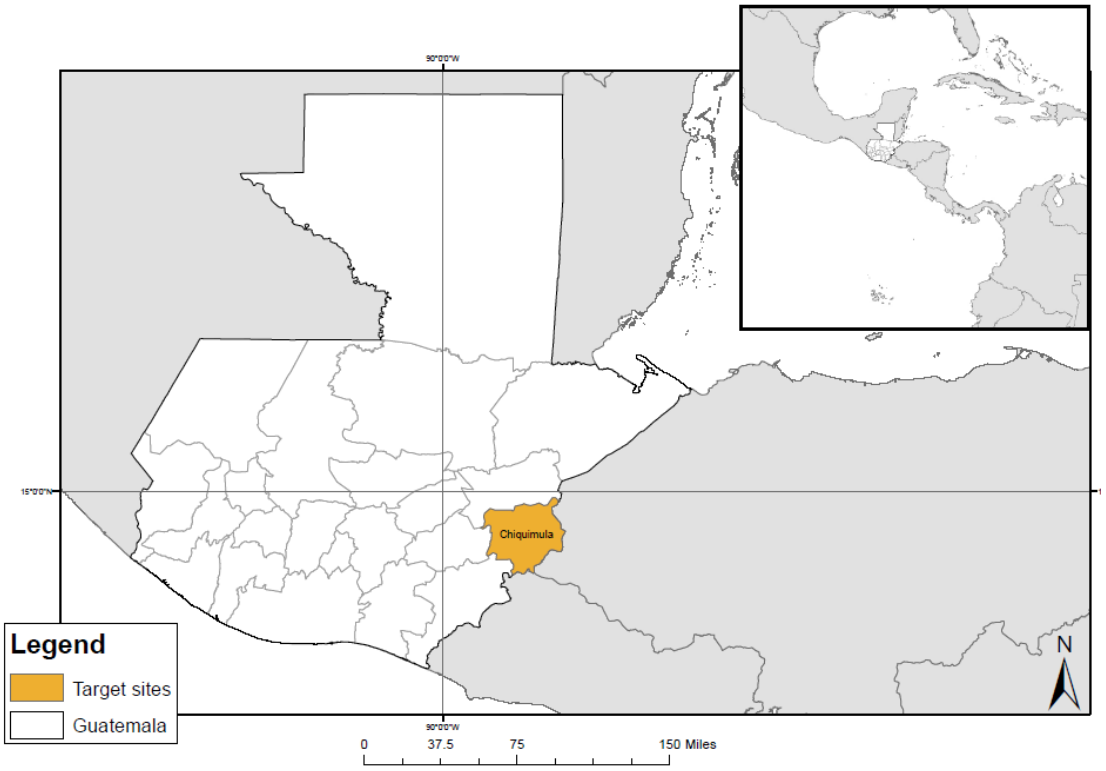

Figure 5. Target sites of the IFAD-EU NUS Project in Guatemala.

Target Sites

The IFAD-EU NUS Project is targeting communities in Chiquimula, which is part of the dry corridor of Guatemala and faces a high burden of malnutrition, poverty and climate risk (Figure 2). Baseline surveys will be carried out in the communities of Tesoro Abajo, Jocotán (Caserío) Petentá (Camotán) and Caserío La Brea (Camotán). The Project will work with communities involved in

FAO's 'Mesoamérica sin Hambre' Project that works through the Mancomunidades (associations of various municipalities). Opportunities to involve their communities that have been part of the Mesoamerican Agroenvironmental Program (MAP) with the Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE) will also be explored to collaborate and build on their existing efforts applying a holistic approach for climate change adaptation, involving promotion of home gardens, exchange of local and scientific knowledge in farmer field fora, training on poultry production, household finance and establishment of seed banks (see abstract on page 14).

Major Activities

The IFAD-EU NUS Project in Guatemala will promote the cultivation, consumption and conservation of tepary bean and Mayan spinach to strengthen food and nutrition security and livelihood resilience of target communities in the face of climate change. Investigations will also be made, starting with baseline household surveys and focus group discussions in the first year, to understand the current use of local agricultural biodiversity in target communities and identify species that could be promoted to address critical nutrition gaps, enhance resilience of cropping and livelihood systems and generate income for target communities.

The Project will involve students from Valle de Guatemala University in carrying out many of the activities which is seen as a strong opportunity to raise capacity in Guatemala for the holistic, integrated approach to agricultural development promoted in the Project. The plans for the Project activities in the first year are detailed below. These activities will be continued and expanded in subsequent years based on findings emerging from the surveys and interactions with the communities.

Surveys and assessments

In the first year of the Project, surveys will identify and document the local food plants in the communities participating in the Project and their tolerance to abiotic factors and nutritional value. These initial investigations will document the state of *in situ* conservation and the use of local crops and other food plants. Work will be done to identify and document degree of threat and genetic erosion they face.

Consultation for value chain enhancement of target crops

Consultation and capacity building workshops with local stakeholders (including the National agriculture research system) will be held to analyse the value chains of target species and determine a strategy and mechanisms for their development in Guatemala using a holistic value chain approach. Systems to make market information available to the farmer communities will be investigated.

Production of high quality Chaya

Researchers at the Universidad Del Valle de Guatemala have been working on chaya since 1992 investigating its nutritional, chemical, molecular, botanical and agronomic aspects. The Project will leverage these efforts and move forward with value chain interventions to raise demand among consumers. In the first year, work will be done to multiply chaya in the communities participating in the Project. A manual will also be elaborated and shared with the farmers with best practices for managing the crop on farm.

Crowd-sourcing evaluation of tepary bean

For the close relationship with common bean, hardy tepary bean could easily fit within the established diets and farming practices in Guatemala. The Project will introduce tepary bean through trials to evaluate the performance and taste compared to a diversity of common bean varieties. These trials will use a 'crowd-sourcing' approach developed by Bioversity International that engages a large number of farmers to grow and evaluate just a few varieties each, ultimately resulting in a big dataset that can be used to identify varieties suited for different microclimates and preferences.

Strengthening networks of conservation farmers and communal seed banks

Guatemala is an important centre of origin and diversity for common bean and a major concern is that introduction of new varieties or promotion of just a few varieties could threaten the persistence of the native diversity. With this risk in mind, various actions will be taken through the Project to support conservation and promote greater use of native bean diversity. The crowd-sourcing trials will in fact disseminate many native common bean varieties to farmers as well as tepary bean, and these varieties may be taken up by farmers who appreciate their qualities. Strengthening seed exchange networks and community seed banks are other actions that will be taken to support conservation, which will build on recent efforts by FAO, the International Treaty for Plant Genetic Resources for Food and Agriculture and UVG.

In the first year, meetings and capacity building workshops will be organized with farmer groups, and national institutions to strengthen existing networks and establish new mechanisms to cooperate and exchange best practices and seeds to strengthen conservation of plant genetic resources. Linkage between in situ and ex situ efforts will be promoted through at least one visit of farmer network representatives to the national gene bank.

Feasibility study for rewards/compensation for agricultural biodiversity conservation services (PACS)

To further contribute to conservation of vulnerable crop genetic diversity and mitigate risk of losing valuable bean genetic diversity with value chain development, an assessment of Guatemala's bean genetic diversity will be carried out based on genebank records to identify distinct varieties that should be prioritized for conservation through a rewards/compensation for agricultural biodiversity conservation services (PACS) scheme. This work will involve a Weitzman analysis and several stakeholder meetings to prioritize material for conservation and assess the feasibility of supporting this work at a national level.

Policy enhancement for the conservation, sustainable use and nutritional value of agricultural biodiversity

A review of existing policies relating to the conservation, sustainable use and nutritional value of agricultural biodiversity in Guatemala will be carried out. Discussion will be promoted through consultation workshops with key stakeholders on how to develop and leverage these policies to enhance the conservation, sustainable use and nutritional value of agricultural biodiversity in Guatemala. Among the policies that will be evaluated are the Politica National de Disarollo Rural Integral (PNDRI), Programa de Agricultura Familiar Para el Fortalecimiento de la Economia Campesina (PAFFEC), the Sistema National de Extension Rural (SNER) and the Plan de acción estratégico para la conservación y el uso de los recursos fitogenéticos Mesoamericanos para la adaptación de la agricultura al cambio climático (PAEM).

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The Indigenous Partnership in the IFAD-EU NUS Project

Supporting and linking indigenous peoples as custodians of agricultural biodiversity and knowledge for sustainable livelihoods

Phrang Roy and Sara Manetto

The Indigenous Partnership for Agrobiodiversity and Food Sovereignty (Italy)

Introduction

The Indigenous Partnership for Agrobiodiversity and Food Sovereignty (The Indigenous Partnership) is a network of indigenous communities and organizations committed to defining their own food and agricultural practices that sustain agricultural biodiversity, assisted by scientists and policy researchers who value participatory agricultural research approaches. The Indigenous Partnership supports indigenous peoples, communities and their representatives to celebrate, defend and revitalize their food systems and agricultural practices at local and global levels through participatory research initiatives and associated advocacy activities. With one foot in the world of leading academic research and the other grounded in the knowledge and priorities of indigenous peoples, the Indigenous Partnership is engaged in the IFAD-EU NUS Project to reinforce and expand global indigenous initiatives related to agricultural biodiversity and food sovereignty and to support the sensitization of methodologies to empower indigenous peoples.

A focus on north-east India

Three million people live in North East India (Figure 1), of which 86% are indigenous (2011 Census). Almost 50% of households are below the poverty line (Human Development Report 2009). This part of India is considered one of the most bio-culturally diverse areas of the world, but is affected by strong Westernization and urbanization that threaten the local agricultural biodiversity and cultural traditions. The Khasi are the majority indigenous group of Meghalaya and other main indigenous peoples are the Jaintias and Garos. All these ethnic groups follow matriarchal traditions, but are strongly impacted by modern influence.

The Indigenous Partnership established the North East Slow Food and Agrobiodiversity Society[§§] (NESFAS) in collaboration with Slow Food International to bring together partners from different sectors to enhance agricultural biodiversity of the region, thereby strengthening food sovereignty. Slow Food brings into play the importance of pleasure through good, clean and fair food, which goes hand in hand with our responsibility for the environment. Meanwhile, the Indigenous Partnership reaffirms the importance of local food systems and the age-old role of indigenous peoples as guardians of agricultural biodiversity, which is inextricably linked to their cultural identity and their rights to food sovereignty and food security.

NESFAS especially focuses on facilitating community-level networks to empower communities to celebrate and defend their diverse food and agricultural practices and to have a say at local, national, and international levels in food policies that will sustain their well-being and protect their lands, territories and resources. The organization is particularly sensitive to traditional ecological knowledge and supporting its integration with modern practices. As a platform, NESFAS believes that traditional ecological knowledge is as important as modern science and therefore facilitates a mutually respectful dialogue for sustainable progress.

The specific focus areas of NESFAS are:

- Millet network
- Shifting cultivation network
- Custodian Farmers
- Food festivals

[§§] http://www.nesfas.org/

- Slow Food Arc of Taste and Presidia
- Agricultural biodiversity walks
- School gardens
- Diversity fairs
- Eri silk weaves
- Mei Ramew Café

Major activities

In collaboration with NESFAS, the Indigenous Partnership is promoting and supporting better management practices, community seed storage and community-based documentation and monitoring of agricultural biodiversity in Meghalaya.

At local economies level the IFAD-EU NUS Project will promote the Mei-Ramew branding development. Mei-Ramew cafes, school gardens and mid-day meals could become nutrition-sensitive value chains. Farmer markets have started in some villages and at the NESFAS Office in Shillong and a Mobile Van does rounds to all the customary weekly markets selling the products of the communities.

The Project will be also involved with NESFAS in training communities on the development of weather information systems and farmer-led market-intelligence systems. Awareness will be raised in the 40 villages on climate resistant crops, and agricultural biodiversity management for climate change adaptation.

The integration between local knowledge and new modern knowledge is a relevant point to develop in all these initiatives.

Indigenous Terra Madre

One of the most important upcoming events is the Indigenous Terra Madre that will be organized in Shillong, Meghalaya, North-East India from 3 to 7 November 2015. It is a joint venture of the Indigenous Partnership, Slow Food International and NESFAS focused on indigenous perspectives and actions. Many communities (40 villages) will host the event. The IFAD-EU NUS Project is supporting the Conference as a special appointment for knowledge sharing and raising awareness of decision makers of the role of communities as custodians of agricultural biodiversity and associated knowledge that underpins sustainable livelihoods.

Supporting project sensitization to Indigenous Peoples

The Indigenous Partnership has many strengths that will be leveraged in the Project. Good practices and approaches will be shared with their network and their guidance will ensure the methods and approaches applied in the Project are sensitive to the needs of indigenous peoples and geared towards their empowerment. Some of their strengths are highlighted in Box 1.

Box 1. Area of strength of the Indigenous Partnership

Local networks: Field presence in north-east India and ability to mobilize local networks in other areas;

Linkages: connections with a global movement, opportunity to leverage internationally for common causes;

Knowledge sharing: Presence of indigenous collective culture and collective local institution allows better knowledge sharing;

Spreading the range: Expand our work in other areas to develop bigger collaboration.

Annexes

Annex I

Conference participants

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Annex II

Conference agenda

Day one 27 April 2015

8.00-8.30	***Registration***
8.30-10.00	**Session I: Opening the Conference & setting the scene** Chair: A. Tutwiler
8.30-8.40	Welcome address by Bioversity International (A. Tutwiler)
8.40-9.10	Welcome addresses by IFAD, EU, Institut d'Economie Rurale (Mali), Action for Social Advancement (India), Universidad del Valle de Guatemala and the Indigenous Partnership for Agrobiodiversity and Food Sovereignty
9.10-9.35	Objectives of the Conference and introduction to the Project (S. Padulosi)
9.35-10.00	Get to know each other & Conference expectations (J. Cherfas, facilitator)
10.00-10.20	***Coffee break***
10.20-13.00	**Session II: Agricultural biodiversity & resilience of livelihood systems** Chair: R. Vodouhe
10.20-10.40	Innovative approaches in climate change adaptation (J. van Etten)
10.40-11.00	Agricultural diversification for climate change risk management in smallholder agriculture systems (M. van Zonneveld et al.)
11.00-11.20	Food and nutrition security, adaptive capacity and resilience to climate change in Central America: A comprehensive participatory approach (L. Mercado)
11.20-11.40	Big data on small farms: Sources and drivers of food security of smallholder farmers (M. van Wijk)
11.40-12.00	Monitoring resilience & indicators (N. Bergamini et al.)
12.00-12.20	Documentation and monitoring of agricultural biodiversity for adaptation to climate change (S. Padulosi et al.)
12.20-13.00	General discussion
13.00-14.00	***Lunch break***
14.00-17.30	**Session III: Holistic approaches for sustainable & nutrition sensitive food systems** Chair: D. Hunter
14.00-14.20	Agricultural biodiversity to improve nutrition using a nutrition-sensitive food system approach (G. Kennedy)
14.20-14.40	Indigenous peoples, crop diversity & livelihoods (P. Roy)
14.40-15.00	The importance of agricultural biodiversity in promoting nutrition-sensitive agriculture (J. Friedrich)
15.00-15.20	Resilience in traditional food systems (P. Eyzaguirre)
15.20-15.40	***Coffee Break***
15.40-16.00	Holistic approach for enhancing the use of traditional crops: Lessons from India (O. King)
16.00-16.20	Green entrepreneurship: Beyond value chains to landscape approaches (W. Douma)
16.20-16.40	Communities' perspectives & participatory approaches (S. Maselli)
16.40-17.00	Gender and climate change and some thoughts on methodology (S. Arora-Jonsson)
17.00-17.30	General discussion
20.00-22.00	***Social dinner***

Day two 28 April 2015

8.30-8.40	**Re-cap from previous day (J. Cherfas)**
8.40-12.30	**Session IV: Managing conservation and use of agricultural biodiversity** Chair: S. Maselli
8.40-9.00	Let the locals lead: Empowering the poor to manage agricultural biodiversity and adversity (B. Sthapit)
9.00-9.20	Rete Semi Rurali: Collective action for sustainable use of agricultural biodiversity in farming systems (R. Franciolini et al.)
9.20-9.40	Incentive mechanisms to conserve agricultural biodiversity (A. Drucker)
9.40-10.00	Private sector engagement for agricultural biodiversity-based climate adaption, nutrition security and poverty reduction (K. Koolman)
10.00-10.20	***Coffee break***
10.20-10.40	Certification schemes and traditional crops (M. Maccari)
10.40-11.00	The contribution of agricultural biodiversity and crop production to agricultural development (M. Marino)
11.00-11.20	Building an enabling policy environment for upscaling and mainstreaming agricultural biodiversity to support nutrition sensitive food systems (D. Hunter)
11.20-11.40	Capacity development: What, where, how? (P. Rudebjer)
11.40-12.10	General discussion
12.10-12.30	Assignment of working groups and instructions for Session V
12.30-13.30	***Lunch break***
13.30-18.00	**Session V: Approaches, methods and tools for addressing the Project themes** Working Groups Five parallel working groups on the Project themes: Sharing experiences and recommendations on methods, approaches and tools to adopt for the Project's implementation (see page 27 for instructions) Working Group 1: Climate change Chair J. Van Etten, Rapporteur L. Mercado Working Group 2: Value chains Chair P. Rudebjer, Rapporteur M. van Zonneveld Working Group 3: Nutrition and food security Chair G. Kennedy, Rapporteur O. King Working Group 4: Conservation Chair S. Padulosi, Rapporteur A .Drucker Working Group 5: Empowerment Chair P. Eyzaguirre, Rapporteur B. Sthapit
15.00-15.20	***Coffee break***
15.20-15.30	Check-in (plenary), then working groups continue
18.20-20.00	**Side event: Certification for agricultural biodiversity conservation** Chair: S Padulosi
20.00-22.00	***Social dinner***

Day three — 29 April 2015

8.30-8.40	**Re-cap from previous day (J. Cherfas)**
8.40-12.30	**Session VI. Reporting of working groups to plenary** Chair: J. Cherfas
	Reporting outcomes of the working groups. Session meant to help identify methodologies to be applied in the Project to: measure impact, identify suitable interventions and leverage synergies across themes. Discussion to help identify gaps in knowledge, skills and capacity to be strengthened by the Project, as well as existing data and assets that can support the objectives of the Project.
8.40-9.00	Working Group 1: Climate change (Rapporteur L. Mercado)
9.00-9.20	Discussion
9.20-9.40	Working Group 2: Value chains (Rapporteur M. van Zonneveld)
9.40-10.00	Discussion
10.00-10.20	***Coffee break***
10.20-10.40	Working Group 3: Nutrition and food security (Rapporteur O. King)
10.40-11.00	Discussion
11.00-11.20	Working Group 5: Empowerment (Rapporteur B. Sthapit)
11.20-11.40	Discussion
11.40-12.00	Working Group 4: Conservation (Rapporteur A. Drucker)
12.00-12.30	Discussion
12.30-13.30	***Lunch break***
13.30-17.00	**Session VII: Getting the job done** Chair: P. Roy
	Review the work plan of the Project, activities, expected outputs, outcomes and impacts. Country coordinators present their views on possible target crops and sites, potential partners and stakeholders to involve, areas of strength and areas where support is needed from the Project team, training needs. Reporting schedule and plan for knowledge management and communication shared, as well as plans for impact assessment.
13.30-14.00	Project framework, team, expected outputs, outcomes and impact (S. Padulosi)
14.00-14.20	Reflections on Project implementation in Guatemala (S. Maselli)
14.20-14.40	Reflections on Project implementation in Mali (A. Sidibe)
14.40-15.00	Reflections on Project implementation in India (A. Mondal)
15.00-15.20	***Coffee break***
15.20-15.40	Reflections on Project implementation by the Indigenous Partnership (S. Manetto)
15.40-16.00	Applying Outcome Mapping to research for development projects: The new IFAD-EU NUS Project (E. Gotor)
16.00-16.20	Data gathering, knowledge sharing and communications management for the Project (G. Meldrum)
16.20-17.00	General discussion
17.00-17.30	**Conference closing** Chair: S. Padulosi

Day four 30 April 2015

8.30-12.30	**Side Event: The 5Capitals Methodology and Gender** Chair: D. Stoian
8.30-8.50	Introduction to the session and its relevance to the Project (S. Padulosi)
8.50-9.20	Making the 5Capitals Methodology gender responsive (D. Stoian)
9.20-9.40	Experiences with the Five Capitals Methodology in West Africa (P. Ceci)
9.40-10.00	***Coffee break***
10.00-11.00	Working groups
11.00-12.30	Sharing outcome of the working groups and the way forward
12.30-13.30	***Lunch***

Annex III

Baseline focus group discussion

Details of the participants and meeting	
Community	
Date of discussion	
Number of farmers, their gender and age (Group 1 and Group 2)	
How were the farmers selected for the discussion?	
Observations/Notes	

Introduction

Good morning/afternoon.

We are coming from [organization name] in collaboration with Bioversity International for a study supported by IFAD, the European Union and the CGIAR Research Program on Climate Change Agriculture and Food Security.

The Project is called 'Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk', which captures very well the aims of the Project. We will be looking at the role of underutilized or traditional crop species, like [target crops - see table below], in strengthening livelihoods in your region in terms of income, food and nutrition security and adapting to changes in the weather.

The Project will run for three years and will involve activities to increase income gained from [target crops], linking them to markets and considering how to process them more efficiently. We will offer training and will hold discussions and knowledge exchanges regarding techniques that can improve production quality and marketing, as well as sharing new and old recipes that can encourage greater use of local agricultural biodiversity for better nutrition.

Today we would like to take some time to discuss in groups about the different food plants that are grown, collected and eaten in your community and the changes that have been going on with the weather and other aspects, so we can understand better how the Project can be of help to your community.

We would like to split in two groups, with good representation of young, old, men and women in each.

Group 1: Sections 1-4
Group 2: Section 5-7

	Target Crop 1	Target Crop 2	Target Crop 3
Mali	Fonio	Bambara Groundnut	Vegetable TBD
India	Kodo millet	Little millet	Vegetable TBD
Guatemala	Phaseolus	Chaya	TBD

SECTION 1: Environment and Annual Cycle

1.1 Annual Calendar

Write out the months of the year on a big paper. Indicate the calendar of events by drawing a line through relevant months

		Jan	Feb	Mar	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1.1.1	What are the seasons experienced locally during the year?												
1.1.2	At what points in the year do they generally experience:												
	Rain												
	Peak rains												
	Drought/water shortage												
	Frost												
	Hail and/or												
	Snow												
1.1.3	Are there lean periods when farm production doesn't meet household needs?												
1.1.4	What are the most important times for agricultural work (e.g. land preparation, planting specific crops, harvesting)?												
	Activity:												
	Activity:												
	Activity:												
	Activity:												
	Activity:												
	Activity:												
	Activity:												
	Activity:												
1.1.5	What are the most important times for off-farm employment?												
1.16	Indicate for each activity in 1.14 and 1.15 which gender (men, women, both) is mainly responsible for the work.												

1.2 Changes in the annual calendar in the last 10 years				
1.2.1	Has there been a change in the rainy period in the last 10 years?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.2	Are there any changes in when peak rains occur?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.3	Are there differences in how heavy rains are?			
1.2.4	Has the number or timing of showers changed?			
1.2.5	Over the whole year, is there more rain, less rain, the same amount of rain compared to 10 years ago?			
1.2.6	Has there been a change in the last 10 years in the timing when the farmers experience drought/water shortage?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.7	How serious is drought/water shortage in a typical year?			
1.2.8	Has the severity of drought/water shortage changed in the last 10 years?			
1.2.9	Has there been a change in temperature? If yes, at which time of year is this most apparent?			
1.2.10	Has there been a change in when they experience frost, hail or snow?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.11	Has the timing of food shortage changed?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.12	Has the frequency or severity of food shortages changed?			
1.2.13	Has there been a change in the last 30 years in the planting and harvesting months, or other agricultural activities?		*Start (month)*	*Start (month)*
		Before		
		Now		
1.2.14	Has there been any change in the agricultural work that men and women perform?			
1.2.15	Where do people in the community go for off-farm work? Which areas and which kind of work?			

1.3 Water and Drought			
1.3.1	Where does the community collect their water? What are the main water sources for drinking water for humans? Livestock?		
1.3.2	What are the main sources of water for irrigation? What systems of irrigation are used?		
1.3.3	Have any water sources dried up in the last 10 years? Which ones? How many?		
1.3.4	What is the reason for drought typically? (e.g. late rain, not enough rain, drying of water sources)		
1.3.5	What actions are they taking to cope with drought in the community?		
1.4 Soil			
1.4.1	Has there been a change in soil quality in the community? If yes, when did this change become apparent?		
1.4.2	How do the farmers recognize soil degradation?		
1.4.3	What is causing soil degradation in their view?		
1.4.4	What actions are they taking to cope or reverse soil degradation in the community?		
1.5 Pests and Disease			
1.5.1	Which crops are most affected by pests and disease? (max 5) What are the pests and diseases that are affecting these crops? What damage do they cause?	Crop	Pest/Disease (notes on damage)
1.5.2	Have any new pests or diseases been observed in the community?		
1.5.3	Have any pests or diseases disappeared from the community?		
1.5.4	What actions are they taking in the community to cope with pests and disease?		

SECTION 2: Climate Shocks and Community Timeline

Discuss when the community has experienced dramatic extreme events.

2.1 What years did they experience the following:

- Major drought
- Major flooding
- Major storms
- Major pest and disease outbreak
- Other natural disasters

Write each event on a separate card.

2.2 How was the landscape and community affected by these events?
2.3 What actions did the community take to cope and recover?
Write these details on the back of the cards for each event.
Facilitators to document results in a table (next page).

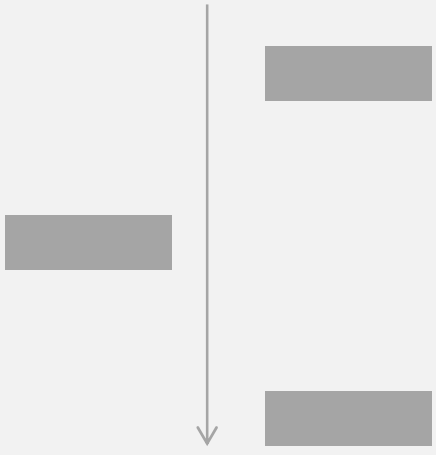
Draw a line on a big piece of paper
Arrange the climate events along it in chronological order to build a timeline
Develop the community timeline by discussing:

2.4 What other events/changes have happened in the community over this timeframe or the last 30 years? Have there been changes in:

- Roads
- Services/infrastructure (schools, hospital, post, telephone, internet, etc.)
- Introduction of new crops/livestock
- Abandonment of crops/livestock
- Introduction of fertilizers/pesticides
- Change in crop rotation practices?
- Change in land use
- Change in livelihood strategies? (e.g. new products, occupations, migration)
- Introduction of new technologies (tractors, etc.)
- Changes in social norms, diets, etc.

2.5 Reflect on changes in temperature and precipitation observed in the first exercise: When did they notice these changes? *Map on the timeline (if changes observed)*

2.6 Have they noticed other changes in the environment (wildlife, plants and animals)? When did these changes start? *Map these on the timeline.*



History of extreme events

Shock	Effect and recovery

SECTION 3: Crop Hardiness

3.1 Are there crops/varieties that are generally less reliable – more likely to fail - than others? *List 3-5 crops.*

Less Reliable Crop/ Variety of Target crop	Why does it fail?	How often does it fail? (e.g. every year, every 2 years) And to what degree (e.g. total, half)?	Where do they find the seed to replant after crop failure?	Why continue to cultivate this crop if it is so unreliable?

3.2 Are there crops/varieties that are generally more reliable – less likely to fail – than others? *List 3-5 crops.*

More reliable Crop/ Variety of Target crop	Notable stress resistance/s	Vulnerable to any stresses?	What is needed to increase use of this crop?

3.3. Are there <u>wild crops</u> turned to in times of climate stress, especially drought? Where are they gathered? When?

Wild crop name	When is it gathered?	Where is it gathered?

SECTION 4: Institutions and Human Capacities

4.1 What are the institutions/farmer groups, formal and informal, that play a role in the livelihoods and social organization of the community?
Discuss and write each institution on a separate card
Include mothers groups, schools, government services, etc.

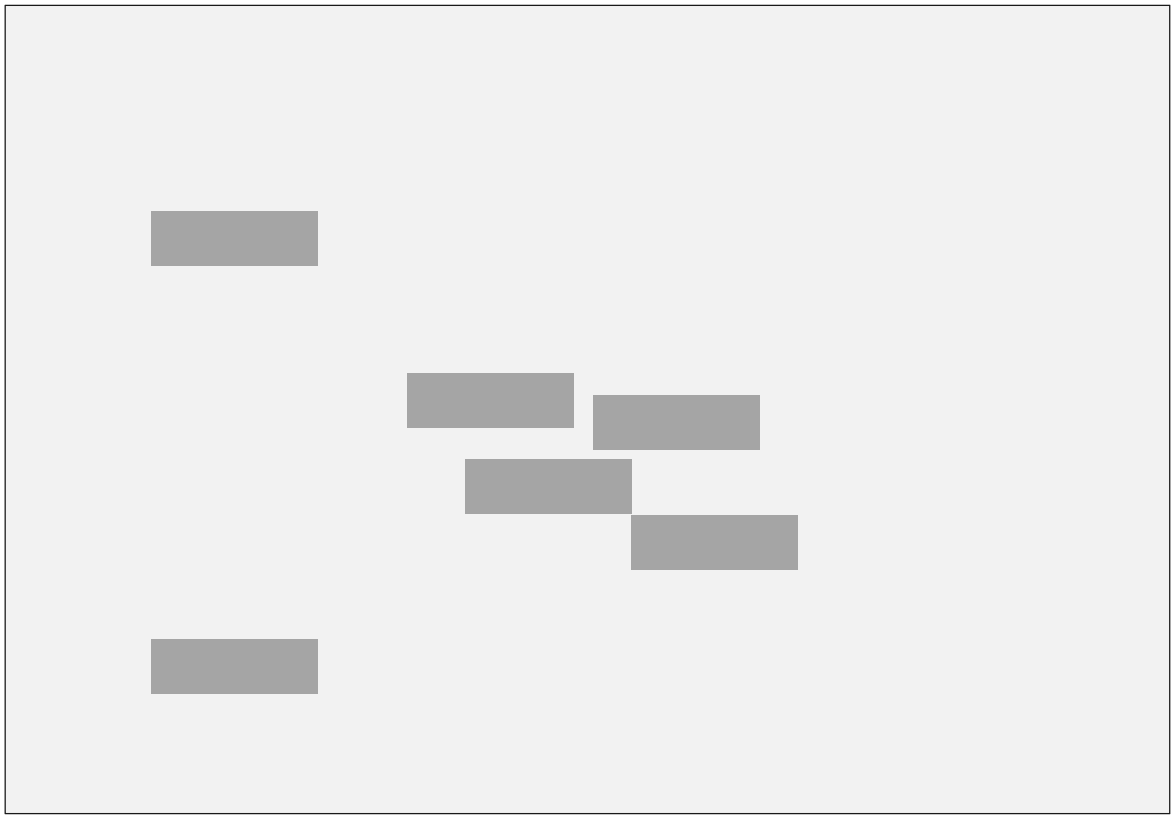
4.2 What is the main role of these institutions?
Write the role on back of the card with the institution name
(e.g. tree nursery/planting,
fish/shrimp ponds, fishing,
forest management,
water catchment management,
soil improvement activities,
irrigation,
savings/credit,
marketing,
productivity enhancement,
seed production,
vegetable production,
mothers groups, etc.)

4.3 Are there institutions related to the management and marketing of the target crops?
Make cards for them if not already identified and document their role with regard to target crops on the back of the cards.

Facilitator: Document the institutions and roles in a table (next page)

4.4 Post the cards on a board or paper, with the space between indicating distance
(e.g. services outside the community would be further away). Give some indication of the distance in terms of how long to walk or how many miles or kilometres.

Take a photo or document the result.



Institution	Role

4.5 Commons and management of natural resources		
4.5.1	Does the community have shared natural resources, e.g. fields for grazing, forests for collecting fruits/firewood, ponds/lakes for fishing?	
4.5.2	If yes, are there rules/institutions governing the sustainable management of these commons? Describe these rules	
4.5.3	Does the community have any connection, coordination, and cooperation with neighbouring communities for the management of natural resources? Describe these links/institutions.	
4.5.4	Are there areas on the landscape under formal or informal protection? Describe these areas/land types/form of protection.	
4.6 Documentation and sharing of knowledge		
4.6.1	Is local agricultural biodiversity and associated knowledge documented in the community? How/by which institutions?	
4.6.2	Are local knowledge and cultural traditions transmitted from elders and parents to young people in the community? How? E.g. songs dances, school curricula.	
4.7 Infrastructure, services and human resources		
4.7.1	Is the socio-economic infrastructure (roads, hospitals, schools, etc.) adequate for the needs of the community?	
4.7.2	How far do they have to walk to access: School? Medical care? The market?	
4.7.3	How is the general level of health of the local people, especially considering the needs for agricultural work?	
4.7.4	Is there adequate labour in terms of amount and skill available in the community for agricultural work?	

SECTION 5: Vulnerability Matrix

With reference to past 5 years:

5.1 What are the most important livelihood sources in the community? List items on the left side of the paper.
(e.g. major staples, major cash crops, livestock, off-farm work, seasonal jobs, etc.)?

5.2 What are the most important hazards or threats faced by the community for their livelihoods? Be as specific as possible, list as headings on a big paper, maximum 5 hazards.
(e.g. drought, landslides, specific crop disease, etc.).

5.3 Rank the relative risk level of each hazard for each of the livelihood sources.
0 = no impact
1 = low impact
2 = medium impact
3 = significant impact

Major livelihood sources	Hazards					Total
Total						

Add up the totals for the columns and rows to see which are the most threatened livelihood sources and the most important hazards.

5.4 What resources are available in the community to mitigate risk for the most important hazards and most vulnerable livelihood sources? *Start with an open question and later consider the role of natural, social, physical, human and financial assets.*

SECTION 6: Crops and Varieties of Target Species

6.1 Crop species cultivated	
6.1.1	What are all the crop species cultivated in the community? *Write the names on separate cards*
6.1.2	*Draw three horizontal lines on a big piece of paper* *Evaluate the crops to define:* a. Which crops are grown by more than 75% of households, almost everyone? *Place the cards above the top line* b. Which crops are grown by fewer than 5% of households, very few households? *Place the cards at the bottom* c. Which crops are grown by fewer than 25% of households, not very many households? *Place the cards in the second bottom quadrant* d. Verify that the remaining crops are grown by between 25-75% of households. *Place them in the second quadrant from the top.*
6.1.4	*Draw a vertical line on the paper* Which of these crops are typically grown in a large area (e.g. in a field, versus a home garden or field margin)? *Move the crops grown in large area to the right of the line.*
6.1.5	Are some crops changing in popularity or the size of the area in which they are grown? *For those mentioned by the participants, indicate the trend with arrows beside the name:* *↑ more families growing* *↓ less families growing* *← Smaller areas* *→ Larger areas*
6.1.6	What is the reason for the trends indicated? Why are farmers growing more or less of these crops? *Document the answers on a separate sheet of paper.*
6.2 Lost Crops	
6.2.1	Are there other crops that have been grown historically in the community but are no longer cultivated? *Add these crops to a 'lost' crops cell.*
6.2.2	What are the features of these lost crops? Why was it lost? Would the crop be relevant to recover for nutrition, cultural value, climate hardiness?
6.3 Wild Gathered Species	
6.3.1	Are there crops gathered from the wild surrounding forests and plains? *Write their names on cards with a green pen.* *Add the cards for wild species to the cells, according to how many families gather them and in which amounts.*

6.4 Crop market links (sell and purchase)	
6.4.1	Which does the community sell to the market? *Looking at all the crops in the cells, underline the crops with a red pen.*
6.4.2	Are there crops that are purchased in the market that are not grown on their farms? *Write out cards for these crops using a red pen. Also consider products purchased in the markets, like oil, noodles, processed snacks, etc. For processed products try to document the main ingredients.* *Add the purchased products as accurately as possible to the cells, according to how many families buy them and in which amounts.*
6.4.4	Are there crops that are purchased in the market that are also grown on their farms? *Indicate with a star *, particularly just for the most important crops.*
6.5 Crop consumption	
6.5.1	Which crops are most important for household consumption? *Consider also seasonally important foods. Circle them with a blue pen and if they are only important in certain months, write the months on the card.*
6.5.2	Put a triangle beside those important as animal feed. △
6.6 Gendered Management	
6.6.1	Are women or men generally more responsible for management of certain crops? *If so, indicate with (M) or (W) beside the crop name.*

ALL CROPS

Small Amount	Large Amount
More than 75% of households, Small amount	More than 75% of households, Large amount Wheat Noodles
25-75% of households, Small amount Kodo Millet↓	25-75% of households, Large amount
5-25% of households, Small area	5-25% of households, Large amount
Less than 5% of households, Small amount Butter tree fruit (W)	Less than 5% of households, Large amount
Lost	Relevance of Lost Crops (Use, Desirable features, reason for loss)

6.7 Varieties of Target Crops (separate analysis for each crop)	
6.7.1	What are all the varieties of the target crop cultivated in the community? *Write the names on separate cards.*
6.2.3	*Draw three horizontal lines on a big piece of paper* *Evaluate the varieties to define:* a. Which varieties are grown by more than 75% of households, almost everyone? *Place the cards above the top line* b. Which varieties are grown by fewer than 5% of households, very few households? *Place the cards at the bottom* c. Which varieties are grown by fewer than 25% of households, not very many households? *Place the cards in the second bottom quadrant* d. Verify that the remaining varieties are grown by between 25-75% of households. *Place them in the second quadrant from the top.*
6.2.4	*Draw a vertical line on the paper* Which of these varieties are typically grown in a large area (e.g. in a field, versus a home garden or field margin)? *Move the crops grown in large area to the right of the line.*
6.2.5	Are some varieties changing in popularity or the size of the area in which they are grown? *For those mentioned by the participants, indicate the trend with arrows beside the name:* *↑ more families growing* *↓ less families growing* *← Smaller areas* *→ Larger areas*
6.2.6	What is the reason for the trends indicated? Why are farmers growing more or less of these varieties? *Document the answers on a separate sheet of paper.*
6.8 Lost Varieties	
6.2.7	Are there other varieties that have been grown historically in the community but are no longer cultivated? *Add these varieties to a 'lost' varieties cell.*
6.2.8	What are the features of these lost varieties? Why was it lost? Would the variety be relevant to recover for nutrition, cultural value, climate hardiness?
6.9 Variety market links (sell and purchase)	
6.2.9	Which varieties does the community sell to the market? *Looking at all the varieties in the cells, underline the crops with a red pen.*
6.2.10	Are there varieties that are purchased in the market that are not grown on their farms? *Write out cards for these crops using a red pen. Add the purchased varieties as accurately as possible to the cells, according to how many families buy them and in which amounts.*

6.10 Modern/Improved Varieties	
6.2.11	Which of these are modern/improved varieties? *Identify the modern varieties with a star*.*
6.11 Consumption	
6.2.12	Which varieties are most important for household consumption? *Circle them with a blue pen.*
6.12 Gendered Management	
6.2.13	Are women or men generally more responsible for management of certain varieties? *If so, indicate with (M) or (W) beside the crop name.*

VARIETIES: TARGET CROP 1 (Mali: Fonio, India: Kodo millet, Guatemala: Beans)

Small Amount	Large Amount
More than 75% of households, Small amount	More than 75% of households, Large amount
25-75% of households, Small amount	25-75% of households, Large amount
5-25% of households, Small area	5-25% of households, Large amount
Less than 5% of households, Small amount	Less than 5% of households, Large amount
Lost	Relevance of Lost Varieties (Use, Desirable features, reason for loss)

VARIETIES: TARGET CROP 2 (Mali: Bambara groundnut, India: Little millet, Guatemala: Chaya)

Small Amount	Large Amount
More than 75% of households, Small amount	More than 75% of households, Large amount
25-75% of households, Small amount	25-75% of households, Large amount
5-25% of households, Small area	5-25% of households, Large amount
Less than 5% of households, Small amount	Less than 5% of households, Large amount
Lost	Relevance of Lost Varieties (Use, Desirable features, reason for loss)

SECTION 7: Features and Knowledge on Target Crops

From the results of the "five cell analysis" above, list all the varieties of the target crops.

7.1 What are the important features and traditional knowledge for the varieties of the target crops. NOTE: If there are too many varieties to manage, just focus on those more threatened/lost.

TARGET CROP 1 (Mali: Fonio, India: Kodo millet, Guatemala: Beans)

Variety	Key features	Main threats (e.g. specific pests, drought, etc.)	Tolerances to abiotic stress or pests and disease?	What are the seed sources?	How is it cultivated? What are relevant practices, planting times etc?	How is it prepared?	Are any products made in the community?

TARGET CROP 2 (Mali: Bambara groundnut, India: Little millet, Guatemala: Chaya)

Variety	Key features	Main threats (e.g. specific pests, drought, etc.)	Tolerances to abiotic stress or pests and disease?	What are the seed sources?	How is it cultivated? What are relevant practices, planting times etc?	How is it prepared?	Are any products made in the community?

Annex IV

Baseline household survey

SECTION 1: Introduction and consent

1.1	District	
1.2	Village	
1.3	Lat	
1.4	Long	
1.5	Elevation	
1.6	Survey No	
1.7	Date of interview	
1.8	Interviewers names	
1.9	Data Entry Clerk/s	

Good morning/afternoon. We are coming from [organization name] with permission from [local government].

We are conducting a survey looking at the role of [target crops – see table below] for income, nutrition and adaptation to weather changes. We would like to ask you some questions that should take no more than one and half hours of your time.

We would like to share some of the information collected so more people understand the needs to strengthen income, nutrition and climate change adaptation in your region, and particularly how to support the role of [the target crops] in strengthening livelihoods. Any information collected will be shared anonymously, without your name, and grouped with the results of other farmers being surveyed.

We ideally will have two respondents for the survey a man and a woman responsible for decision making in the household. We would prefer to speak to the heads of household – man and woman.

	Mali	India	Guatemala
Target Crop 1	Fonio	Kodo millet	Phaseolus
Target Crop 2	Bambara Groundnut	Little millet	Chaya
Target Crop 3	Vegetable TBD	Vegetable TBD	TBD

1.10	Consent given? Y /N	

SECTION 2: Basic household information

2.1 Details on the members of the household:

What are the age and gender of all members of the household?
What are their levels of education (number of years schooling)?
Which members are currently in school?
Which members contribute an income to the household?
Which members are available to help on the farm, for how many months per year?

2.1.1	Household members	Gender	Age/ Year of Birth	# Years of School	Enrolled in school this year? (check)	Income earner? (check)	# Months/yr available to help on farm
	H1 HOH	Male					
	H2 HOH	Female					
	H3						
	H4						
	H5						
	H6						
	H7						
	H8						
	H9						
	H10						
	H11						
	H12						
	H14						
	H15						
	H16						
	H17						
	H18						
	H19						
	H20						
2.1.2	Household type: *MW= Male headed with a wife or wives* *MH= Male headed, divorced, single or widowed* *WH= Female headed, divorced single or widowed* *MA= Female headed husband away, husband makes most agricultural/HH decisions* *FD= Female headed, husband away, female makes most agricultural/HH decisions* *CH= Child headed/orphan* *OH= Other*						
2.1.3	Ethnicity/Caste [Codes to be defined in each country]						

2.2 Details on the respondents:

We would like to have two respondents: a man and a woman responsible for decision making in the household, ideally the male and female heads of household. One respondent is acceptable if a suitable decision maker not available to represent one gender.

	Male respondent	Female respondent
Name		
Code (from table above)		
If not HOH, relationship to HOH *1 = Husband/Wife* *2 = Father/Mother* *3 = Child* *4 = Son in law/Daughter in law* *5 = Nephew/Niece* *6 = Grandchild* *7 = Brother/Sister* *8 = Other related* *9 = Other unrelated*		

2.3 Country-specific questions (linked to PPI index)

India	Guatemala	Mali	Response
2.3.1i What is the household type? *1 = Labour (agricultural, casual, other)* *2 = Self-employed (agriculture or non-agriculture),* *3 = Regular wage/salary-earning or others*	2.3.1g Can the female head/spouse read and write? *1 = Yes* *2 = No* *3 = No female head/spouse*	2.3.1m How many members of the household usually work as their main occupation in agriculture, animal husbandry, fishing, or forestry? *1= One or none* *2 = Two* *3= Three or more*	
	2.3.2g Does any household member work mainly in agriculture, animal husbandry, hunting or fishing, *1 = Yes* *2 = No* *3 = No one works mainly in agriculture*		
	2.3.3g Do any household members work mainly as casual labourers or domestic workers? *1 = Yes* *2 = No*		

SECTION 3: Farm Details and Sources of Livelihood Security (MAN TO ANSWER)

3.1 Land profile corresponding to last 12 months of production

	Land	Area
3.1.0	Land unit of measurement	
3.1.1	Total Land Available	
Tenure		
3.1.2	Owned, including land rented out to others	
3.1.3	Rented/Leased (for own use)	
3.1.4	Communal land used for cultivation	
3.1.5	Communal land used for grazing	
Land Use		
3.1.6	Rented out	
3.1.7	Rainfed cultivation	
3.1.8	Irrigated cultivation	
3.1.9	Home garden	
3.1.10	Grassland/rangeland	
3.1.11	Permanent fallow/degraded	
3.1.12	Forest	
3.1.13	Pond	
Fragmentation		
3.1.14	Number of parcels	
3.1.15	How far to walk between most distant parcels?	

NOTE: can define other land types relevant to study area (e.g. sloping land)

3.2 Which crops were grown by the household in last 12 months?

Crop Name	Area planted [Relevant local unit]	Household Consumption? 1 = yes	Income earned? 1= yes	Grown under irrigation? 1= yes	Inputs used [Insert coded list]

3.3 Does the household process/add-value to any crops before sale? Which type of products are made?

Crop species	Product [insert coded list]

3.4 Details on production of varieties of target crops in last 12 months

3.4.1 Target crop 1

Variety	Area Sown [Relevant local unit for area]	Yield [relevant local unit for mass]	Seed Source [insert coded list]	Form (Raw or different products) [insert coded list]	Sale (% of Yield)	Buyer [insert coded list]	Price [relevant local unit for currency/relevant local unit for mass]

3.4.2 Target crop 2

Variety	Area Sown [Relevant local unit for area]	Yield [relevant local unit for mass]	Seed Source [insert coded list]	Form (Raw or different products) [insert coded list]	Sale (% of Yield)	Buyer [insert coded list]	Price [relevant local unit for currency/relevant local unit for mass]

3.4.3 Target crop 3

Variety	Area Sown [Relevant local unit for area]	Yield [relevant local unit for mass]	Seed Source [insert coded list]	Form (Raw or different products) [insert coded list]	Sale (% of Yield)	Buyer [insert coded list]	Price [relevant local unit for currency/relevant local unit for mass]

3.5 Livestock

Animal Type	# Owned	Income earned 1= yes
Cows		
Calves		
Bulls		
Oxen		
Goats		
Sheep		
Pigs		
Chickens		
Rabbits		
Fish		
Horses		
Burros		
Mules		
[Insert country-specific list]		

3.6 Do you <u>sell</u> any of the following livestock products from your own production in last 12 months?

Product	Income earned 1= yes
Milk: cow	
Milk: sheep/goat	
Butter	
Yoghurt	
Cheese	
Meat: cow	
Meat: sheep/goat	
Meat: chicken	
Meat: pig	
Fish	
Eggs	
Wool	
Honey	
Other	
[Insert country-specific list]	

3.7 Other important livelihood activities based on farm, woods and rivers in last 12 months?

Income source	Income earned 1= yes
Wild plant gathering	
Timber	
Fuel wood	
Charcoal	
Manure/compost production	
Fishing	
[Insert country specific list]	
Other (specify)	

3.8 Off-farm income. Did you receive income from following in last 12 months (check):

Income source	Income earned 1= yes
Employment on someone else's farm	
Other paid employment, business	
Remittances or gifts	
Payments for environmental services	
Payment from projects/government	
Loan/credit	
Renting machinery or animals	
Renting out land	
[Insert country specific list]	
Other (specify)	

3.9 Most important livelihood sources

What are your most important sources of income? (list a maximum of 5 sources)	
How important is [target crop 1] for your household income? *0 = no importance, no income gained* *1 = minor importance* *2 = medium importance* *3 = major importance*	
How important is [target crop 2] for your household income? *0 = no importance, no income gained* *1 = minor importance* *2 = medium importance* *3 = major importance*	
How important is [target crop 3] for your household income? *0 = no importance, no income gained* *1 = minor importance* *2 = medium importance* *3 = major importance*	

SECTION 4: Physical Assets

4.1 Wealth indicators (PPI index)

Mali	India	Guatemala	Response
4.1.1m What is the main construction material of the roof of the residence? *1= Tile or thatch* *2= Mud, corrugated metal sheets, concrete or other*	4.1.1i Does the household possess any casseroles, thermos or thermoware? *1= Yes* *2= No*	4.1.1g What is the main construction material of the residence's floors? *1= Parquet, granite, or ceramic* *2= Formed cement bricks* *3= Mud bricks or cement slab* *4= Earth, sand wood or other*	
4.1.2m What is the main construction material of the walls of the residence? *1= All cement* *2 = Partly cement or other*	4.1.2i What is the primary source of energy for cooking? *1= LPG or electricity* *2= Firewood and chips, dung cake, kerosene, charcoal, coke or coal, gobar gas, or others* *3= No cooking arrangement*	4.1.2g Does the household have a refrigerator? *1= Yes* *2= No*	
4.1.3m What is the households main source of drinking water? *1= Faucet tap* *2= Public pump* *3= Modern well* *4= Surface water, non-modern well, drilled well or others*	4.1.3i Does the household possess a mobile handset and a telephone instrument (landline)? *1= Yes, a landline, regardless of mobile* *2= Yes, only a mobile* *3= No, neither one*	4.1.3g Does the household have a gas or electric stove? *1= Yes* *2= No*	
4.1.4m What toilet arrangements does the household have? *1= Latrine or flush toilet* *2= Others*	4.1.4i Does the household possess a television and a VCR/DVD/VCD player? *1= Yes, both* *2= Yes, only one* *3= No neither one*	4.1.4g Does the household have a stone mill? *1= Yes* *2= No*	
4.1.5m Does the household own any television sets? *1= Yes* *2= No*	4.1.5i Does the household possess an almirah/dressing table? *1= Yes* *2= No*	4.1.5g Does the household have an electric iron? *1= Yes* *2= No*	

Mali	India	Guatemala	Response
4.1.6m Does the household own any radios? *1= Yes* *2= No*	4.1.6i Does the household possess a sewing machine? *1= Yes* *2= No*		
4.1.7m Does the household own any irons? *1= Yes* *2= No*	4.1.7i Does the household possess a bicycle, motorcycle/scooter or motor car/jeep? **1**= *Motorcycle scooter but no car* *2= Motor car/jeep* *3= Yes, bicycle only* *4= No, none*		
4.1.8 Does the household own any motorbikes? *1= Yes* *2= No*			

4.2 Assets related to agriculture and the target crops

4.2.1	Do you own any of the following assets: [insert list of tools relevant to processing and value addition of target crops]	
4.2.2	Do you have access to irrigation? [insert list of irrigation system types relevant to Project area]	
4.2.3	Do you hire agricultural labourers to assist with farm work? *1= Yes* *2= No*	

SECTION 5: Roles in Production of Target Crops and Social Assets (WOMAN TO ANSWER)

5.1. Roles of household in production of [target crop 1]

5.1.1	Indicate the household member with the following roles in production of [target crop 1] Indicate precise household member using codes from question 2.1.1		
	Activity	Performs work	Decides how, when or who to perform task?
	Land preparation		
	Planting		
	Manuring		
	Weeding		
	Crop protection		
	Irrigation		
	Harvesting		
	[Insert crop specific list for processing activities]		
	[Insert crop specific list for value addition activities]		
	Marketing		
5.1.2	Which household member receives the cash from selling [target crop 1]?		
5.1.3	Who decides on how to use the cash from [target crop 1]?		

5.2. Roles of household in production of [target crop 2]

5.2.1	Indicate the household member with the following roles in production of [target crop 2] Indicate precise household member using codes from question 2.1.1		
	Activity	Performs work	Decides how, when or who to perform task
	Land preparation		
	Planting		
	Manuring		
	Weeding		
	Crop protection		
	Irrigation		
	Harvesting		
	[Insert crop specific list for processing activities]		
	[Insert crop specific list for value addition activities]		
	Marketing		
5.2.2	Which household member receives the cash from selling [target crop 2]?		
5.2.3	Who decides on how to use the cash from [target crop 2]?		

5.3. Roles of household in production of target crop 3

5.2.1	Indicate the household member with the following roles in production of [target crop 2] Indicate precise household member using codes from question 2.1.1		
	Activity	Performs work	Decides how, when or who to perform task
	Land preparation		
	Planting		
	Manuring		
	Weeding		
	Crop protection		
	Irrigation		
	Harvesting		
	[Insert crop specific list for processing activities]		
	[Insert crop specific list for value addition activities]		
	Marketing		
5.2.2	Which household member receives the cash from selling [target crop 2]?		
5.2.3	Who decides on how to use the cash from [target crop 2]?		

5.4 Indications of women's empowerment

5.4.1	Does any member of your household participate in community or local institutions? Does any member of your household have a leadership role in any community or local institution?		
	Institution	Participating Household members (codes from question 2.1.1)	Household members with leadership role (codes from question 2.1.1)
	[insert list of institutions identified in FGD or country specific list]		
5.4.2	Does any member of your household have access to credit? From which source?	Household members (codes from question 2.1.1)	Credit Source [insert coded list]
5.4.3	How would you rate your availability of leisure time? *1= Very poor, very little free time* *2= Poor* *3= Satisfactory* *4= Good* *5= Excellent*		

SECTION 6: Food security and diet quality (WOMAN TO ANSWER)

6.1 Household Food Insecurity Access Scale (HFIAS)

Each of the questions in the following table is asked with a recall period of four weeks (30 days). The respondent is first asked an occurrence question – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

Example:
In the past four weeks, did you worry that your household would not have enough food?
0 = No (skip to Q2) 1 = Yes 1.a.

How often did this happen?
1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)

		Yes/No	How Often? *1 = rarely (once or twice)* *2 = sometimes (three to ten times)* *3= often (more than ten times)*
6.1.1	In the past four weeks, did you worry that your household would not have enough food?		
6.1.2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?		
6.1.3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?		
6.1.4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?		
6.1.5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?		
6.1.6	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?		
6.1.7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?		
6.1.8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?		
6.1.9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?		

6.2 Annual food security assessment

In the past 12 months did your household (check the months that apply):

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.2.1	Experience food insufficiency?												
6.2.2	Access food aid?												

6.3 Dietary Diversity Questionnaire

6.3.1 The following questions are directed specifically to the female respondent, considering only what she consumed:

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home.

Start with the first food or drink of the morning. Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

Breakfast	Snack	Lunch	Snack	Dinner	Snack

6.3.2	Did you eat anything (meal or snack) OUTSIDE the home yesterday? 1= Yes 2=No	

6.3.3 When the respondent recall is complete, the enumerator is to fill in the food groups based on the information recorded above in section 6.3.1. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

Food Group	Example	Yes = 1 No =0
Cereals	bread, noodles, biscuits, cookies or any other foods made from millet, sorghum, maize, rice, wheat + insert local foods available grains e.g. ugali, nshima, porridge or pastes or other locally available cereal foods	
Vitamin A rich vegetables and tubers	pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)	
White roots and tubers	white potatoes, white yams, cassava, or foods made from roots	
Dark green leafy vegetables	dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, kale, spinach	
Other vegetables	other vegetables (e.g. tomato, onion, eggplant) + other locally available vegetables, including from the wild	
Vitamin A rich fruits	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruit	
Other fruits	other fruits, including wild fruits and 100% fruit juice made from these	
Organ mean (iron rich)	liver, kidney, heart or other organ meats or blood-based foods	
Flesh meats	beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
Eggs	eggs from chicken, duck, guinea fowl or any other egg	
Fish and seafood	fresh or dried fish or shellfish	
Legumes	beans, peas, lentils or food made from these	
Nuts and seeds	nuts, seeds or foods made from these	
Milk and milk products	milk, cheese, yogurt or other milk products	
Oils and fats	oil, fats or butter added to food or used for cooking	
Sweets	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes	
Spices, condiments, beverages	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages	
Insects	termites, grass-hoppers, silk worm, larvae	
Did you eat anything (meal or snack) OUTSIDE the home yesterday?		

6.4 Consumption of target crops

How often do you typically consume the target crops? Are there seasonal differences? How is the crop prepared?

6.4.1 Target crop 1

Season (Months)	Crop consumed every # days *e.g. 1 = Every day* *2= Every other day* *3.5 = Twice a week* *7= Once a week* *14= Once every two weeks* *21 = Once every three weeks* *30= Once a month, etc.*	How prepared [insert coded list of recipes]

6.4.2 Target crop 2

Season (Months)	Crop consumed every # days *e.g. 1 = Every day* *2= Every other day* *3.5 = Twice a week* *7= Once a week* *14= Once every two weeks* *21 = Once every three weeks* *30= Once a month, etc.*	How prepared [insert coded list of recipes]

6.4.3 Target crop 3

Season (Months)	Crop consumed every # days *e.g. 1 = Every day* *2= Every other day* *3.5 = Twice a week* *7= Once a week* *14= Once every two weeks* *21 = Once every three weeks* *30= Once a month, etc.*	How prepared [insert coded list of recipes]

SECTION 7: ADAPTIVE PRACTICES (BOTH MAN AND WOMAN TO ANSWER)

7.1 Information about climate change

		Man response	Woman response
7.1.1	Have you received any information regarding changing patterns in the weather (climate change)? *1 = Yes* *2 = No* *3 = I don't know*		
7.1.2	Where do you get the information? [Insert list of information sources]		

7.2 Information about adaptive farming practices for climate change

		Man response	Woman response
7.2.1	Have you received any information regarding how to adapt your farming practices to changes in the weather? *1 = Yes* *2 = No* *3 = I don't know*		
7.2.2	Where do you get the information? [Insert list of information sources]		

7.3 Information about the role of traditional crops in climate change adaptation

		Man response	Woman response
7.3.1	Have you received any information regarding the role of traditional crops or varieities, including [the target crops] but also old varieties of [staple crops] in climate change adaptation? *1 = Yes* *2 = No* *3 = I don't know*		
7.3.2	Where do you get the information? [Insert list of information sources]		

7.4 Have you received seed from the following sources in the past 3 years (read options):

	Man response	Woman response
Own stock		
Other farmer in the community – related		
Other farmer in the community – not related		
Community Seed Bank		
Market place		
Farmer in another community - related		
Farmer in another community – not related		
Relief agency		

Government agency		
Private seed company		
[Insert country-specific list]		
Other (specify)		

7.5 Have you shared seed with the following in the past 3 years (read options):

	Man response	Woman response
Other farmer in the community – related		
Other farmer in the community – not related		
Farmer in another community - related		
Farmer in another community – not related		
Community Seed Bank		
Other (specify)		

7.6 What changes have you made in the way you manage your land crops and farm animals in the last 3 years?

7.6.1 Have you made any changes in the crop species on your farm in the last three years? Specifically have you (read options):

	Crop Code
Introduced new crop species	
Testing a new crop species you are still unsure about	
Stopped growing a crop entirely	
Stopped growing a crop in one season	
Expanded area to a crop	
Reduced area to a crop	

7.6.2 Have you made changes in the crop varieties grown on your farm in the last 3 years, specifically have you (read options)?

		Crop Code
Stopped using a variety		
Introduced a new variety of crop, if yes what were the novel features of the crop introduced (don't read list, check features mentioned):		
	Higher yielding	
	Better quality	
	Pre-treated improved seed	
	Shorter cycle	
	Longer cycle	
	Drought tolerant	
	Flood tolerant	
	Salinity tolerant	
	Toxicity tolerant	
	Disease resistant	
	Pest resistant	
	Other (indicate)	

7.6.3 In the last 3 years, have you made changes in the timing of your farming operations? What were the changes? (do not read options)?

	Crop Code
Earlier land preparation	
Earlier planting	
Later planting	
Other	

7.6.4 In the last 3 years have you made changes in your cropping practices or management of land, soil, or water? What were the changes (don't read options)?

	Crop Code
Introduced intercropping	
Introduced crop cover	
Introduced mulching	
Introduced rotations	
Introduced hedges	
Introduced/built ridges or bunds	
Introduced terraces	
Introduced stone terraces	
Introduced contour ploughing	
Introduced improved irrigation efficiency	
Introduced improved drainage	
Introduced micro-catchments	
Tidal water control management	
Started irrigating	
Stopped irrigating	

7.6.5 In the last 3 years, have you made changes in use of inputs, mechanization or pest management? What were the changes (don't read options)?

	Crop Code
Mechanized farming	
Started using or using more mineral chemical fertilizers	
Started using manure/compost	
Stopped using manure/compost	
Started using or using more pesticides/herbicides	
Started using integrated pest management	
Started using integrated crop management	

7.6.6 Have you made changes in livestock management in the last 3 years? What were the changes (don't read options)?

	Crop Code
New farm animal or fish types introduced	
New farm animals or fish types being tested	
Stopped keeping one or more types of farm animals or fish	
New breed introduced	
Reduction in herd size	
Increase in herd size	
Change in herd composition	
Stall keeping introduced	
Fencing introduced	
Cut and carry introduced	
Growing fodder crops	
Improved pastures	
Fodder storage (e.g. hay, silage)	
Other	

Annex V

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Annex VII

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