

## 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<sup>1\*</sup>, Abigail Fallot<sup>2</sup>, Marie Turmel<sup>1</sup>**

<sup>1</sup>Bioversity International (Costa Rica)

<sup>2</sup>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