WORKSHOP REPORT

LEARNING EVENT: Adaptation to Climate Change in Small-Scale Agriculture – Selection of Adapted Seeds and Varieties

9 September 2015, 9.30 – 16.40 at HEKS/EPER, Seminarstrasse 28, 8042 Zürich

Frame: Plant genetic resources are essential for sustainable agriculture and food production. They provide the basis for farmers and breeders to develop new plant varieties necessary to cope with unpredictable human needs, growing food demands and changing environmental conditions. Therefore, they are also an important strategy to adapt to new climatic conditions. Moreover, sustainable use of agricultural biodiversity can improve people's well-being and food and nutrition security. This workshop aims to share knowledge on how agricultural biodiversity can serve as an adaptation strategy, identify gaps, synthesize lessons learned and propose future strategies. Issues range from conservation biology of genetic resources through social sciences to policy and legal aspects.
The Learning Event is organized by HEKS/EPER with expert inputs from Monika Messmer (FiBL) and Case Study presentations from Caritas Switzerland, Helvetas Swiss Intercooperation and HEKS/EPER.

Programme Outline:

Time	Content	Methodology	Responsible
9.30	Welcoming: short introduction of the program and objectives		Judith Macchi (HEKS)
9.40	Introduction Round	*Experience and Expectations of the participants*	Judith Macchi (HEKS)
10.00	Presentation of Case Studies: - Diversification in Afghanistan (Helvetas Swiss Intercooperation) - Seed Banks in Central America (Caritas)	*Presentation* *Q&A*	Tina Rohner (HSI) Monique Frey (CaCH)
11.00	Coffee Break		
11.30	Presentation of Case Studies continued - Testing of adapted varieties in Niger (HEKS/EPER)		Judith Macchi (HEKS)
12.00	Key Theoretical Input: Plant Genetic Resource Management as an adaptation strategy	*Presentation* *Q&A*	Monika Messmer (FiBL)
13.00	Lunch Break		
14.00	Identification of Bottlenecks and Lessons Learnt to be further discussed	*Plenary Discussion*	Monika Messmer (FiBL)
14.30	World Café on identified Bottlenecks and Lessons Learnt	*World Cafe*	All Participants
	Coffee Break (individual during World Café)		
15.30	Presentation of World Café Results	*Presentations*	Table hosts
16.00	Way forward?	*Plenary Discussion*	Monika Messmer (FiBL)
16.30	Wrap up and closing (incl. Evaluation)		Judith Macchi (HEKS)

Participants

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Facilitators

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Plant Genetic Resources Management as a Strategy for Climate Change Adaptation

Effects of climate change on plant genetic resources

According to the Intergovernmental Panel on Climate Change (IPCC, 2014) there is a medium level of confidence that if temperatures rise by 2 °C or more above late twentieth century levels, without adaptation, production of the world's major staple crops (wheat, rice and maize) will be negatively affected in both tropical and temperate regions, although some locations may benefit. There is evidence that climate change has already negatively affected wheat and maize yields in many regions. Climate change will shift the distribution of land suitable for cultivating many crops. It is predicted that in sub-Saharan Africa, the Caribbean, India and northern Australia, the amount of land suitable for crop production will decline, while there will be gains in the northern United States of America, Canada and most of Europe.

It is predicted that there will be substantial falls in the yields of key crops in a number of food insecure regions, with serious implications for food security. The areas in question include Southern Africa, where land suitable for growing maize – a major staple crop in the region – is predicted to disappear almost completely by 2050, and South Asia, where the productivity of groundnut, millet and rapeseed is predicted to decline. For thousands of years, farmers have adapted their crops and their cropping systems as environmental conditions have changed. However, the speed and complexity of human-induced climate change are likely to present unprecedented challenges. New crop varieties will be needed, and in some cases farmers will have to shift to growing new crop species. The areas that are currently the most food-insecure will be worst affected and will have the greatest need for new crop varieties that are tolerant of drought, high temperatures, flooding, salinity and other environmental extremes. In addition to its impacts on domesticated crops, climate change will affect the ability of many wild relatives of crop species to survive in their current locations.

Moreover, catastrophic extreme weather events such as floods and droughts, which in many parts of the world are expected to become more frequent because of climate change, can pose an immediate threat to the survival of breeds and varieties that are raised only in specific small geographical areas. Plant diseases and pests are heavily influenced by climate and many of the ecosystem services upon which crop production depends will also be affected by climate change, including pollination, biological control and nutrient cycling.

Roles of plant genetic resources in coping with climate change

Plant genetic resources will be vital in adapting crop production to the effects of climate change. Diverse species, varieties and cultivation practices allow crops to be grown across a wide range of environments. Over 10 000 years, diverse genetic resources have enabled farmers to adapt to gradual climatic changes and to other shifting demands and pressures. Traditional crop varieties are well adapted to current conditions in their local production environments. The challenge for the future is to maintain a good match between crops and production environments as the effects of climate change increase. Crop wild relatives will be a key resource in meeting this challenge, as their genes can promote resistance to many of the environmental stressors associated with climate change.

Crop production in all countries relies on genetic resources sourced from all over the world. This interdependency is likely to increase as a result of climate change. Better-adapted crops will need to be brought in from elsewhere. International movement of germplasm will be essential in adapting agriculture to these novel climates. On a more local scale, seed systems will be essential to the process of adaptation, providing farmers with the opportunity to exchange landraces that have a diverse range of characteristics and are developing under novel selection pressures associated with climate change. However, there are limits to the extent to which local seed systems can adapt. As changes accelerate, seed systems will need to stretch over wider and wider areas. There is a need for policies that support seed systems and seek ways of enabling long-distance seed exchange via seed fairs and other means. In addition to informal mechanisms, local seed systems could also include more formal community-based seed enterprises that facilitate smallholder farmers' access to improved and adapted cultivars and other inputs that may be required for adaptation to climate change.

Climate change is not only expected to bring directional changes (e.g. higher average temperatures at a given location in the future), but also to increase the variability of the climate. Farmers usually address directional changes either by drawing on adapted material from among the genetic resources already present locally or by seeking material from neighbouring areas. However, as the climate becomes more variable, and extreme events become more extreme, new strategies may be needed. Greater intravarietal diversity may be needed in order to cope with unpredictable extreme climate events. Traits that contribute to phenotypic plasticity (the capacity to cope with a wide range of environmental conditions) may become increasingly important.

Climate change may increase the importance of plant species that have previously been underutilized or considered to be of minor importance. Breeding programmes will need to develop strategies for specific crops and regions, targeting the development of varieties that will be relevant to the challenges facing farmers 10 to 15 years into the future. Breeders will need to identify genetic resources with traits that can be used to develop varieties that will be able to thrive in extreme climatic conditions. There is a need to develop screening methods that can be used to identify the physiological basis of tolerance to such stresses. In recent years, research of this kind has progressed for tolerance of drought, salinity, submergence and heat stress in major food crops.

On-farm conservation of plant genetic resources will become increasingly important in the context of climate change. Conserving genetic resources in complex, diverse, risk-prone environments builds on natural and farmer selection, and helps to maintain a variety of genetic options that farmers can use as climates change and become more variable. Traditionally, conservation of plant genetic resources has focused mainly on ex situ conservation. However, it is now being recognized that a complementary approach, involving both in situ an ex situ methods, has advantages.

Disaster management and seed-relief measures also need to adapt in response to climate change. Current approaches to seed relief do not take into account the significance of diversity or the need for seed that is well-adapted to the conditions at specific sites. Under normal circumstances, informal farmer seed systems maintain and promote local diversity. However, when major disasters occur, these seed systems can break down. They are often replaced by international seed distribution programmes that usually provide commercial varieties from outside the local area. Climate change is predicted to increase the occurrence of extreme events such as floods, droughts and hurricanes, leading to greater reliance on seed relief. More-effective seed distribution networks that supply well-adapted seed need to be developed, both for post-disaster situations and to support longer-term adaptation of agricultural systems to climate change. Strategically located small enterprises dealing in local and improved adapted varieties could make it easier to obtain suitable material, particularly during emergencies.

In many countries, access to genetic resources is still limited by an overly complex policy environment. The International Treaty on Plant Genetic Resources for Food and Agriculture provides a multilateral legal framework that facilitates exchange of plant genetic resources. Its Multilateral System of Access and Benefit-sharing covers currently 35 of the approximately 150 food crops traded on the world market. Thousands of other crop or plant species are consumed and traded locally but do not enter the world trading system and much of the genetic diversity for these crops is not stored in genebanks. As climate change proceeds, it is likely that a broader range of species will need to be exchanged between countries and regions. It will be important to ensure that these genetic resources can be accessed fairly and equitably by those who need them.

Extracts from FAO 2015: Plant genetic resources for food and agriculture and climate change. Coping with climate change – the roles of genetic resources for food and agriculture. Rome. http://www.fao.org/3/a-i3866e.pdf

Presentations (refer to attachments):

1_Adaptation to Climate Change in Small-scale agriculture – Adapted Seeds and Varieties _Introduction
2_ Plant Genetic Resource Management as an adaptation strategy
3_Case Study Helvetas_ Afghanistan: DRR and Climate Change Adaptation for Resilient Livelihoods
4_Case Study Caritas_ Nicaragua: Seed Banks in Chinandega
5_Case Study HEKS_ Niger: Testing of Adapted Varieties in Mayahi Department, Niger

Results Group Work:

Plenary discussion on Key Success Factors and Main Challenges

Key success factors

- Participation of farmers
- Exchange of farmers, demonstrations, field days
- Build capacity with government authorities
- Ownership of farmers
- Incentive for farmers must be given
- Local seed banks

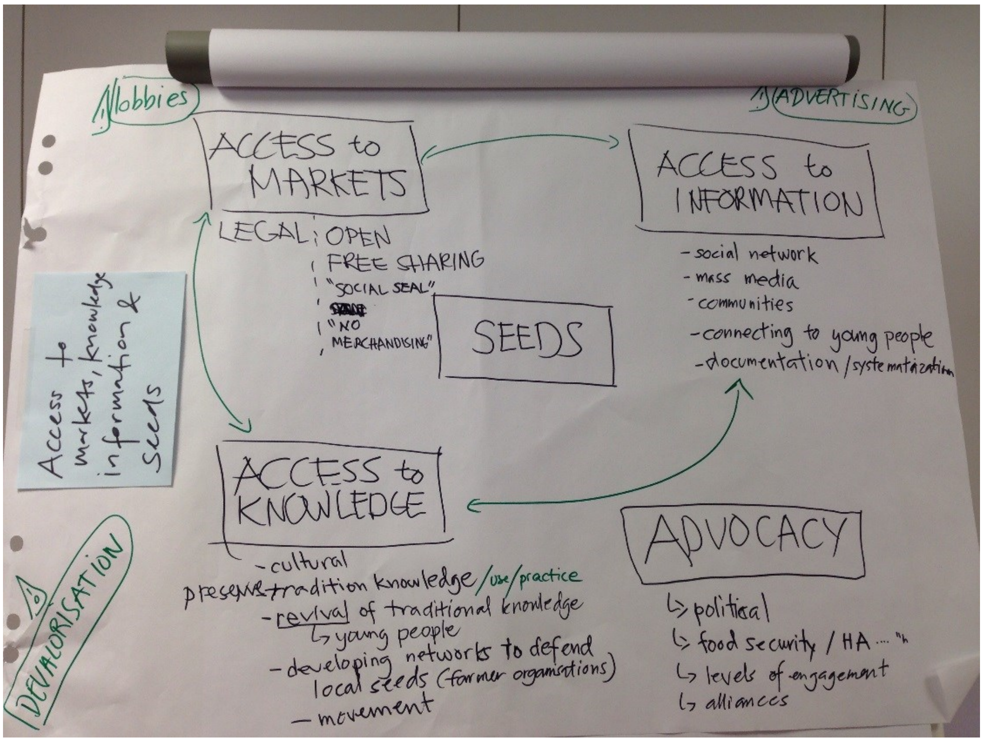
- NGOs join hands to support agriculture, needs issues
- Interdisciplinary, holistic approach
- Awareness of all stakeholders incl. private sector
- Link research – private sector
- Make research programmes more attractive
- Engage women
- Integration of seeds, traditional breeds, biodiversity
- New technologies → yield increase
- NGO, politic, public discussion on seed
- Access to seeds, markets, knowledge and information

Main Challenges

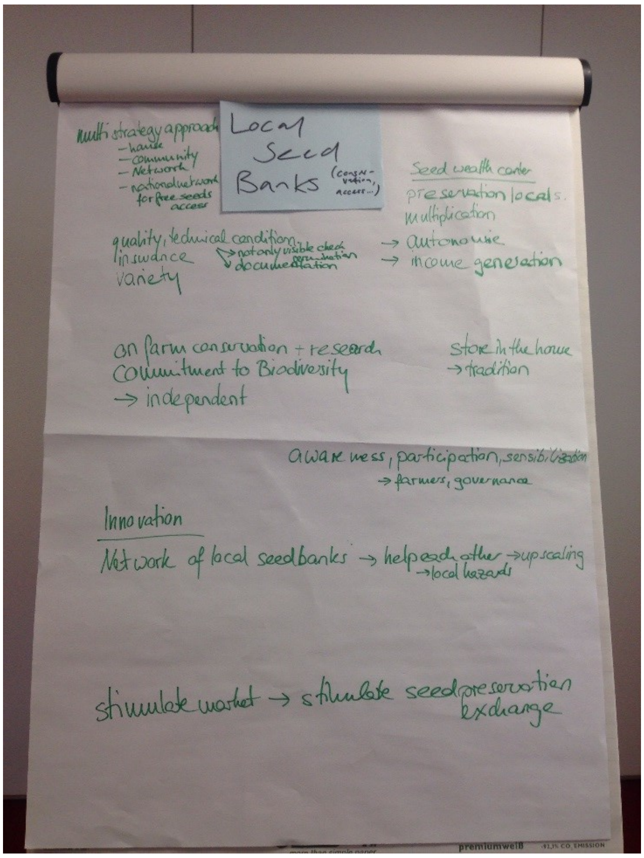
- Implementation in least developed countries, in crises
- Legal framework
- Less land for more production
- Identification of traditional seeds (F1 hybrid, inbred lines)
- Awareness rising that F1 is not automatically superior
- Multi track framework (national, multinational level)
- Pressure from corporate seed companies
- Risk of PPB
- Loss of knowledge on seed savings
- Lack of public funding
- Motivation of young people for agriculture
- Local solutions for adapted varieties → very knowledge intensive
- Lack of simplified/adjusted research methodologies
- Gap between research and implementation in farmer field; link farmers, advisors and research
- Conservation of seeds without market value

Group discussions on the following four main bottlenecks identified:

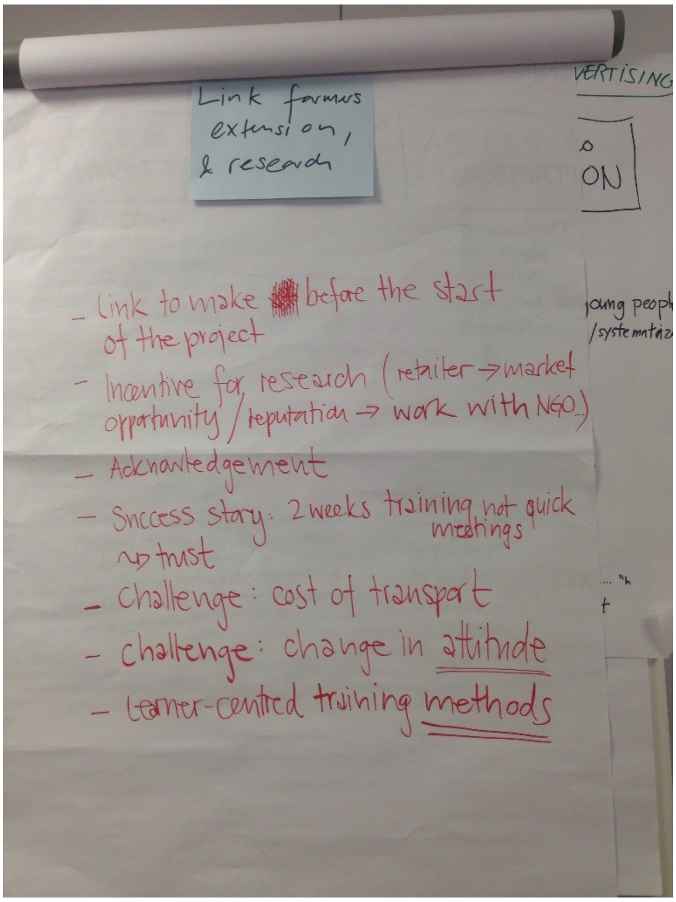
Access to seeds, markets, knowledge and information



Local Seed Banks (conservation, access …)



Link farmers, extension and research



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