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Compilation of Submissions on Farmers' Rights for the Sixth Session
Addendum 1

Note by the Secretary

1. This paper is submitted to the 6th Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA) as an addendum to the information document IT/GB-6/15/Inf.5. It is based on the results of the International Fund for Agricultural Development (IFAD) and Oxfam-funded programme: *Putting Lessons into Practice: Scaling up People's Biodiversity Management for Food Security*, which is part of the global programme: *Sowing Diversity=Harvesting Security*. Lessons and policy recommendations relate to Article 6: "Sustainable Use of Plant Genetic Resources" and Article 9: "Farmers' Rights" of the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA).
2. It is a joint submission by:
 - Oxfam, the Netherlands
 - *Asociación para la Naturaleza y el Desarrollo Sostenible (Asociación ANDES)*, Peru
 - Community Technology Development Trust (CTDT), Zimbabwe
 - Southeast Asia Regional Initiatives for Community Empowerment (SEARICE), Vietnam
 - Centre for Genetic Resources the Netherlands, Wageningen University and Research Centre (CGN-WUR)
3. The paper has been inserted in the form and language in which it was received. The summary translations in French and in Spanish are available in the Treaty web page: <http://www.planttreaty.org/content/farmers-rights-submissions> .

From Lessons to Practice and Impact: Scaling up Pathways in Peoples' Biodiversity Management

This paper is submitted to the 6th Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA). It is a joint submission by:

- Oxfam, the Netherlands
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It is based on the results of the International Fund for Agricultural Development (IFAD) and Oxfam-funded programme: Putting Lessons into Practice: Scaling up People's Biodiversity Management for Food Security, which is part of the global programme: Sowing Diversity=Harvesting Security. Lessons and policy recommendations relate to Article 6: "Sustainable Use of Plant Genetic Resources" and Article 9: "Farmers' Rights" of the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA). The policy recommendations may further guide the selection process of the Treaty's Benefit Sharing Fund.

Background

Scaling up pathways describe how programme outputs are used within and outside programme coverage in such a way that the impact on social, environmental or economic conditions is enhanced. Such pathways describe how impact is spreading. This paper reviews the results from the programme, "Putting Lessons into Practice: Scaling up People's Biodiversity Management for Food Security" (1 October 2012 – 30 September 2015), implemented in Peru, Vietnam, and Zimbabwe. Beneficiaries totalled about 81,000 households, including 60% women. Ninety-one season-long Farmer Field Schools (FFS) were established in Peru, Vietnam and Zimbabwe. These FFS involved at least 2000 women farmer participants from the three countries.

The objectives of the programme are to:

- Develop locally appropriate adaptation strategies for food security.
- Empower indigenous peoples and smallholder farmers to influence policies towards realising farmers' rights and the right to food, and
- Strengthen their adaptive capacities in the conservation, access and sustainable use of plant genetic resources.

This programme has been geared towards empowering indigenous peoples and smallholder farmers, to uphold, strengthen, and mainstream the rights and technical capacities to manage their biodiversity for food and nutrition security in the context of climate change adaptation. It is relevant to IFAD's and Oxfam's shared priority theme of food security under climate change conditions, with a focus on environmental sustainability, social equity, and the roles of women. The programme also addresses the interconnectedness of food systems at global and local levels, as well as the active participation of the poor in achieving inclusive policy governance, and in exercising their Farmers' Rights and right to food. It focuses on the knowledge and experiences of indigenous peoples and smallholder farmers being decisive elements in the 'global responses' to climate change; their knowledge of ecosystems and their resilience are key to identifying the challenges posed by climate change, and to building appropriate responses.

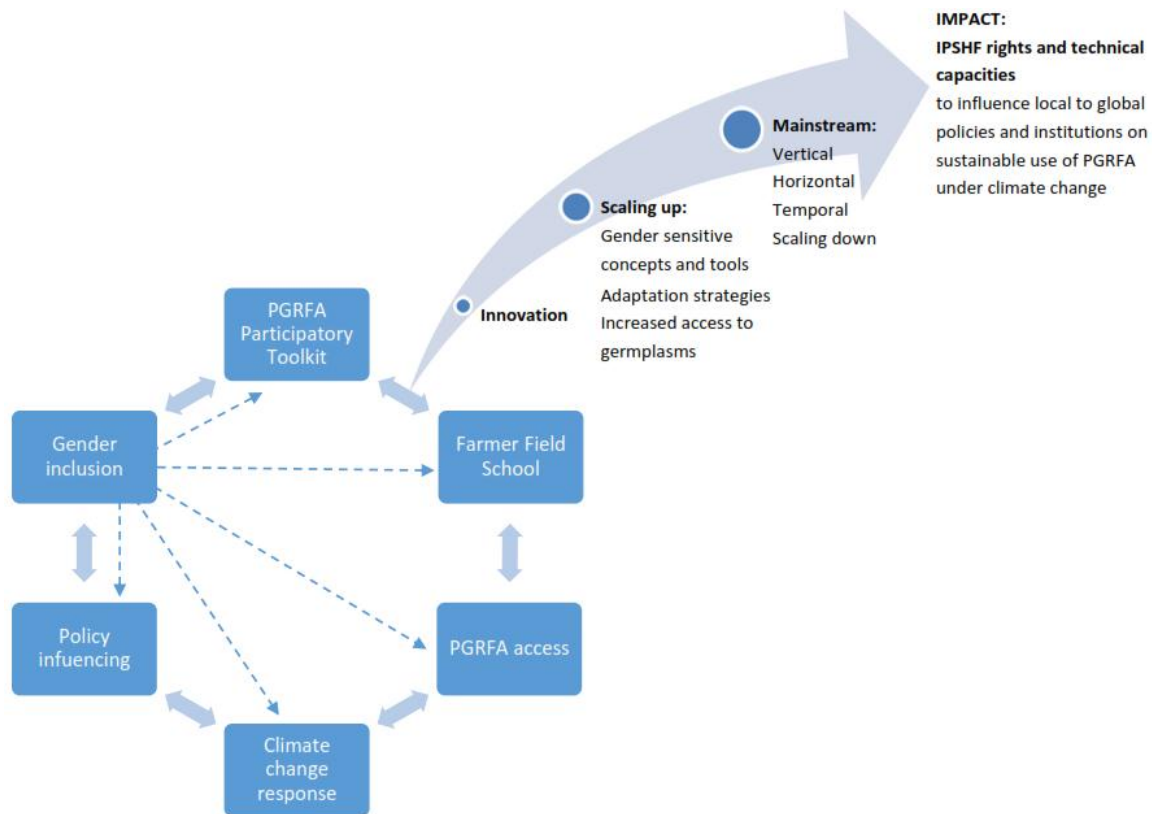


Figure 1 Scaling up pathways

The paper relates the programme results to the programme assumptions as reflected, in particular, in the early Technical Report “Conceptual and Methodological Development for a Baseline Survey”¹, and the end results of the three-year programme phase. It analyses six main areas of impact, stemming from the programme’s results; these are described as follows:

1. **PGRFA participatory toolkit scale up pathway.** The development of an elaborated participatory toolkit is essential for establishing a baseline to guide programme planning. Without a properly established baseline, it will not be possible to measure progress or to attribute change to programme interventions.
2. **FFS scale up pathway.** Development of a self-explanatory Farmer Field School curriculum that is user friendly and can be adapted by a wide range of stakeholders within and outside the programme scope. Given the limited availability of professional experts and funding, the autonomous organization of Farmer Field Schools is a vital community formation. FFS provides the means to move from an anecdotal to a high-impact phase in terms of programme results, sustainability, and outreach.
3. **PGRFA access pathway.** Facilitating farmers’ access to plant genetic resources for food and agriculture is an important right. Often the major limitation to the proper functioning of farmer-managed seed systems is the lack of access to a portfolio of diverse crops and varieties. Without access to diversity, investments in local plant genetic resources management are meaningless. Properly addressing this pathway may also benefit from a framework that integrates multiple land use options such as in a landscape approach in bio-cultural territories.
4. **Policy-influencing scale up pathway.** The strengthening of farmer-managed seed systems requires favourable policies to be sustainable. Collective policy analysis and advocacy are needed to promote and mainstream the local and global importance of farmer-managed seed systems.
5. **Climate change response pathway.** Today’s food production takes place against the backdrop of climate change. The scale up pathways above cannot be separated from the effects of climate change and the responses of indigenous peoples and small-holder farmers to them.

¹ Oxfam Novib (2013)

6. **Gender inclusion pathway.** Men and women play different roles in food production and seed management. In order to effectively improve food security, seed security, and farmers' livelihoods, it is essential to recognise these different roles and to discuss optimal, fair, and equitable division of labour and decision making.

1. PGRFA participatory toolkit scale up pathway

In 2012 and 2013 a baseline survey² was conducted in the programme countries Vietnam, Peru, and Zimbabwe to understand and build upon local peoples' perceptions, knowledge and needs, and to identify and strengthen their coping strategies with regard to climate change. To conduct the baseline survey, a baseline tool was developed within a formulated research framework. The baseline tool incorporated a questionnaire that focussed on a broad range of demographic, biophysical, climatic, agricultural, economic, institutional, and gender aspects, including issues regarding agro-biodiversity, farming systems, adaptation strategies and policies. The following chapters were distinguished:

- Demographic Information
- Farming Systems and Indigenous Knowledge
- Climate Change and Indigenous Knowledge
- Seed Security
- Food Security
- Institutional Policies

Information was obtained from different sources, such as participatory rural appraisals, including farmer interviews and focus group discussions; also from public sources of statistical data. The PGRFA participatory toolkit was developed and used for farmer interviews, focus group discussions, and participatory rural appraisals. The toolkit contained a series of gender sensitive tools analysing:

- a) Farmers' crop diversity at the crop species level through crop and gender calendars, including a four-square analysis or diversity wheel that may focus on both major and home garden crops, all with a timeline analysis.³
- b) Diversity in crop varieties: abundance, changes in numbers over time, positively and negatively regarded traits, and reasons for adoption or disregard of new varieties, all with a time line analysis.
- c) Farmers' strategies to deal with changes in weather patterns, such as later onset and/or shorter duration of rainy seasons, increasing drought during the rainy seasons, increasing temperatures, and more irregular weather patterns, including changes in the choice of crops and varieties.
- d) Farmers' seed systems, including crop types and varieties (self and cross fertilisers, open pollinating varieties and hybrids, sexually or clonally propagated crops); seed sources (farm-saved seeds, local exchanges, commercial markets, public sources); farmer's experiences with, and attitudes towards, these different seed sources.
- e) Farmers' diversity management: capacity to maintain their preferred diversity, and a comparison between their diversity management and that carried out by the formal sector.
- f) Livelihood strategies: understanding the relationships between on-farm and off-farm opportunities, age and gender roles, market crops and subsistence crops, and the developments in these relationships over recent decades.
- g) Land use options and practices in connection with the management options mentioned above.
- h) The asset base of the farmer: resource mapping and soil mapping; his/her access to labour and capital; availability of supportive institutions (research, extension); access to water, fertilisers, pest control; role/share of cropping versus livestock raising.

² ibid

³ Analyses of neglected and underutilised crops (NUS) have been conducted only in the SD=HS programme phase.

- i) Produce for market, including marketing channels and value chains (distance, type of products) and the relative share of market income in the family's livelihood.
- j) Farmers' adaptation strategies towards changes in food demand, consumer prices, and availability of seeds on the market.

In that context, the Multiple Evidence Based (MEB) approach, developed by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)⁴ was tested. The tools above may slightly overlap, but their combined use increases accuracy and detail in the output of the baseline. Information resulting from the use of the toolkit is best combined and compared with data from public sources, in particular demographic data, meteorological records, and data on crop production.

Results obtained pointing to scale up pathways. Proper use of the PGRFA participatory toolkit increases farmers' awareness and understanding of their livelihoods, in particular their seed and food security, past and present changes, as well as future challenges to, and opportunities for, their livelihoods; this is mainly as a result of globalization, changes in socio-economic and market conditions, and climate change. Such awareness and understanding increases farmers' self-confidence and preparedness to cope with challenges.

The baseline survey results in Zimbabwe showed that farmers grow five to six different crops and three to four different varieties per crop. They also highlighted that some of these varieties were local whilst others are modern. In the programme sites in Vietnam, except for rice with niche uses like sticky varieties for cakes and village ceremonies, traditional varieties of rice had been completely lost from the farming systems. Such results provide an important basis for later decision-making in Farmer Field Schools.

In Peru, the use of an indigenous landscape approach (bio-cultural territory) is enhancing a key objective of on-farm conservation: maintaining crop evolution in farmers' fields, farms and landscapes. The approach is enhancing farmers' efforts to adapt landraces to their changing field conditions and to socio-cultural preferences.

Some findings from the programme's baseline surveys

- Farmers are aware that climate change is taking place. Responses depend on how farming systems and crop performance are affected.
- In times of increasingly irregular weather patterns, weather forecasts may assist farmers in better planning their crop production. In addition to local predictions, which are steeped in tradition, meteorological forecasts play an increasing role but do not yet reach all farmers.
- Diversification in crops and varieties forms a farmers' response to climate change to different extents. This is considered essential as a risk aversion measure against climate change.
- The practice of on-farm seed-saving is essential as affordability of, and accessibility to, seeds offered in the market are limited. However, farm-saved seeds may be of poor quality and lack adequate diversity.
- The baseline tool has been improved, in particular in terms of analysing crop diversity, seed security, climate change perceptions, and adaptation strategies.

Source: ONL, ANDES, CTDI, SEARICE, CGN-WUR. 2013.

Results from the baseline survey regarding farmers' perceptions of climate change and weather variability in the last few decades point towards a later onset of the rainy season and other consistent changes in weather patterns, in all three programme countries (Peru, Vietnam, and Zimbabwe). These changes have been so pronounced that in response, a substantial proportion of the farmers have shifted to other varieties (often shorter duration or more drought tolerant) or to more drought tolerant crops. In Peru, farmers responded by changing their land use, growing preferred varieties at higher altitudes. They are also enriching their traditional seed systems with repatriated seeds from the International Potato Centre (CIP) that farmers experiment and incorporate- keeping some and discarding others. The results of the baseline survey also showed that some coping strategies developed in the programme context may already have been spontaneously adopted before the start of the programme by a limited number of (model) farmers. A comparison of farmers' perceptions with meteorological data shows convergence as well as

⁴ <http://www.ipbes.net>

differences and it is important not to disregard but to understand these differences. Such a difference can be observed in Zimbabwe where the baseline survey suggests there is not always agreement between the forecasts of the Zimbabwe Meteorological Services Department (ZMSD) and farmers' perceptions. For instance, farmers observed a marked decrease in rainfall, but the weather data indicated that average rainfall remained the same. This might be caused by the severity of the impact of the changes. For example, if average rainfall remains at the same level but falls in heavier spells, resulting in more water run-off, which farmers cannot use, this may lead farmers to conclude there is less rainfall overall.

Changes in the importance of crops to farmers in north Vietnam appear closely related to integration in the national economy and to market access. Off-farm family income has become very substantial and higher than income from farming, in two provinces. As a result, labour availability for farming is reduced and in turn influenced the preferred traits of varieties. Vegetable cash crops provide greater income compared to rice and other crops and therefore take up a greater proportion of labour capacity available to farmers' families. Infrastructure, especially irrigation facilities, allows two rice crops per year, requiring the use of short-duration and non-photosensitive varieties. Climate change impact, in particular drought and unpredictable weather patterns, also increases the preference for short-term varieties.

Over time, the increased use of hybrid maize in Zimbabwe, despite regular crop failures due to drought has replaced the cultivation of millets and reduced the importance of other crops. Government subsidises hybrid maize seeds and fertilisers. Forty percent of hybrid maize seed sales are to government. The price of maize grain is set by the National Grains Board at 400 USD per ton, far higher than for the other cereals grown by farmers. Hence, for market reasons farmers grow maize; for food security, they continue to plant millets and sorghum as well as a range of legume crops.

Results from the baseline survey also showed an increased occurrence of pest and disease infestations affecting crop yields and seed quality; these may or may not be related to climate change. Such results are vital inputs to discussions and decision-making when setting selection and breeding goals in farmer field schools.

Results showed significant differences in the use of farm-saved seeds across countries and between crops; but also that their use still prevails. Better availability and affordability as well as adapted traits (probably in local varieties) are the major drivers behind this. Project results show that farmers and communities make different and independent decisions in multiple locations, environments, and situations. The results of the PGRFA also show the weaknesses of local seed systems, in particular lack of access to sufficient diversity and the poor quality of many of the locally available seeds.

The baseline tool has been improved by:

- The introduction of a timeline in crop diversity and a better categorization of crops, leading to a better understanding of why crops and varieties appear and disappear within agro-ecosystems and in terms of socio-economic conditions.
- Better timeline analysis of seed sources and the practice of on-farm seed storage.
- Better documentation and understanding of farmers' perceptions of climate change.
- More support for the development of climate change adaptation strategies, including landscape approaches that take a strong bio-cultural and socio-economic perspective.

The toolkit should provide insight into changes in cropping patterns and farming practices; the baseline tool, as a living document, should support such processes. Changes in cropping patterns and farming practices may result in the conscious exclusion of some crops and varieties from the farming system, but may also follow from the unwanted loss of crops and varieties due to persistent weather conditions over subsequent seasons.

The programme also allowed a comparison of experiences and perceptions of indigenous peoples and smallholder farmers from the three countries. Whereas similarities between the countries (such as late onset of rainy seasons and increasing droughts) may make the results more convincing, differences have been equally interesting since they challenge programme partner organizations to understand these differences and explain them from the underlying geographic,

climatic, socio-economic and cultural aspects. These differences also highlight that successful actions need to be based on local information.

Conclusions on PGRFA participatory toolkit scale up pathway

A proper baseline survey is indispensable for achieving and maintaining sustainable changes in farmers' seed security, food security, and livelihoods. A participatory toolkit that is gender sensitive stands at the heart of such a baseline survey (see pathway 6).

The toolkit for PGRFA has been substantially elaborated, expanded, tested and adapted. The new version developed during this programme has been used in establishing baselines in the context of the further scaled up programme, Sowing Diversity = Harvesting Security (SD=HS)⁵. It will be important to evaluate with farmers whether the PGRFA participatory toolkit has also been useful to them. Publication and wide distribution of the improved and expanded PGRFA toolkit and of the results obtained from using the toolkit in the programme's context will allow other stakeholders to establish a similarly well-founded baseline for the purpose of participatory programme planning for joint ownership and accountability, or in the framework of establishing programmes for extension services and public breeding institutions. A website offering the PGRFA toolkit for free and showcasing results obtained is currently in planning. Options for additional modern communication tools, such as mobile phones and apps, are also being explored.

2. Farmer Field School scale up pathway

Following the baseline surveys, 91 season-long farmer field schools (FFS) were established by the programme partners in the three years of the programme implementation. All FFS focussed on improving crop production by addressing the needs for diversity of crops and varieties at the community level. Farmer field schools should have three major but disparate outcomes. First, participatory learning should convince participants that they can collectively tackle the challenges associated with suboptimal yields, pest and disease infestations, climate change adaptations, and lack of access to appropriate diversity. Second, FFS participants should acquire knowledge and skills on how to do this, whether through evaluation of new crops and new varieties accessed from outside the community, or through selection and breeding for preferred traits using the available varieties. For farmer field schools to become self-replicating, training of trainers (ToT) and the development of a basic curriculum are essential. Third, collective reflections should lead to policy analysis and engagement, in support of their seed and farming systems. These three outcomes contribute to the empowerment of farmers by strengthening their rights and technical capacities. Technical empowerment includes demystifying plant breeding and equipping farmers to continuously adapt their PGR management in response to constantly changing environmental and market conditions. Political empowerment includes enabling farmers to demand appropriate policies, services and resources. In an environment that is constantly changing, and with varieties continuously evolving, the only constant factor is the farmers' agency to continuously learn and adapt. An additional outcome of FFS may be strengthening the landscape perspective, underlining the intrinsic links between food production and the environment, and taking into account evolutionary processes, resulting in new diversity.

While crop choice and improvement goals are potential components of all FFS, the crop and varietal selection may differ from region to region and from community to community. In response to climate change in Zimbabwe, FFS focussed on the (re)introduction of additional crops to the farming system, in particular staples such as cereals, pulses, and root and tuber crops that traditionally played a role in the farming system. Such an increase in crop diversity in a farming system aims to make the system more resilient to adverse weather conditions. In Peru, taking a slightly different angle, efforts focussed on the proper management (conservation and use) of the potato varieties still available or repatriated in the communities, but threatened as a result of climate change. This approach places emphasis on maintaining genetic diversity in the framework of processes that support ongoing on-farm conservation. At the same time, additional commonalities among the three countries appeared to be important. As a rule of thumb, it

⁵ In addition to Vietnam, Peru and Zimbabwe, SD=HS has been further expanded in Myanmar, Lao PDR, India, Mali and Senegal. Thematic expansion includes: nutrition through biodiverse diets and improved use of neglected and underutilised species, as well as pilots for Farmers' seed enterprises.

appeared important to select a staple crop in the case of participatory plant variety selection or participatory plant breeding, whether rice in South-East Asia or maize in Eastern and Southern Africa. There is relatively more diversity of staple crops available in the communities and if needed, diversity can be accessed outside. In addition, it is often more feasible with staple crops to engage public breeding institutes, provide access to PGRFA, perform pre-breeding, and provide technical support. From the perspective of an appropriate diet, additional focus on vegetable crops or other nutrient-rich crops, is often considered important. An important gender dimension plays out in such options and choices. Men often play a more dominant role in market crops, whereas women are often responsible for home garden crops, including the so-called neglected and underutilized species.

In preparing for and undertaking FFS, it is important to notice the different roles of different members in the community. Not only gender roles stand out; age, wealth and experience also play a role. For older farmers it is easier to recollect traditional farming practices and crops from the past; relatively wealthier farmers can better afford to “experiment” with diversity; and some farmers (both men and women) have “green thumbs” and enjoy working with their plants. Other members in the community may be followers, or even prefer to sit on the fence, and wait to see the results of a season-long FFS. As FFS progressed, many participants became more actively engaged in joint experimentation and analysis.

Results obtained pointing to the FFS scale up pathways. In Vietnam, the FFS paid specific attention to a recent approach in rice cultivation called System of Rice Intensification (SRI). An important innovation of the programme is the FFS approach to SRI. Rather than mechanically following SRI techniques, the FFS approach enabled the farmers to adapt SRI to their specific agro-ecologies. Also in Vietnam, two season-long, specialised Training of Trainers sessions were organised. Training in Zimbabwe also involved seed production of so-called small grains. Over 750 farmers were trained in seed production and as a result, 17 tonnes of pearl millet seed and seven tonnes of sorghum seed were produced and sold locally.

Complementing FFS, seed and food fairs and farmer field days formed a major way to introduce and spread diversity amongst a wide range of communities. In Peru, gastronomy clubs were organised prior to the programme. The combination of seed fairs with food fairs proved important since it is not only the loss of diversity in PGRFA that need to be addressed. The loss of knowledge in the food preparations and the nutritional value of bio-diverse diets need to be addressed too. Furthermore, in Peru barter markets are strengthened enhancing the exchange of both crop products and seeds between poorer community members occupying different ecological zones. A draft toolkit with training materials on establishing bio-cultural sites has been developed and tested in Peru and has been proposed for adoption by an international network of indigenous peoples from mountain environments. Similarly, community seed banks proved to be an important facility in the short-term conservation of seed supplies of traditional varieties in both Zimbabwe and Peru.

In addition, the use of video cameras proved to be an important means to document and share observations made in the field in all communities. Women were particularly active in the use of videos. In Vietnam, a review of the FFS curriculum was undertaken to evaluate its gender sensitivity, whereas in Peru, a specific training module on gender analysis was developed. For SD=HS, this will be further adapted to develop gender focused FFS with particular attention to nutrition and the role of neglected and underutilised species in enhancing food security.

Some findings from the programme’s farmer field schools

The FFS form an empowering learning tool and offer an essential opportunity for interaction and collaboration between local communities and experts from the public sector (e.g. breeding institutions, gene banks, and universities). Leadership of the local technicians, forming the bridge between the programme staff and the local communities, and helping the programme staff to understand the community’s social networks appeared very important in Peru. The FFS also formed the basis for organising a successful protest against the claiming of plant breeders’ rights to native potatoes by the National Institute of Agricultural Innovation (Instituto Nacional de Innovación Agraria), INIA. In some programme sites in Vietnam, farmers seemed to have completely abandoned the practice of saving seeds on-farm because of poor seed quality, but the FFS succeeded in reintroducing the practice for valued traditional varieties. In Zimbabwe, the self-confidence of smallholder farmers increased when academics and researchers asked them for

their views and ideas during field days. The construction of facilities offering seed storage may play an important role in further scaling-up efforts.

Cooperation with public sector institutions has been very important. In Peru, the Potato Park is in close collaboration with the International Potato Center (CIP); this has resulted in the repatriation of a large number of lost or diseased traditional potato varieties. In addition, an agreement of collaboration was signed with the National Service of Hydrology and Meteorology (SENAMHI) to use meteorological data and to identify options for using traditional knowledge for the purpose of weather forecasting. The partners in Zimbabwe are collaborating with the University of Zimbabwe on the use of meteorological records as well as the regional breeding stations of the International Maize and Wheat Improvement Centre (CIMMYT) and the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) on the use of maize, sorghum and millet diversity. Furthermore, there was collaboration with the extension services department Agritex, the Zimbabwe Farmers Union, and the national gene bank. In the north Vietnam programme sites, the Food Crops Research Institute (FCRI) provided training and segregating F4 materials for further selection in the FFS fields. All partners collaborated intensively with the national extension services as a key partner in supporting local communities in their FFS operations. In terms of programme management, FFS enabled the partners to leverage the programme grant with substantial additional resources and services from local and national actors in the form of genetic resources, extension services, and training. This is illustrated in south Vietnam, where provincial governments funded more FFS in order to reach more farmers and communities. FFS have proved to be an important scaling up component to mobilise support from a broad range of stakeholders. The SD=HS programme plan is to elaborate on these findings, by adding a higher level of quantification and systematic documentation.

Conclusions on FFS scale up pathway

Across the programme countries, FFS appear to offer an effective pathway to integrate farmers' traditional knowledge with science-based knowledge and technology. A reviewed season-long curriculum for farmer field schools offering modules on different levels of intervention (between and within crops; selection and breeding), various crop types (self-pollinating, open-pollinating, vegetatively propagated crops) at farmer to landscape integration levels, and accommodating distinct roles amongst community members (gender, age, wealth, expertise) will not only help sustain the FFS once the programme withdraws, it will also help autonomous uptake of FFS outside the programme coverage. Dedicated organization of Training of Trainers sessions involving farmers and extension workers and the organised and facilitated transfer and adaptation of local innovations by farmers from one area to another will further promote such autonomous uptake. Training in seed production for local communities may add to improved farmers' livelihoods and to both seed and food security. Specific attention may be given to the promotion of FFS with the help of the module-based curriculum by extension services, including in the programme countries. Hence, FFS are an important entry and exit strategy for scaling up and spreading impact.

3. PGRFA Access Pathway

Seed security is an important contributor to food security. In that context, it should be noted that seed security is not only about increasing volumes but also about improving quality, e.g. in germination rates, absence of pests and diseases, and seed diversity.

Often, lack of access to preferred diversity is a major shortcoming in the functioning of local farming systems. Organizing and running an FFS invariably results in the identification of crops and traits that are not available, but are regarded by the community as potentially useful introductions to a given farming system. Such crops and traits might be accessed from various sources, including:

- Normally frequented local or regional markets, including barter markets, where farmers and traders offer local or commercial varieties.
- Distant markets, only occasionally within reach and with external support, but recognised for crops and traits of interest to the programme community.
- Public institutions, offering stable, near-stable, or segregating breeding lines for Plant Variety Selection (PVS) and Participatory Plant Breeding (PPB).

- Gene banks, providing access to farmers' varieties that have been lost.
- Private or state-run seed companies, offering modern varieties adapted to local conditions to a greater or lesser extent.

Individual farmers in a community may spontaneously specialise in seeking access to additional diversity, select within heterogeneous varieties, or even hybridise two different varieties or populations in order to increase the diversity to choose from and to create new and improved germplasm. They may act as "farmer-breeders". Often however, a major added value of organising an FFS lies in strengthening the capacity of a community and its individual (model) farmers to access and increase diversity, thereby catering for the identified needs of such a community. Lack of access to diversity may thus be alleviated by the actions of Civil Society Organisations (CSO) and other stakeholders such as the Zimbabwe Farmers Union to bring in additional diversity from external sources, complemented by selection and crossing experiments in the community. Most important however is to strengthen the role of research and breeding institutions, provide expertise and, in particular, PGR materials to the FFS.

In Peru, barter markets (chalayplasa) are a source of seeds for native potato varieties. These markets usually offer much greater crop diversity than commercial markets. Up to 60% of the region's estimated 240 potato varieties are found in the chalayplasa markets, whereas only 25% can be found in commercial markets.

The focus of FFS may thus differ substantially. Impoverished farming systems may benefit from the addition of suitable crops that are absent from or rarely found in the system; or from the enhanced number of well adapted varieties of staple crops to choose from. The focus is on greater diversity both at the crop and the variety level. In Zimbabwe and Peru, in particular, many FFS focussed on this. An alternative approach could be to focus on an improved set of varieties, often in staple crops, either by selection from stable lines or established varieties, development of open pollinated varieties (OPV), or by crossing two or more varieties or populations. In such a case, the focus is on an improved diversity. It is not the number of varieties, but the quality of the varieties that poses the challenge. More commonly preferred traits in such selection or breeding programmes include yield, taste, storability, pest and disease resistance, drought tolerance, and early maturity. This second type of FFS in the programme countries tends to focus on selection in segregating F4 or F5 generations of crosses obtained from breeding programmes, and to a limited extent, on crosses between preferred varieties made by farmers. For the FFS, costs, effort, and total duration are lowest for expanding diversity, higher for selection in F4 and F5 populations, and highest for farmer crosses. The seeds of most cultivated varieties are maintained in the community, saved by farmers for the next cropping season, and offered to others as farm-saved seeds. However, the practice of saving seeds on-farm is eroding. Hybrid maize and hybrid rice are almost invariably purchased. The quality of seeds saved on-farm is deteriorating and farmer-to-farmer exchange of seeds is decreasing. Traditional varieties have become threatened.

Efforts to increase available diversity may not only focus on larger, well-known crops, but also on neglected and underutilised species, especially plants that may play a role in the hunger period, in particular for the poorer members of the community. Community seed banks may offer safe storage facilities for all crops and varieties that are locally maintained whether in larger quantities for the purpose of short-term seed storage or in smaller quantities for the purpose of conservation. The chalayplasa network of markets in Peru allows farmers to exchange their native varieties.

Results obtained pointing to scale up pathways. Access to additional diversity proved to be a consistent theme in the programme activities. The results of the baseline survey and the initial activities in the FFS provided information as to which diversity farmers were missing. Actions to increase access to greater diversity and create new diversity in PGRFA were undertaken in the framework of the FFS.

A major initiative accomplished in the programme framework was the provision of a high number of native potato cultivars (almost 400) from one programme area in Peru to another, i.e. from the Potato Park to the Lares Valley, under an agreement between the Potato Park communal gene bank and the Lares communities, with support from CIP and programme partner, ANDES. In this context, CIP also assisted in evaluation trials of potato varieties in the Potato Park.

Some findings on improving access to diversity

Access focuses on broadening crop diversity, by providing for the (re-)introduction of crops and varieties that are (nearly) absent in the farming systems; although selection for preferred traits between varieties of staple crops obtained from external sources is also prevalent. Participatory plant breeding, which involves performing crosses, is only practised on a limited scale for few staple crops given the technical challenges involved and the substantial investments needed over time needed. In obtaining better preferred varieties, farmers can select either between stable lines or from segregating populations, preferably in later generations. Cooperation with public sector institutions, that facilitate access, in particular breeding institutes, provides a major gateway for access to higher yields and novel diversity.

A long-term community conservation strategy is needed to secure lasting availability of less preferred varieties. Landscape approaches may appear to be a useful element of such a strategy. The role of community seed banks in securing lasting access to a diverse collection of crops and varieties (also referred to as community gene banks), as opposed to a short-term storage facilities of larger volumes of seed for the next season needs to be evaluated⁶. It may be argued that varieties that no longer fit farmers' needs may rather be transferred to formal sector gene banks. Community seed banks may offer shorter-term storage of varieties related to farmers' experimentation in the FFS context. Community seed banks may ensure the availability of materials for multiplication into larger seed lots, but not offer storage space for seed lots per se. The organization of ownership of, and control over, the facility and the stored seed lots and crop variety samples should serve to contribute to these goals.

Farmers in Chiredzi, Zimbabwe requested from the national gene bank the reintroduction of three sorghum varieties that had been inadvertently lost from their farming systems. Six sorghum and eight pearl millet advanced breeding lines and an additional 28 varieties of different crops, both farmers' varieties and formal sector varieties, were introduced in farmers' fields in collaboration with the Matopos Research Station. Alongside farmers' own trials, 20 crop diversity demonstration plots were established in the programme sites with on average 16 crop varieties per site. In Vietnam, 15 varieties in total were added to the communities' diversity portfolio: eight favourite traditional rice varieties were reintroduced, of which three were adapted to climate change; four formal sector varieties were adapted to local needs; and three farmer-bred varieties, of which two derive from the crossing of a local and an improved variety, were developed. It appeared that farmers' practices in the FFS differed considerably; some FFS only select few plants from segregating F4 populations and others use bulk selection techniques, resulting in two well-performing F7 plants that perform better than the strongest inbred lines from the public sector. In another successful effort, farmers assessed the strengths and weaknesses of their favourite sticky rice variety, a traditional variety called Nep Lech, which resulted in the setting of new communities breeding objectives. After three seasons of intensive selection, under guidance from the FCRI, Nep Lech now provides 30% higher yields.

Case study from Vietnam

Due to the dominance of commercial rice production, much of the diversity in the rice fields of Vietnam has been lost. The estimated rice land in the north is up to 1.5 million hectares, of which around 600,000 are planted with hybrids, and up to 900,000 with inbred⁷. One inbred rice variety, BC15, is cultivated in up to 60% of the 900,000 hectares planted with inbred. BC15 is a modern variety, with good eating quality and tolerance to pest and diseases. However, like any other variety, the BC15 rice variety will also deteriorate overtime, i.e. due to introgression, mutations, or decrease resistance to pests and diseases, etc. Eventually there will be a need to rehabilitate or develop new and more diverse varieties. The dependence on a very narrow set of varieties, and increased risk of diseases, due to the varieties' eventual deterioration, could make rice production very vulnerable. This context has been relevant in shaping the FFS objectives of

⁶ see also the typology by Vernooij et al. 2014

⁷ Nguyen, N. L. (2013). Rice production in Vietnam. Presentation at the South-East

the programme and will continue to be relevant for further scaling up. Despite the dominance of hybrid and modern rice varieties, farmers still maintain some traditional varieties for their eating qualities and/or cultural importance. This is especially true for sticky rice varieties, of which there are very few if any being introduced by breeding and research organizations. Nep Lech is a traditional sticky rice variety that is very popular for consumption by farmers on special occasions. It is the favourite within programme sites of Vietnam. Through the diversity wheel exercise, the programme in Vietnam discovered that most farmers in Bao Ai commune normally grow Nep Lech in small plots of land, to make rice wine and cakes, especially for traditional festivities, including the Tet Holiday. The communities grow Nep Lech because of its good eating traits; it is aromatic, tastes good, and is soft and glutinous in texture. However, due to market incentives for higher and more stable yields, a lot of traditional rice varieties are lost, or not easily accessible in the local market. This was not the case for Nep Lech, given its niche value. Additionally, the communities reported that they needed to improve the quality of the Nep Lech variety, to improve its productivity, taste, and aroma, and increase tolerance to pests and diseases. Through the programme's farmer field school, the communities in Bao Ai commune, particularly the women, were supported to assess the strengths and weaknesses of Nep Lech, which resulted in the setting of the women's breeding and selection objectives. Through this process, the women were able to identify their preferred traits for Nep Lech. After three seasons of systematic selection, the Bao Ai's communities were able to enhance the quality of their Nep Lech variety with a reported 30% increase in productivity and greater pest resistance. This FFS result is a good example of conservation through use where the women conserved their local cultivar by enhancing the cultivar's traits.

Another best practice in Vietnam for scaling-up is illustrated by the partnership model between farmers and plant breeding institutions on FFS-Participatory Plant Breeding. Through this programme, the Field Crop Research Institute provided two fourth filial generations (F4) for each FFS in Son La. The FFS in Son La successfully applied the bulk selection techniques for three seasons, which resulted in well performing F8 cultivars, better than the strongest inbred lines that survived the massive drought caused by El Niño at the beginning of 2015.

Conclusions on PGRFA access pathway

The major scale up pathway on access lies in increased cooperation between local communities and the formal sector. Community-to-community transfers offer another interesting gateway to access. Mechanisms by which communities can access additional diversity need to be further strengthened and mainstreamed. In particular, breeding programmes and gene banks that form part of the formal sector need to develop and promote practices and procedures in order to facilitate access to their breeding materials and collections. Gene banks can be supported in the identification (jointly with farmers) of preferred lost farmers' varieties and in the regeneration and multiplication of the seed stocks of such varieties. Traditional and scientific knowledge can be linked in the form of facilitated and/or directed access to relevant PGRFA, by supporting farmers to identify their preferred trait and breeding objectives. Breeding institutions can facilitate the on-farm testing of new stable lines or still segregating populations, or advise on the use of particular lines as parents in farmer-breeding efforts. Crossings performed at the local level can focus on combining better yields and resistances obtained through formal breeding with traits preferred by local communities, e.g. regarding taste, processing, and non-food purposes.

4. Policy Influencing scale up pathway

Seed policies affect the functioning of smallholder seed systems, whether intended or not. Seed policies are linked from a local to global continuum. These policies are mostly embodied in national laws and regulations, but are also "coordinated" at the international level. International agreements, such as the WTO TRIPS⁸ agreement and the UPOV⁹ system are reflected in national policies on intellectual property rights applying to crops. The Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) have elaborated the concepts of access and benefit-sharing (ABS) and Farmers' Rights. At the national level, patent laws and plant breeders' rights laws offer protection

⁸ World Trade Organisation (Trade-related aspects of intellectual property rights).

⁹ International Union for the Protection of new Varieties of Plants.

to the developers of modern varieties, whereas ABS laws may set requirements on the access to plant diversity originating from the country. Farmers' rights, recognizing the role of small-holder farmers in conserving crop diversity, have only been embodied in law in a limited number of countries. At the national level, these international agreements need to be translated and implemented in a coherent and non-conflicting manner.

In particular, seed laws tend to interfere with the functioning of smallholder seed systems. Seed laws are often introduced with the goal to improve food security, by promoting the cultivation of modern high-yielding varieties, developed and marketed by the private and - sometimes for some crops - the public breeding sector. These laws set requirements for the properties of new varieties, and the capacity and facilities of breeders and seed multipliers. Often, the requirements cannot be met by farmers (e.g. organised in cooperatives) wishing to register their own varieties and market their own seeds. However, successes were reported in Vietnam: two farmer-developed varieties were registered after a tedious and costly process. In addition, plant breeders' rights laws often set limitations on the options of all farmers, including small-holder farmers, to propagate and/or market protected varieties. In Vietnam, propagating and purchasing unregistered seeds or those not included in the list of plant varieties permitted for production and trading is prohibited (Article 9, Section 2 of the Vietnam Seed Ordinance). Violation of these provisions has corresponding administrative sanctions and monetary fines, as stipulated in Decree 114/2013/ND-CP. These sanctions and fines have such an impact that during the 2015 Farmer Technical and Policy Conference, provincial government officials cited this prohibition as a deterrent to the promotion of farmer-developed varieties under the programme in the north Vietnam sites.

Some findings on policy influencing

The programme was able to raise awareness amongst farmers on how policies affect their seed systems, but also how they may be able to influence these policies. The programme also created coalitions for change and extends from the local to the global levels. The issue of how policies affect small-holder seed systems is addressed from local to global levels. Activities range from awareness raising to taking initiatives to influence existing (and propose new) policies and regulations, from local to international levels. Many stakeholders are involved in these initiatives; especially small-holder farmers. One of the challenges in these initiatives is to expose how existing policies and regulations negatively affect the functioning of farmers' seed systems, either intentionally or unintentionally, and how this may have a negative effect on food security at national and international levels. Another challenge is how the programme can help farmers claim and establish a role in policy making at the national level, increase the impact of their efforts to understand, influence, contribute to, and participate in the development of policies. Another challenge is how to help farmers formulate their views on the role of NGOs in addressing PGR and food production policies.

In Peru, focus group discussions in the programme communities were held to gain a better understanding of how international and national policies are affecting farmers in relation to climate change and food security. At the programme community level, two municipal ordinances were proposed, dealing with food and seed security, and the protection and promotion of barter markets, respectively. The Lares policy platform was established, to address policy and issues of power distribution at the local level, and to provide a platform for discussions between indigenous farmers and the relevant government representatives and other stakeholders on national and sectorial policy on climate change. An attempt by INIA to establish plant breeders' rights on a number of traditional potato varieties was successfully challenged. In Peru and Vietnam, initiatives were taken to develop bio-cultural protocols that facilitate the exchange of local varieties.

In Zimbabwe, policy reviews were organised with farmers and the farmers union, and collaboration was sought with all stakeholders at the national level to address such issues as farmers' rights and seed laws. A new farmers' rights bill was drafted for consideration with active participation, contributions, and inputs from CTD and officers from the ministry of agriculture. In Vietnam, two farmer technical and policy conferences were held to raise awareness on policies; another national farmer technical and policy conference will take place soon to campaign for continued government support after programme withdrawal, technical backstopping, and policy reforms, especially at the local provincial level. Also, advocates of FFS are trained in the use of a policy module in farmer field schools. Furthermore, an on-going study

on the national seed law of SD=HS suggests that a national policy is needed to endorse local certification of locally adapted farmer-bred varieties, complementing and correcting policies focussing on commercial production. In Zimbabwe, nearly 6,000 households were reached through FFS, seed fairs, and farmer field days to inform them about farmers' rights and the right to food. An alliance with the Zimbabwe Farmers Union ensures outreach to more than ten thousand farmers in neighbouring districts. Two on-farm seed production associations drafted their constitutions as a means to recognise and regulate the contribution of farmer associations to national seed production.

At the global level, side events were organised during the fifth Governing Body session of the ITPGRFA, in 2013, and at the 15th Regular Session of the Commission on Genetic Resources for Food and Agriculture in 2015, highlighting the results of the programme results and initial results of the programme's study on seed laws. After an active lobby by Civil Society Organizations in advance of and during the 15th regular session of the Commission, the Voluntary Guide for National Seed Policy Formulation was approved, containing the suggested texts of SD=HS and other Civil Society Organisations. The approval of the Guide is significant because it recognises and supports the importance of informal seed systems, unlike most seed policies and laws that only cater to the formal sector. Despite the Guide being voluntary, many developing countries will hopefully consult it in response to the need to formulate or revise their national seed regimes. Also, CSOs and farmers organizations will use the Guide as a reference point in developing proposals addressed to their governments for a more inclusive seed systems approach, which is vital for the national economy and the country's food and nutrition security.

Case study from Peru

In early 2013, Peruvian indigenous farmers were angered when it was revealed that the National Institute of Agricultural Innovation (INIA), a government research agency, had claimed plant breeders' rights to more than fifty traditional varieties of potatoes. The potatoes were bred not by government researchers but by indigenous farmers who considered the claims to be an affront to their culture, knowledge, and resources. A purple variety named Leona was claimed. One breeder reacted to that claim saying "The breeding on that variety was done 500 years ago!" Most of the varieties were actually provided to INIA by the International Potato Centre (CIP), which had collected them from the farmers' fields. If the aim was to protect the varieties against misappropriation by others (as stated by INIA), why did INIA not simply use the registry of native potatoes, which does not give exclusive rights?

Through this programme, informal discussions amongst all concerned parties were held during the fifth session of the Governing Body of the ITPGRFA in Oman. Simultaneously, indigenous peoples and farmers federations from the Cusco region gathered in a workshop convened by Asociación ANDES and the Potato Park Association. The workshop participants gathered to analyse and debate INIA's claims on native crop species. A crisis commission was formed that included members of the various participating communities, and was tasked with challenging the INIA claims.

In letters to the government, meetings, and a protest in the city of Cusco, the potato farmers insisted that the claims be dropped. In December 2013, the National Patent Office (INDECOPI) rejected INIA's claims and the case was officially closed.

Case study from Zimbabwe

In Zimbabwe, the Community Technology Development Trust (CTDT) has a prominent role in dialogue facilitation between farmers and governments on seed laws and farmers' rights. Gaps between policy and local implementation, in particular farmers' participation in decision making processes and awareness raising, often remain an issue for many countries, as also illustrated in Zimbabwe. Through years of collaboration and trust building, CTDT has been able to facilitate farmers to openly share their experiences and concerns as concrete inputs to the national legislation pertaining to the ITPGRFA. Likewise, CTDT facilitated dialogue and awareness raising amongst stakeholders that allowed farmers to be better informed of recent developments concerning their seed and farming systems.

Through the programme, a national multi-stakeholder workshop, Promoting Seed, Food, and Nutrition Security in Zimbabwe in the Context of Climate Change, was held in March 2015 and was able to raise awareness on seed laws and farmers' rights. Concerns were shared about:

- The recent takeovers of some of the most established home-grown southern African seeds companies (PANNAR; MRI; SeedCo) by some of the largest global seeds companies (respectively: DuPont; Syngenta; Monsanto, Groupe Limagrain).
- The speed of regional (COMESA, SADC, ARIPO) harmonisation of seed laws and plant variety protection laws without the participation of farmers and without the regional policy makers having sufficient understanding of the farmers' seed systems and how these may be affected by the new policies.
- The possible human rights implications of a UPOV-based plant variety protection regime, particularly on the farmers' rights to save, use, exchange, and sell their seeds.

The workshop resulted in the formation of a Seed Security Network Dialogue Initiative in Zimbabwe, which will champion the establishment of a national seed policy with an integrated seed system approach. The proposed policy will highlight how best to formulate and implement an alternative plant variety protection policy through sui generis legislation in order to incorporate and guarantee farmers' rights, as articulated under the ITPGRFA. The network will also facilitate discussions on other issues like food sovereignty, prior informed consent, participatory plant breeding and variety selection, smallholder climate change strategies, and access and benefit sharing.

Conclusions on policy influencing scale up pathway

Policy development takes place on a local to national, to international continuum. This programme has been able to empower local communities to influence local to international food, agriculture and climate change policies. To that end, the programme has provided evidence on the effects of policies on farmers' seed systems and succeeded in taking initiatives, setting examples, and creating coalitions to promote change from local to international levels. The programme has contributed evidence-based policies that are also grounded on the experiences of, and validated by, indigenous and farming communities. The programme has provided models for other actors engaged in local to global and global to local policy influencing. In order to maximise opportunities for influencing policies regarding the functioning of farmers' seed systems, local to international coalitions of organizations are needed. Successful cases of support for informal seed systems need to be sustained and mainstreamed into policy reforms. Publicising the results of the efforts undertaken in this programme carefully and in sufficient detail will guide other actors in developing their own activities and create a basis for wider collaboration beyond the programme boundaries.

5. Climate change response pathway

Climate change formed the central theme in this programme. While the effects of climate change strongly differ from site to site and from season to season, the effects are everywhere. In particular, these translate into increasing droughts, higher temperatures, and more extreme and more irregular weather patterns. Predictions indicate that the effects of climate change will increase over time and hit regions to varying extents and in different ways.

In the programme sites, farmers have been exposed to these changes. They may have experienced them as profound and consistent changes in local weather patterns and not interpreted them as climate change until information from outside the community triggered them to think in terms of global climate change playing out at the local level. Nevertheless, in all programme sites farmers have been responding to the changes observed such as described in their PGRFA management.

Climate change predictions point to an increasingly drier climate in Zimbabwe, to higher temperatures in the Andes, and to more irregular weather patterns in many regions. Farmers' experiences at the local level often concur with these predictions at general levels and their responses to the changes are an attempt to maintain production levels and local food security.

Results obtained pointing to scale up pathways. Strengthening farmers' seed systems cannot take place without taking into account the past and future impact of global climate change at the local level where a range of other agronomic and socio-cultural factors can be taken into account as well. In identifying which additional diversity is needed in communities, analysis of past changes will help identify shortcomings in novel diversity and how to fill those gaps. Analysis of past changes will also guide communities in responding more adequately to current and future constraints. Communities that have experienced increasing harvest failures over the last decade should be prepared for a further increase in disruptive weather patterns.

Some findings of climate change at the local level

Farmers are aware that climate change is affecting them. In addition, it appears that farmers' perceptions and responses are influenced by how their farming systems and crops are affected. An important question is to what extent farming communities can effectively cope with the effects of climate change on their own. The many failed maize crops in the dryer areas of Zimbabwe (a distortion attributed to market push and ineffective policy) and the need to grow potatoes at higher altitudes in the Peruvian Andes are examples of climate change playing out at the local level. Later onset of rains, mid-season droughts, and shorter rainy seasons occur in many places. Traditional varieties have been lost as a consequence. Farmers already experienced these changes and responded to the extent possible by opting for other varieties or even other crops or livestock. But farmers also experienced limited possibilities to react. Part of the diversity needed under the new weather conditions is simply not available in the communities and cannot be accessed easily from outside. Farmers may be assisted in obtaining their own early maturing varieties. Moreover, the socio-economic consequences of adaptation strategies should be carefully monitored in order to draw lessons and adjust these strategies.

Perceptions on climate change as well as farmers' responses were discussed and analysed in the context of the PGRFA participatory toolkit and the FFS. Farmers in Peru perceived considerably more incidences of extreme weather events and associated an increase in pest and disease infestations with these events. In response, they adopted more flood and drought tolerant, traditional potato varieties. A new potato community seed bank has strengthened the capacity of farmers to store seeds of local varieties given that increases in extreme climatic events are increasing the risk of field losses, reducing the capacity to save seed as well as sharing it. In Vietnam, early maturing rice varieties were adopted and in Zimbabwe, farmers took early maturing and drought tolerant maize varieties, a strikingly common development in these very different ecosystems. In response, farmers in Vietnam also turned to horticulture and livestock production. Farmers in Zimbabwe turned to conservation agriculture, carefully managing their water supplies. As a result, Zimbabwean farmers cultivate relatively high numbers of crops (5-6) and varieties per crop (3-4) as a risk aversion strategy.

Farmers use weather forecasts to different extents. This is correlated to the way weather information is offered to farmers, as well as to local geographic conditions (e.g. mountains exhibit more variable weather conditions). In addition, many farmers will also rely on traditional knowledge for signs indicating the onset of rains, temperature changes, etc. In Peru, a

participatory approach that integrates local knowledge and science in a community vulnerability assessment and the formulation of local adaptation plans for food and seed security was tested.

Farmers' perceptions of climate change largely coincide with, but sometimes deviate from, meteorological records. An analysis of these differences may help to better understand weather patterns, agronomic practices, and coping strategies. In Zimbabwe, farmers' perceptions of less rainfall were compared with meteorological records showing no substantial change. One of the explanations for this discrepancy derived from the programme analysis is that rainfall increasingly arriving in the form of heavy showers will lead to more run-off and loss of water, which does not show in the meteorological data. Hence, while the meteorological rainfall record remains the same, farmers perceived less rainfall since they were able to make less use of the rain. In Zimbabwe, 122 extension officers were trained in weather data collecting and recording and 44 rain gauges were distributed to model farmers to complement the farmers' home-made rain gauges. The programme is using this to assist farmers in planning their agricultural calendar and in managing their PGR for climate change adaptation.

Conclusions on climate change response scale up pathway

In response to climate change adaptation, it is essential to promote enhanced biodiversity management by farmers, in particular the integration of more crops and varieties into the farming systems. How can we help farmers stay ahead of the climate change curve? The integration of climate change modules into the PGRFA participatory toolkit and FFS curricula will help mainstream the awareness of climate change and the options to cope with these changes. Participatory tools, such as season calendars, measuring weather patterns and crop performance may be promoted. Adaptation strategies, including local adaptation plans may be integrated into the FFS curriculum. Providing novel crops and varieties by other stakeholders, normally not within reach of small-holder farmers, may help local communities respond better to the effects of climate change. The collaboration of farming communities with meteorological stations, as in the context of climate farmer schools in Zimbabwe may increase the usefulness and use of weather forecast data.

6. Gender inclusion pathway

With regard to farmers' management of PGRFA, the programme took on IFAD's view that gender equality and women's empowerment are both objectives and instruments of poverty reduction. The feminization of agriculture due for example to the urban migration and prevalence of HIV-AIDS in Zimbabwe, implies that seeds and food security intervention cannot succeed without the inclusion and participation of women. Moreover, considering women's role in biodiversity management for food security, the programme and the communities benefited from working with women and their social networks. Hence, addressing gender roles is not only an important component of the scale up pathways of peoples' PGRFA management, gender roles themselves are an important aspect of each of the other pathways.

In the appropriate context, barter markets can serve as a 'weapon of the weak', promoting equality in transactions rather than equivalence in produce exchanged. Women in the Andes who are often amongst the weakest sectors of farming communities are the most active users of barter markets.

Except for a few tools, such as the gender-specific agricultural calendar, most of the Participatory Rural Appraisal (PRA) tools (like spatial maps and time lines) tend to be gender blind. For this reason, aside from "calibrating" the tools, the management of the tool application also needed to be made gender-sensitive. Identification of female-headed households, gender balance in focus group discussions, women enumerators, and gender-disaggregated data are important in the use of the PGRFA participatory toolkit.

In the context of the PGRFA access pathway, the baseline survey confirmed the role of women in the management of biodiversity at the very least a role shared equally with men. Women's roles in seed management include selection, storage, sowing, maintenance, quality management and exchange of seeds. Furthermore, in the programme's participatory plant breeding activities conducted through the FFS, men and women shared decision-making on which crops to address and what breeding objectives to be pursued. It appeared that women's preferred traits, such as easier processing, good taste, and nutritional value are often missed. In many instances, women's capacity to pay sharp and persistent attention to details appeared indispensable in the observation and selection of breeding lines during major stages of growth, also in the minute operations in

performing crossings and dealing with very small crop flowers. Especially during hunger periods, women's knowledge in gathering and processing neglected or underutilised species occurring in the wild formed important coping strategies. Therefore, addressing gender roles is an important challenge when working in mixed groups of men and women. Special attention is needed for women's preference for specific traits and breeding objectives. Women's access to and benefits from PGRFA are crucial not only for women's empowerment, but also for food security at household and community levels. This in turn may have an impact on national and global food security.

In the context of FFS, the programme reviewed the existing curriculum for gender sensitivity. The inclusion of gender role awareness in the curriculum made for a good start. In the SD=HS programme, this approach will be further elaborated into a gender and social inclusion perspective. The selection of female participants and the inclusion of women in the Training of Trainers sessions are essential for a gender sensitive FFS to reach out to more women. It helped the programme break the traditional bias against women's participation in training sessions. Furthermore, the fact that FFS are conducted in the community avoided the traditional mobility constraints faced by women. The design of the FFS in such a way that varieties preferred by women are tested on women's land ensures that FFS developed/adapted varieties meet women's needs. While it remained difficult to document this systematically, the use of video cameras proved very useful. Another lesson is that the gathering of data from the FFS sites (through the Agro-Ecosystem analysis (AESAs) or Gene-by-Environment Analysis (GEAN)), is best done just after sunrise when insects are easier to observe or gather. Whilst FFS are best conducted in the early morning due to crop conditions, this is also the busiest time for women's additional household tasks. Therefore, household negotiations (a small process, as part of the FFS Guide) to relieve women of household chores one morning per week to participate in the FFS session are needed.

For the policy influencing pathway, a major bottleneck is the two-way knowledge gap. On the one hand is the relatively well known fact that women generally have little access to knowledge that is critical to their agricultural productivity. On the other, the development and agricultural sectors tend to have very little understanding and appreciation of women's knowledge contribution to food security through their management of PGRFA.

Results obtained pointing to scale up pathways show that the programme has been able to contribute to the empowerment of women by strengthening their technical knowledge and building their confidence in PGRFA management. Within the three year programme period this has produced good results, e.g varietal enhancement through subjecting selected cultivars under strong positive and/or negative selection pressure. Women were able to systematise the management of their diverse crops and to enhance the productivity of these crops through careful selection of the best performing plants. This in turn has resulted in clear appreciation of how women's work supports household and community food security, leads to increased income, and allows consumption of their most preferred varieties, such as the Nep Lech rice variety in Vietnam.

Development interventions in gender empowerment often tend to use the framework of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), which addresses discrimination against women by gender and class, but not by ethnicity. In our programme, social inclusion of women appeared especially difficult to realise in the context of marginalised indigenous peoples, particularly in north Vietnam. PGRFA also has a dimension of peoples' culture and identity. The Potato Park in Peru has successfully integrated this notion in the bio-cultural heritage site and this model is being adopted by the programme in Lares. For indigenous peoples' issues, the SD=HS programme phase will work towards the integration of the framework of the International Convention on the Elimination of All Forms of Racial Discrimination (CERD).

Conclusions on gender scale up pathway

All scale up pathways of peoples' biodiversity management need to be guided by a gender empowerment rationale based on the fact that globally at least half of food producers are women, and therefore women and their social networks have a pivotal role in PGRFA management for food security. At the same time, women's access and use of PGRFA tend to be marginalised through factors that discriminate women by gender, class, and ethnicity. The programme shows that women's participation is crucial; therefore, farmers' rights, including the right to participate equitably in benefit sharing arising from the utilization of PGRFA (ITPGRFA, article 9.2.b), and the right to participate in decision making on the conservation and sustainable use of PGRFA (ITPGRFA, article 9.2.c) should be enforced and consciously extended to women.

7. Lessons and Policy Recommendations

In line with Article 6, Resolution 7/2013 of the Governing Body, regarding the request to cooperate with relevant entities, including NGOs, under the framework of the Treaty, for the effective implementation of activities in support of the Programme of Work on Sustainable Use of PGRFA; and the request to all Contracting Parties to promote, as appropriate, the access of all farmers to the PGRFA in the Multilateral System and the broadening of the base of crops in use;

Also, in line with Article 9, Resolution 8/2013 of the Governing Body and recalling resolutions 2/2007, 6/2009 and 6/2001, requesting recommendations, based on best practice, for policies to promote access to genetic resources under the Multilateral System by local and indigenous communities and farmers; and for the exchange of knowledge, views and experiences to promote the realization of Farmers' Rights;

Finally, in line with Article 9, Resolution 8/2013, on the joint identification between the Treaty, UPOV and WIPO of possible areas of interrelations, and cognizant of Article 9.3 of the Treaty that nothing shall be interpreted to limit Farmers' Rights, subject to national law and as appropriate;

The following are policy recommendations based on the programme's best practices:

1. Sustainable use of PGRFA requires the strengthening of both the technical capacities and the rights of indigenous peoples and smallholder farmers. Their agency is a decisive element in the global responses for food and nutrition security. Access to PGRFA is not only dependent on the availability of materials and corresponding conditions under the Multilateral System, it is also determined by peoples' capacity to exercise their rights. Broadening of the genetic base of crops in farmers' fields requires multi-stakeholder collaboration, taking a rights-based approach. We recommend that the Treaty build this approach into its work programmes and its work on capacity building approaches.

2. The right of farmers to participate in decision making on the improvement and use of PGRFA is an important requirement, the execution of which requires tools (such as PPB, empowerment of farmers in FFS) and policy space (farmers' participation in local, national and global forums), so that farmers can enact their technical expertise and political rights to use for their own research and breeding and selling of their seeds. Intellectual property rights (IPRs) and seed laws that prevent farmers' access and use violate farmers' rights and peoples' rights to food. It is recommended to actively guide Contracting Parties in the development and implementation of these rights. This guidance should include the presentation of cases or contexts in which intellectual property rights limit farmers' rights, or act as a barrier to the full use and conservation of PGRFA.

3. The sharing of best practices should also focus on scaling up such practices and on designing impact pathways to reach many more farmers, especially women, and in clarifying the various stakeholders' roles. We recommend that project selection, implementation, and budget allocations of the Benefit Sharing Fund be guided by an articulated scale up pathway. This includes fair and clear budget allocations amongst relevant stakeholders vis-à-vis their roles in the project. In this way, the Benefit Sharing Fund could better fulfil the Treaty's ambition that

benefits should primarily, directly and indirectly, reach farmers in all countries, especially in developing countries, who conserve and sustainably utilise plant genetic resources for food and agriculture.

4. Considering the diversity and complexities of farming systems worldwide and the impact of climate change at the local level, participatory diagnosis via innovations such as the PGRFA toolkits enables farmers, extension agencies, and breeding institutions to jointly understand the changing needs of farmers as dictated by environmental and socio-economic conditions. Such joint exercises help to better identify preferred traits, better define the breeding objectives set by farmers, and permit more effective sourcing of proper PGRFA, including breeding materials. We recommend that the Treaty facilitate dialogues between national and international public sector breeding institutions and smallholder producers to promote more effective collaboration.

5. The need for access to additional and novel diversity proved to be a consistent theme among all the communities in the project. Community-to-community exchanges offer one reliable gateway to access. However, with profound changes in climate and market conditions, mechanisms by which communities can access additional diversity need to be expanded, further strengthened, and mainstreamed. In particular, we recommend that formal sector breeding institutions and gene banks should develop policies and promote practices to facilitate access by farmers to potentially useful PGRFA contained in their breeding materials and collections. Gene banks can be supported in the identification (jointly with farmers) of preferred lost farmers' varieties and in the regeneration and multiplication of the seed stocks of such varieties.

6. In their need to have access to breeding lines and pre-breeding materials, farmers need access to materials under the Multi-Lateral System, including germplasm of locally high potential for the purpose of further enhancement and use. In order to facilitate this, research institutions and CSOs have a role in realising farmers' access to these materials and in helping farmers develop an informed selection process. Such a support role includes enabling farmers to identify their desired germplasm characteristics, match these with PGRFA potentially providing such traits, which have user-friendly characterization. We recommend that the Treaty Secretariat collect lessons in best practices of facilitated access.

7. Climate change is resulting in new biotic and abiotic stresses that require traits that can cope with the constraints. In this context, farmers' adaptation strategies have shown to favour the use of short duration varieties. Many short-duration varieties are varieties bred for intensive systems that have replaced local short-duration varieties. Facilitated access by farmers to these short-duration varieties, which are often IPR protected, is essential to adapt farming systems to new climate conditions. We recommend that the holders of rights over such varieties publicly declare that they will make these varieties available, at no cost, to indigenous peoples and smallholder farmers for plant breeding purposes. We invite the Treaty Secretariat to maintain a roster of the breeders prepared to share these materials.

8. The FFS is an empowering learning tool and offers an essential opportunity for interaction and collaboration between local communities and experts from the public sector (e.g. breeding institutions, gene banks, and universities), as well as extension services. FFS design provides a vehicle for organising and strengthening the capacity of a community and its individual (model) farmers to access and enlarge diversity that caters to the identified needs of that community. Lack of access to diversity may be alleviated by the actions of CSOs and other stakeholders by bringing in additional diversity from external sources, complemented by selection and crossing experiments in the community. But most of all, strengthening the role of research and breeding institutions and extension services in the FFS to provide support, expertise and, in particular, PGRFA materials, is decisive. We recommend that the Governing Body adopt a recommendation to its stakeholders for this purpose.

9. Women's access and use of PGRFA tend to be marginalised by the same factors that discriminate women by gender, class, and ethnicity. The programme shows that women's participation is crucial; therefore, farmers' rights, including the right to participate equitably in benefit sharing arising from the utilization of PGRFA (ITPGRFA, article 9.2.b) and the right to participate in decision making on the conservation and sustainable use of PGRFA (ITPGRFA, article 9.2.c) should be enforced and consciously extended to women. The Programme of Work on the Sustainable Use of PGRFA and the Treaty's Benefit Sharing Fund should incorporate criteria and indicators related to women's inclusion in participatory diagnosis, planning, monitoring, and evaluation, in relation to the conservation and use of PGRFA; and all impact pathways should specifically strengthen the role of women as managers of biodiversity.

10. Some local varieties are fetching high market prices, sometimes 50-100% higher than modern cultivars. However, many of these local varieties have been largely replaced or even lost, especially in areas where farmers adopted components of intensive agriculture (e.g. irrigated lands). Some of these local varieties may no longer be cultivated but can be re-introduced or used as parent materials upon request by farmers. We recommend that gene banks and breeding institutions treat farmers' requests for these materials as a matter of priority.

11. Policy development takes place on a local, to national, to international continuum. This programme was able to empower local communities to influence local to international food, agriculture, and climate change policies. Successful cases need to be sustained and mainstreamed into policy reforms. To that end, policies should be guided by the convergence of local experiences from multiple countries in their full diversity and a global policy agenda should be set towards strengthening informal production systems and maintaining crop diversity in alliance with multiple stakeholders, ranging from local to global institutions. We recommend that the Governing Body review its procedures, particularly in view of the changes that have been adopted by governments and UN agencies, through the Committee on World Food of indigenous peoples and smallholder producers, in policy discussions.

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