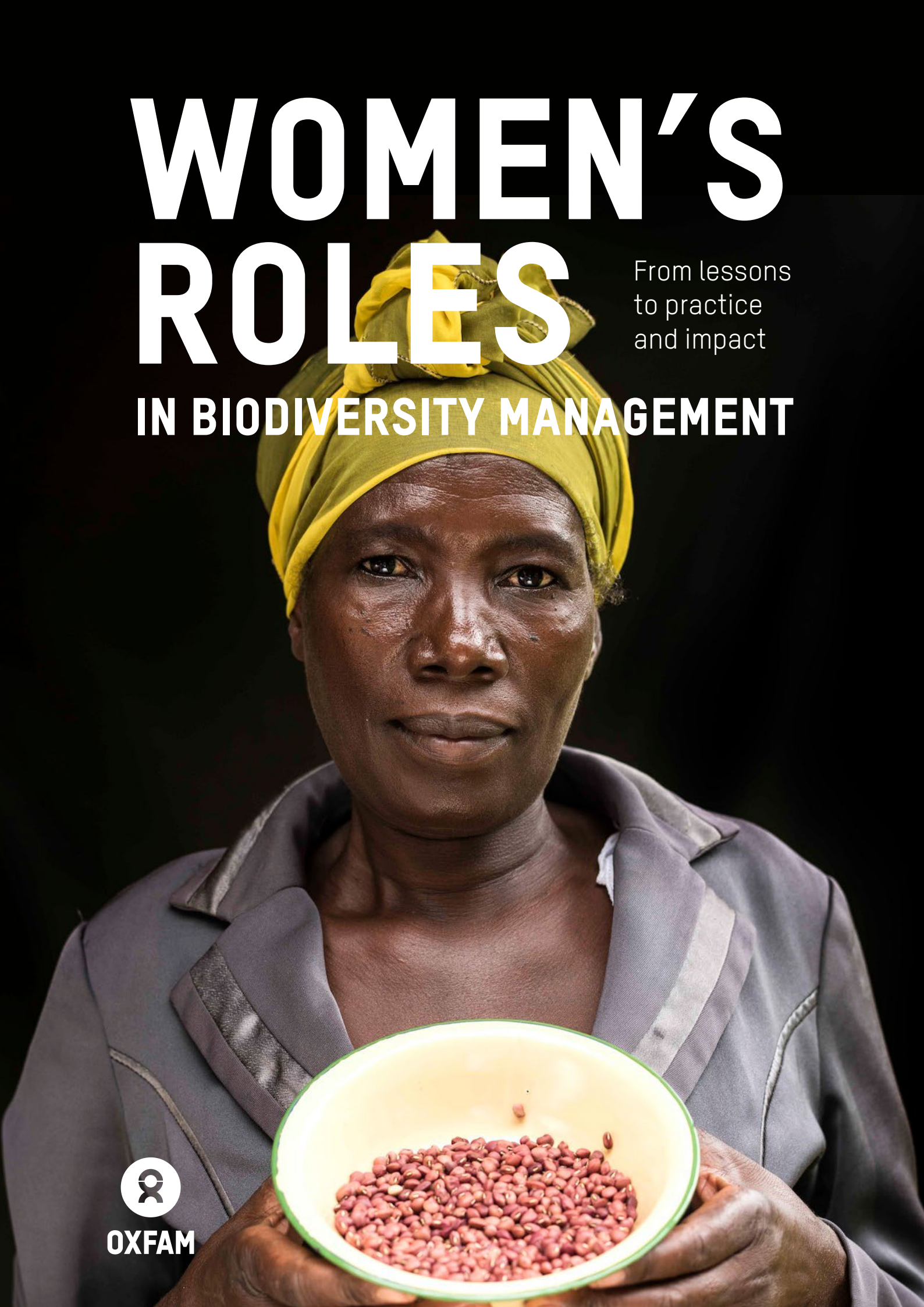
WOMEN'S ROLES IN BIODIVERSITY MANAGEMENT

From lessons to practice and impact



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DESIGN
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PHOTO COVER
As a member of the board of her Farmer Field School, Mandinema Nyambara inspects the crops they grow. She also learns new techniques, like ploughing the soil without using cattle. 'I want to educate young farmers on climate change and the importance of seed diversity. Thanks to the Farmer Field Schools I learned to grow millet and sorghum. We observed that these crops grow better in our unpredictable seasons. The picture is one of the Guardians of Seeds collection, in which SD=HS highlights the often marginalized and invisible role that women smallholder famers play in seed management. Photo by Sacha de Boer.

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INTRODUCTION

Indigenous peoples and smallholder farmers, a large percentage of whom are women, provide about eighty percent of the food consumed in almost all of the developing world, contributing significantly to food and nutrition security and poverty reduction.[1] Throughout history, plant genetic resources that are essential to household food security and livelihoods have mainly been managed by women. As a result, women tend to be more knowledgeable about the different characteristics and traits (e.g., agronomic, nutritional, culinary, processing and storage), and are primarily responsible for managing and conserving both cultivated and harvested plants.[2] The IFAD[3]-Oxfam Novib programme, *Putting lessons into practice: Scaling up People's Biodiversity Management for Food Security*[4] was a three-year global programme that aimed to 'uphold, strengthen, and mainstream the rights and technical capacities of indigenous peoples and smallholder farmers, in order to influence local to global policies and institutions on the sustainable use of plant genetic resources for food security, under conditions of climate change'. The Programme was implemented jointly by Oxfam Novib (at global level) and three country partners: Asociación para la Naturaleza y el Desarrollo Sostenible (ANDES) in Peru; South East Asia Regional Initiatives for Community Empowerment (SEARICE) in Vietnam; and Community Technology Development Trust (CTDT) in Zimbabwe. Around 83,700 households in the three countries benefitted from the Programme—including 15,532 primary target households[5] or 82,400 inhabitants, of whom 60% were women.

The aim of the Programme was to strengthen farmers' technical capacities and seed systems, and this was done using the Farmer Field School (FFS) approach. Rather than simply transferring technology, or training farmers to produce seeds for distribution to other farmers, it focused on people's capacity to self-organise and learn, to continuously innovate and update their practices, and engage in advocacy for corresponding policy

1 IFAD and UNEP. 2013; FAO. 2014.
2 Howard-Borjas P, Cuijpers W. 2002.
3 International Fund for Agricultural Development
4 Hereafter: The Programme
5 Primary target households are households located in the geographic areas where most programme activities took place —2,062 in Peru; 6,750 In Vietnam; 6,720 in Zimbabwe—and to which most funding was allocated.

changes. The Programme acknowledged that gender relations play an important role in the management of agrobiodiversity, which is in line with recent studies.[6] It worked under the assumption that women, as managers and custodians of crop diversity, and having extensive traditional knowledge, contribute significantly to farmers' seed systems. For the Programme to achieve its goal, women's participation and inclusion—in FFS activities in particular—was indispensable. At least 1,890 women (72%) out of a total of 2,614 farmers in Peru, Vietnam, and Zimbabwe directly participated in Farmer Field Schools. Emphasis on participatory appraisal and discovery-based learning (rather than using one-way technical training), has enabled farmers—especially women farmers—to (independently) identify and propose solutions to challenges such as suboptimal yields, pest and disease infestations, climate change effects, and lack of access to agro-ecologically suitable diversity. FFS is also an effective learning environment that offers essential opportunities for interaction; and for collaboration between farmers and indigenous communities and experts from the public sector (breeding institutions, gene banks, universities, meteorological offices). In addition, the Programme has built on women's knowledge of (and skills in) managing plant genetic diversity, by addressing gender roles and differing needs. At the end of the three-year implementation period, results showed that both the Programme and the communities had benefited from working with women and their social networks. This was further substantiated by the Programme's six scaling-up pathways;[7] gender inclusion is not only an important pathway, it is also embedded in all the other pathways.

Programme activities included three case studies, conducted in Peru, Vietnam, and Zimbabwe. A baseline survey was conducted in each country at the start of the Programme, and from 12,600 target households, there were 847 respondents (60% women). At the end of the three-year implementation period, endline studies were conducted in the three countries, and results measured against four key indicators that had been agreed at the

[6] Howard, P. (Ed.). 2003; Nuijten, E. 2010; Pionetti, C. 2011

[7] The six scaling-up pathways are: Plant Genetic Resources for Food and Agricuture (PGRFA) Participatory Toolkit; Farmer Field School (FFS); PGRFA Access; Policy Influencing; Climate Change Response; Gender Inclusion. A full copy of the report is available at: https://www.sdhsprogram.org/publications/scaling-up-pathways/

outset: households reached with percentage of women participating, seed security, food security, policy engagement.

The baseline survey helped the farmers to analyse and better understand their livelihoods, particularly their seed and food security and past and present changes in cropping patterns and farming practices. It also helped identify challenges to their livelihoods—and opportunities for improving them. A baseline survey tool was developed within the research framework and cross-referencing was done, using a range of information sources such as household interviews, participatory rural appraisals, including focus group discussions (FGDs), and public statistical and meteorological data. Additionally, seven[8] FGDs were conducted in Peru, Vietnam, and Zimbabwe at the end of the Programme; these concentrated on women-specific roles, knowledge, and needs in seed management. In total, 135 farmers participated in the FGDs (97 women[9]). The case studies focus mainly on the innovation, lessons, and achievements in gender inclusion.

> "Taking women's particular knowledge about local environmental conditions, seed systems and crop diversification strategies into account facilitated the farmer-to-farmer transfer of innovation and strengthened the capacity of (women) farmers to autonomously identify "new" coping mechanisms in traditional practices, knowledge and biodiversity for food and agriculture."
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[8] Two FGDs were carried out in Peru (Choquecancha and Pampacorral communities); three in Vietnam (Bao Ai commune, Bac Ha commune and Chieng Sinh commune); and two in Zimbabwe (one community in each of Chiredzi and Goromonzi districts).

[9] Twelve women participated in Peru, 44 in Vietnam, 41 in Zimbabwe.

1. THE PERU CASE STUDY

1.1 CONTEXT

In Peru, the Programme directely benefited 2,062 Quechua families in 23 rural communities, in Lares. This is one of the poorest districts in Cusco, according to INEI[10], whose figures show that 97.8% of the population there live in poverty, and of those, 89.2% live in extreme poverty. The Lares valley is located at the centre of the origin of potato, an area nurtured for centuries by the deep-rooted, local food systems of the Quechua peoples.[11] Potato is important to the Quechua peoples' food and nutrition security and to their livelihoods. The farmer seed system of saving and exchanging Andean potato tubers has played an important role in maintaining diversity for thousands of years, and continues to be the norm in potato cultivation today. This informal seed system[12] provides 95% of the tuber seed for the Andean regions. A study focused on the seed network in the Andean countries[13] reported that supplies of tuber seed in local markets were not always reliable.

The farming communities of the Programme areas are based, primarily, in two agro-ecological zones: the Puna Zone (Upper Valley Zone) and the Quechua Zone (Middle Valley Zone).[14] Land ownership in Lares is communal; families manage the land according to their own needs, and management is transferred from one generation to the next. The size of the average family farm is 0.8 ha, and the most common crops are potato and maize, grown under rain-fed conditions. Besides potato (the main crop), other Andean root and tuber crops are cultivated too; and in the middle zone, beans and quinoa are grown in addition to maize. Livelihoods in the Lares valley are based on subsistence farming—and occasional sales of surplus in the local market. The baseline survey corroborated an earlier study, that climate change poses a serious risk to food security in the Lares district. Schaefleitner et al. (2011)[15] have reported that in the coming years, potato cultivation will be increasingly

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[10] Instituto Nacional de Estadística e Informática. 2010.

[11] ANDES. 2013.

[12] Agriculture in developing countries is characterized by small-scale farming, which relies heavily on the informal – rather than the formal, commercial– seed system, and is the basis for farmers' livelihoods and national food security in these countries. One of the primary features of the informal seed system is the wide spread practice of freely saving, replanting, exchanging and selling seed (Berne Declaration. 2014).

[13] Zimmerer, K.S. 2003.

[14] Lares valley is divided into three agro-ecological zones (upper, middle, and low).

[15] Schaefleitner, R., J. Ramirez, A. Jarvis, D. Evers, R. Gutierrez, and M. Scurrah. 2011.

affected in many of the present cultivation areas; mostly by heat stress. This means that the appropriate conditions for potato crops are expected to shift to ever higher altitudes. It is also predicted that temperature increase will result in more virulent outbreaks of potato diseases that could result in increased yield losses.[16]

The baseline survey results revealed that almost all farmers in the Low and Upper Zones attributed the loss of traditional species to extreme weather events. Fifty percent attributed an increase in pests and diseases to climate change, which was resulting in increased problems for their crops.[17]

With an overview of the combined challenges of climate change and access to seeds, it is clear that the formal seed system has played an important role, primarily in introducing new varieties, including many selected for resistance to pests and diseases particularly late blight (in the selection of which, farmers play a key role). The International Potato Center (CIP) reported that two modern varieties released (by CIP) in 2004—and which farmers helped test and evaluate—sustained yields of five tonnes per ha in 2010, when the potato crop was infested with late blight.[18] Yields of other varieties decreased to two tonnes per ha in that year.[19]

1.2 WOMEN'S SEED MANAGEMENT IN LARES

In Lares, women are the principal custodians of seeds and are responsible for households' seed-management activities. They are directly responsible for food crop production and take into consideration seed selection factors that are critical for families' food and nutrition security. The baseline survey in Peru confirmed that women in the Programme areas have continuously adapted their seeds to the different agro-ecological zones,[20] and maintained knowledge of varieties that have been adapted to different ecological niches and varying altitudes.[21] Farmers in Lares have observed climate change, and responded by cultivating and assessing higher number of cultivars for adaptation. It is reported that they adapt to increased drought incidences by cultivating more drought tolerant traditional variety[23], and use resistant variety[22] to respond to increased pest/diseases occurrences; also by changing their land use—i.e. growing their preferred varieties at higher altitudes. It has been observed that men and women normally share responsibility for seed selection and storage. In the Middle Zone, where subsistence farming is more prominent than in the Low Zone, almost 76% of households reported that women are solely responsible for seed storage. The baseline survey also highlighted that in 100% of households in the Upper Zone, the women largely make decisions about which potato varieties to cultivate, since they are most familiar with the characteristics of the native potato varieties grown in their community (shape, colour, taste and flavour of the tubers). During seed selection, women take all these characteristics into account, to ensure optimal nutrition levels in the meals to be prepared.[24] To this end, every day, the women prepare steamed *mote* (boiled maize), toasted grains and pulses, parboiled tubers, as well as nutritionally rich combinations of ingredients in soups and stews.

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16 Rodomiro Ortiz. 2012.
17 ANDES. 2013.
18 Phytophthora infestans causes the serious potato disease known as late blight or potato blight.
19 Personal communication with R. Salazar. 2015.
20 Low, Middle, and Upper Zones
21 ANDES. 2013.
22 Boli variety in the Middle and Upper Zones
23 Canchán variety in the Middle Zone and Boli variety in the Upper Zone
24 Tapia, Mario. E. and Ana De la Torre. 1998.

While both men and women are involved in crop selection, have specialised local knowledge, and use a variety of criteria to choose between crops; women use different criteria than men. For example, women in Pampacorral explained that although both men and women take part in harvesting, the women primarily sort and distribute the potato tubers according to family needs.[25] They also separate tubers to be used in the next planting season from those selected for family consumption (e.g. to be processed as *chuño*[26]), and exchange any that remain. They carefully observe the quality of the sprouts, and meticulously select the cleanest and healthiest seeds (many "eyes", indicate sprouts), i.e., that are free of blight and other diseases and have no damage or cuts from harvesting or pests including worms. Women are in charge of the activity known as papa chauchuy; this is tuber selection by removing those with blighted sprouts (normally two days before planting). The women turn to their traditional knowledge for storage and preservation of the potato cultivars; they store them in a warehouse made of wood, in which the tubers are covered with *ichu*, a specific type of grass. They are also responsible for cleaning and disinfecting the storage room, to prevent infestations of the potato tuber moth and the Andean weevil. Both men and women rely on biocultural indicators, amongst other tools, to make decisions during planting season. For example, although site selection is a family decision, it has been observed that women use plant indicators—useful for predicting soil fertility—as one of the criteria for site selection. Men, however, observe the colour of the land and calculate the size of the land area to assess the quantity of seed required. (During the planting season, men also use the crescent phase of the moon to identify sowing time) Box 1. Table 1.[27]

Women play an important role in seed exchange and run the barter market. Local markets, including the barter markets, play an important role in the informal seed system in Lares, as they facilitate the movement of varieties and the exchange of diverse food produced in the agro-ecological zones. The women in Pampacorral reported that when they lost native potato varieties in Pampacorral to blight, they were able to recover those varieties from a neighbouring community through seed exchange.

BOX 1. WOMEN'S TRADITIONAL KNOWLEDGE ON PLANTING TIME

"As previously practised by our foremothers and forefathers, we continue to observe biocultural indicators, such as reading the stars, observing the wild plants and the behaviour of wild animals such as the fox, to decide when is the best time to start sowing."

Source: Focus Group Discussion with women participants in Pampacorral. ANDES. 2015.

[25] Focus Group Discussion in Pampacorral community. ANDES. 2015.

[26] To make Chuño, potatoes are left to freeze overnight, then thawed in the sun and crushed by foot, to extract their liquid. They are then frozen again, and the process is repeated until the potato is dehydrated.

[27] Focus Group Discussion in Pampacorral and Choquecancha communities. ANDES. 2015.

Women farmers in Lares gather and select potato tubers for the next planting season during an FFS session.

Photo: Liska van der Heide/ Oxfam Novib

TABLE 1

BIOCULTURAL INDICATORS USED BY WOMEN AND MEN IN LARES

BIOCULTURAL INDICATORS	TIME	FAVOURABLE PREDICTION	UNFAVOURABLE PREDICTION	RELIABILITY
Algae in the river, creek, or spring (Mayu lacco o lacco)	August–September	Intense green colour means it will be a good year for crops. Timely harvest may be expected.	Late appearance of algae in September and yellow/burnt appearance, due to frost, indicate delayed crops.	Widely used, and considered reliable.
Grouping of stars (Qolcca)	Mid or end June (13th or 24th)	First appearance of a big group of stars indicates a good year, with normal crops.	First appearance of a small group of stars is a sign of a bad year, hence planting time should be adjusted or delayed.	Widely used, and considered reliable.
Singing or crying fox (Atocc waccac)	August or September	A long cry or singing, giving the impression of a laugh or contentment, means a good year, with normal rainfall.	A short incomplete cry indicates a bad year, with irregular rainfall and low yield.	Widely used, although some said that it is not always reliable.
Fruit signs (avocado, mango)	September–October	Little flowering means little potato yield and plenty of fruit for barter.	Ample flowering means good potato yield but less fruit for barter.	Widely used by people living near the stream.
Fruit signs (Pichinchu rurun)	May	Small quantity of fruit indicates more food and good harvest.	Large quantity of fruit indicates less food and bad harvest.	

Source: Focus Group Discussion in Pampacorral and Choquecancha communities. ANDES. 2015.

1.3 INNOVATION AND RESULTS

ROLE OF TRADITIONAL KNOWLEDGE IN POTATO REPATRIATION

Given the challenges posed by climate change and the uncertain availability of potato cultivars in the market, the Programme's prime intervention in Peru focused on increasing access to plant genetic resources (PGR). This was done by transferring a high number of native potato cultivars (approximately 400) from one Programme area in Peru to another, i.e., from the Potato Park[28] 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. CIP also assisted in evaluation trials of potato varieties in the Potato Park. This model is based on an indigenous landscape approach that contributes to a key objective of on-farm conservation: maintaining crop evolution in farmers' fields and landscapes. The approach supports farmers' efforts to adapt cultivars to their changing field conditions and to socio-cultural preferences. The repatriated seeds have enriched Lares communities' traditional seed systems. Both women and men farmers have been able to experiment with and reintroduce the repatriated seeds, selecting some—especially those with climate resilient traits—and discarding the rest. From the first repatriation batch, only 19 of 174 cultivars survived late blight.[29] An important lesson learned from the first repatriation (and useful for future reintroductions) has been the need to build on and advance the existing traditional knowledge of Lares communities—in particular of Lares women. Traditional knowledge embedded in local customary laws recommends that land infested by late blight be allowed to return to full organic fertility before re-cultivating. Fields on such land should be allowed to rest for at least six years (fallow period) before planting a new potato crop, in order to restore the soil condition. The fact that only 19 cultivars survived highlights the importance of Lares farmers' traditional knowledge which, for decades, has been essential for managing and adapting plant genetic resources in a changing context. It also underlines the importance of community monitoring and evaluation in future potato (re)introduction efforts. After the first repatriation, women and men farmers subjected the surviving cultivars to further observation, since they have the potential for blight resistance. Farmers' experience with the first transfer resulted in the transfer of a new batch of 225 cultivars to a communal plot, located at higher altitude areas in the Lares valley. Based on this experience, a protocol is being drafted by the Potato Park, Lares communities, and ANDES[30] for the transfer of material from the Potato Park to Lares. Farmers'—especially women's—traditional knowledge, is embedded in the protocol.

1.4 LESSONS

The case study in Peru illustrates one of the Programme's major achievements: to provide farmers with greater access to diverse plant genetic resources, through cooperation between the Lares communities, the Potato Park, and CIP. It also demonstrates how women farmers were able to strengthen their technical capacities by participating actively in the assessment and selection of repatriated native potato cultivars, and in the evaluation of the reintroduction process. The transfer of native potato cultivars back to the Lares communities allowed women and men farmers to select from a range of cultivars that had previously been lost from their fields. This reintroduction contributes significantly to the community diversity portfolio and enables them to respond to changing climatic and socioeconomic conditions. The repatriation highlights the importance of building on traditional knowledge—especially women's. Further collaboration is foreseen, to ensure that the protocol for transfer from public

[28] The Potato Park was established to conserve potato biodiversity in the Cusco region of Peru.

[29] Oxfam Novib et.al. 2014.

[30] ANDES. 2014.

BOX 2. TRADITIONAL SEED MANAGEMENT RITUALS

The *Papa Watay* ritual, through which the potato spirit is connected with Mother Earth (Pachamama), is performed during the harvest period. Potato collections (a wide range of varieties) from individual households and/or the community, are exhibited as an offering to Mother Earth for her generosity.

The *Papa Watay* ritual confirms the importance of potato diversity to the community in Lares. Women and men farmers have conserved potato diversity for decades, and continue to do so by continually adapting and selecting the cultivars that suit their local climate, agro-ecological conditions, and needs.

The traditional values of the Lares communities, including the Papa Watay ritual, have been the main drivers of the conservation and management of potato cultivars, and are closely interlinked with FFS implementation objectives in Lares. Integration of these traditional values in FFS activities should be encouraged.

Rich selection of potato cultivars managed by the women farmers in Lares

Photo: Jiska van der Heide/Oxfam Novib

breeding institutes will be tailored to better address farmers' needs and better facilitate their requests for germplasm. In addition, the case study illustrates the importance of strengthening the role of the barter market, through which farmers in and outside the community can exchange crop products and seeds, while sharing related knowledge and experience in seed management and farming.

The Peru case study shows that the FFS in Lares benefits from, and builds on, decades of traditional knowledge from the Lares communities, and that it promotes further exchange of women's traditional knowledge, in particular. It also confirms that although men and women both have traditional knowledge, both are specialised in observing different biocultural indicators. For example, while men observe the moon for an indication of the appropriate sowing time, women use their knowledge of the biocultural indicators of plants and animals to select the best sites. Women in Lares are also recognised for their local knowledge about seed selection, storage, and exchange and barter. Through the FFS, local knowledge was exchanged and recognised as women's contribution to community seed management.

2. THE VIETNAM CASE STUDY

2.1 CONTEXT

The Programme in Vietnam was implemented in four communes in four provinces (Tan Vinh commune in Hoa Binh province; Chieng Coi commune in Son La province; Da Loc commune in Thanh Hoa province; Yen Hop commune in Yen Bai province), and directly involved 6,750 households. These four provinces are home to a number of ethnic minorities, e.g., Muong, Tay, and Dao (Hoa Binh); H'mong and Muong (Son La); Muong (Thanh Hoa);[31] Nung, Cao Lan, and Dao (Yen Bai). Vietnam is the world's second largest rice exporter, and rice production has a prominent role in terms of food security, rural employment (two thirds of the rural labour force[32]), and foreign exchange. Rice cultivation is central to agriculture in Vietnam, and the crop occupies 82% of the country's arable land.[33] In 2012, this was approximately 7.8 million ha,[34] of which approximately 1.8 million ha was cultivated in the north.[35]

Although 23% of total rice cultivation is in the north, the average farm size per household in the north is very small—ranging from 0.1–0.4 ha.[36] The baseline survey in Vietnam revealed that the practice of saving and re-using rice seeds for the following planting season has almost disappeared.[37] More than 90% of farmers in Hoa Binh, Yen Bai, and Thanh Hoa, and 66% in Son La depend heavily on purchasing seeds, particularly hybrid or other modern improved varieties.[38] Although hybrid rice is widely promoted by the government, inbred varieties (both modern and traditional) still take up much of the rice land in the north, especially in the summer-autumn season.[39] The dominance of the commercial production

[31] The Tay, the Thai, and the Muong are the second largest ethnic groups in Vietnam (Hai-Anh Dang. 2010. A widening poverty gap for ethnic minorities. Chapter 8: Vietnam)

[32] IFPRI. 2010.

[33] IRRI. 2010.

[34] FAOSTAT. 2012. http://faostat.fao.org/site/709/DesktopDefault.aspx?PageID=709#ancorhttp://faostat3.fao.org/home/E

[35] Nguyen, N. L. 2013.

[36] SEARICE. 2013.

[37] Oxfam Novib et. al. 2014.

[38] SEARICE. 2013.

[39] From approximately 1.8 million ha rice land areas, 1.1.million ha of rice land areas in the North is still dominated by inbred varieties, while the remaining is planted with hybrids (Nguyen, N. L. (2013)).

of hybrid rice has contributed to the loss of diversity in the rice fields of Vietnam.[40] Dependence on a limited range of varieties that lead to increased risk of disease (as the varieties eventually deteriorate) could make rice production more vulnerable.[41] This was significant in shaping the Programme's FFS objectives, and will continue to be relevant to further scaling up. Despite the dominance of hybrid and modern rice varieties, farmers still maintain some traditional varieties that are valued for their eating quality and/or cultural importance. This is especially true for sticky rice varieties, since very few (if any) new sticky rice varieties are coming from breeding and research organisations.

The baseline survey confirmed that farmers in the target areas of Vietnam are aware that climate change is happening, and have adapted their farming systems and choice of crop varieties accordingly.[42] Effects of climate change, especially drought and unpredictable weather patterns, have in fact led to an increased preference for early maturing varieties. Another factor influencing the shift in varietal preferences is the country's changing economy, resulting in scenarios of higher family income from off-farm activities than from farming. As a result, availability of farm labour is reduced, in turn influencing the choice of variety.

2.2 WOMEN'S ROLES IN AGRICULTURAL LABOUR AND FOOD SECURITY

In the four Programme communes in northern Vietnam, the baseline survey confirmed that women manage the fields and are the main workforce—doing most of the farm work. This is because men regularly seek off-farm work, especially in urban centres, as a result of the country's growing market economy. Women's roles in crop management are closely linked to their responsibility for ensuring daily household food security and stockpiling food for periods of scarcity. Many reported that the relatively small plots of land could not generate enough income and food, although these still contribute substantially to household food security. In some cases, (as in Phung village, in Chieng Sinh commune, in Son La province), the family plots could produce just enough for home consumption. The

[40] Oxfam Novib, ANDES, CTDT, SEARICE, CGN-WUR. 2015.
[41] Ibid.
[42] Oxfam Novib, ANDES, CTDT, SEARICE, CGN-WUR. 2013.

baseline survey showed that farmers in this commune are particularly likely to experience food shortages in April, May, and June.[43] In these months, women often have to resort to the market for rice, as the rice produced on-farm is not enough to feed the family.

As managers of the fields, women decide—often together with their husbands—which rice varieties to plant. In Vietnam (as in Peru and Zimbabwe) they are actively involved in seed management; this involves a range of activities such as selection, storage, transplanting, maintenance, and exchange. The Farmer Field School has built on and strengthened the important roles played by women, by ensuring they are included and participate in all FFS sessions, and by responding to women's varietal preferences during selection and breeding.

2.3 INNOVATION AND RESULTS

STRENGTHENING WOMEN'S ROLES IN BIODIVERSITY MANAGEMENT THROUGH FARMER FIELD SCHOOLS

Through the Programme, the South East Asia Regional Initiatives for Community Empowerment (SEARICE), in collaboration with local partners in Vietnam[44], have successfully established nineteen season-long Farmer Field Schools in nineteen communes, directly involving 630 farmers (79% women).

Using the diversity wheel[45], during FFS sessions women farmers displayed a strong preference for growing traditional varieties of sticky rice such as *Nep Lech*[46], grown in Bao Ai commune in Yen Bai province, and *Tan Do*, grown in Chieng Sinh commune in Son La province. These traditional varieties have been in their families for hundreds of years and are valued for their cultural importance and eating qualities (aromatic with a soft, glutinous texture). The women in Chieng Sinh commune noted that the same yield of the *Tan Do* variety could feed more people than other sticky rice varieties.[47] (The higher dietary fibre and protein contents of *Tan Do* may be the cause of satiety.[48]) Over time, however, in terms of productivity, taste, aroma, and tolerance to pests and diseases, the quality and characteristics of these traditional varieties declined. The farmer field school in Vietnam has been instrumental in re-establishing women's access to these preferred traditional varieties; they have been able to rehabilitate and enhance their favourite, traditional sticky rice varieties, Nep Lech and Tan Do. Building on women's traditional knowledge of variety selection, the FFS provided the technical and scientific background to select the plants with the best properties. The FFS helped women participants identify their preferred traits, and after three seasons of systematic selection, the quality of their Nep Lech variety was enhanced, with a reported increase in income as compared to hybrid (box 3) and higher concomitant resistance to pests and diseases. This case is an illustration of conservation through use; women preserved their local

[43] In another village (Pot village) in Chieng Sinh commune, it was reported that 26% of households experience food shortage for 33 days per year. The longest period of food inadequacy recorded was up to 180 days. (SEARICE. 2013)

[44] Mainly: The Centre for Sustainable Rural Development (SRD), and the Plant Protection Department (PPD) of the Ministry of Agriculture and Rural Development (MARD) and the Field Crops Research Institute (FCRI).

[45] The diversity wheel is a tool that aims to assess, in a participatory way, the amount of crop diversity available in a community, identify varieties at risk of disappearing, and account for varieties that have disappeared from the communities. The Local Initiatives for Biodiversity, Research and Development (Li-Bird), Bioversity International, and IFAD collaborated on the development of the tool.

[46] Nep Lech is a traditional sticky rice variety, normally grown in small plots of land to make rice wine and cakes, especially for traditional festivities such as the Tet Holiday.

[47] Three bowls of other sticky rice varieties were necessary per person but two bowls of the *Tan Do* variety were sufficient (Focus Group Discussion in Vietnam in Chieng Sinh commune, Son La province. Oxfam Novib. 2015).

[48] However, further research on the nutrition composition is required to provide a scientific explanation for the higher satiating capacity of the Tan Do variety.

Women farmers participating in an FFS participatory plant breeding exercise in North Vietnam

Photo: Hoang Huy/ Oxfam Novib

BOX 3. FFS CONTRIBUTION TO WOMEN'S TRADITIONAL KNOWLEDGE AND SEED SECURITY

"Our parents and grandparents taught us how to perform variety selection on sticky rice. For example, they taught us how to hand-dry the grains, choose seeds that are uniform in size and appearance, then use these seeds for the next crop. When we participated in the FFS, we learned new ways to select! Now I know how to select seeds from a standing crop, and how to choose panicles that are alike and will flower at the same time. I also know how to observe the leaf and the root, and why I should choose a certain set of characteristics or traits. FFS has not only taught us how to rehabilitate, it has also facilitated cross breeding, and shown us how to develop new varieties".
(**Source:** Ms. Nhu, Bao Ai commune. FGD in North Vietnam, 2015)

"After learning how to cross-breed and develop new varieties, my family now supplies five pure-bred varieties to several villages! Four of these were provided by the Field Crop Research Institute; the fifth I received through exchange with a neighbouring village. In the past I had to buy hybrid seed that came from China, but now I can produce my own seed—that has greater productivity and sells for a higher price. Now I sell the rice grain and exchange the seeds. I feel a lot more confident, thanks to the FFS!
(**Source:** Ms. Huong, Bao Ai commune. FGD in North Vietnam, 2015)

"I have an area of 0.1 ha that was used exclusively to grow a Chinese hybrid, but after participating in the FFS, I was brave enough to grow only Nep Lech. The Chinese hybrid would usually yield a 500 kg harvest; Nep Lech yields only around 300 kg, but it fetches a very good price in the market, so I earn more. With the income from Nep Lech, I can then buy two tonnes of hybrid rice! The Nep Lech harvest is sold as young sticky rice, and even the stalk can be used as straw, to produce brooms that are sold for USD 1.10 each. (The stalk is much stronger than that of hybrid varieties.) Also, I have more savings as a result of using fewer chemicals. It was a good decision to choose Nep Lech—my income has increased four-fold!"
(**Source:** Bao Ai commune woman farmer. FGD in North Vietnam, 2015)

cultivar, not simply by maintaining its original traits, but by reselection and enhancement. In addition to strengthening women's technical capacities, FFS has helped significantly in disseminating improved or newly selected rice varieties and associated knowledge[49], to communities outside the Programme's target areas. This is illustrated in the endline report[50] which showed that at least eighteen stable, climate-resilient rice varieties (i.e., with good lodging tolerance, drought and salinity tolerance, flood tolerance, and broad adaptability to many different soil types) were developed through FFS activities in the four communes, in Vietnam. Women farmers' preferences for early maturing varieties—that can be grown twice a year—were taken into account as selection criteria. In addition to these newly developed varieties, thirteen varieties (nine traditional), including the preferred sticky rice varieties, Nep Lech and Tan Do, were rehabilitated, enhanced and grown extensively in farmers' fields.

The case study further confirmed that the Programme's positive result was the main catalyst for the wide dissemination of seeds and associated knowledge (within and outside the programme area). A woman from the FGD reported[51] that her neighbours had requested some of the improved seeds after witnessing the good yield. Normally, one kilogramme of improved seed variety is exchanged for one kilogramme of other seeds, or for grains, or money. The women in Bao Ai commune, for example, have been exchanging seeds with six neighbouring villages. Since the culture of sharing is very prominent amongst the women, anyone can have access to good (improved/new) seeds. The women in the Programme sites typically exchanged at least two rice varieties, CN19 and GL102. During the exchange, they described the characteristics of each seed variety and how to grow it, and shared their personal experience with it. Single transplanting and water regulation have been reported as the most common cultivation techniques the women shared when exchanging seeds. The women confirmed that after being introduced to the new techniques in the FFS sessions, they changed their transplanting method, from 3–4 kg seeds per sao[52] to less than 1 kg per sao. These examples show that women are effective agents in strengthening the seed supply in the Programme areas. The Plant Protection Department in Son La province reported that Chieng Sinh commune alone now provides 15% of its total seed demand, while in the past farmers relied entirely on external seed sources.

The introduction of a partnership model on participatory plant breeding, established between FCRI and FFS farmers in Son La province, is evidence of further innovation facilitated by FFS. The Plant Protection sub-Department in Son La acknowledged the benefit of the partnership since FCRI provided not only technical breeding support but, most importantly, access to new varieties and/or early segregating materials that could be further selected in FFS fields, to match local conditions and needs.[53] Through this partnership, the FFS participants (both men and women farmers) successfully applied bulk selection techniques for three seasons on two early segregating populations from FCRI. This resulted in well performing cultivars that were stable at F8 (8th generation). These two F8 cultivars outperformed all other rice varieties during the severe drought conditions experienced at the beginning of 2015.

[49] Knowledge of FFS-introduced cultivation techniques.

[50] Oxfam Novib, et al. 2015.

[51] Focus Group Discussions in Bao Ai commune (Than Hoa province); Bach Ha commune (Yen Bai province); Chieng Sinh commune (Son La province). Oxfam Novib. 2015.

[52] 1 sao is approximately 497 m2.

[53] Key informant interview with PPSD in Son La. Oxfam Novib (2015).

2.4 LESSONS

The case study in Vietnam demonstrates the remarkable capacity of women farmers, in particular, to improve crop production and address the need for crop and variety diversity at community level. They have also been able to adapt to challenges posed by climate change and changing market conditions by systematising the management of their diverse crop portfolio. In addition, through careful selection, they have been able to enhance the productivity of their preferred varieties. These results amount to a clear appreciation of women's work: how it supports household and community food security, how it leads to increased income, and how it enhances the community's preferred varieties such as *Nep Lech* and *Tan Do*.

The case study confirmed that women have become more seed secure as a result of strengthened technical capacities. They are now much better placed to control the quality of the seeds they produce; also to select and store seeds for the next growing season. Previously, each season they had to rely on purchasing costly hybrid rice seeds, the quality of which was reportedly unreliable. The women confirmed that their selected variety had a higher yield, improved qualities, and fetched a higher price in the market. The women in Go Chua village (Bach Ha commune, Yen Bai province) confirmed that having control over seed is important to them, since women know which seeds are best suited to their local conditions.[54]

Seed security is particularly important, should a natural disaster occur. In case of flooding, the women now have direct access to seeds (for re-transplanting) that are well adapted to local conditions and needs. The case study also showed a link between seed security and food security. Loss of harvest to severe drought, for example, as experienced in Son La in early 2015, could have dire implications for households' food security. That season, farmers were instead able to cultivate their own improved, drought tolerant variety.

Recognition of the important role played by women in biodiversity management is another significant achievement. After participating in the FFS, women's knowledge and skills in selection, storage, transplanting, maintenance, harvest, and exchange (including new knowledge on variety enhancement) have been acknowledged by many stakeholders. It is clear that women often have a broader set of varietal selection criteria than men, since they use plant materials in more diverse ways. For example, as shown in box 2, rice not only provides food, but also straw that can be used to produce brooms and, in turn, generate additional income. At the household level, women now feel more confident to make independent decisions about which varieties to cultivate. A further example of the increasing recognition of women's knowledge and capacities is that women are now being recruited by PPSD as field instructors in Son La province.[55]

FFS also facilitated increased access to crop diversity by (re-)introducing crops and varieties that had disappeared from the farming systems. Participation in FFS permitted women farmers to access higher yielding and novel rice varieties from public breeding institutes, and select their preferred traits from within these varieties. The Programme will continue to work on facilitating this partnership, so that farmers (particularly women farmers) will have access to a wider range of varieties and be able to improve skills in line selection, in an effort to adapt to climate change. The Programme will also ensure inclusive priority setting and breeding approaches (within the formal breeding sector) that better accommodate farmers' needs.

[54] Focus Group Discussion in Go Chua village, Bach Ha commune, Yen Bai province. Oxfam Novib (2015).
[55] Key Informant Interview with PPSD, Son La province. Oxfam Novib (2015).

Indigenous women participating in a Farmer Field School session in North Vietnam.

Photo: Hoang Huy/Oxfam Novib

3. THE ZIMBABWE CASE STUDY

3.1 CONTEXT

The Programme in Zimbabwe was implemented in four districts, located in three provinces—Chiredzi district (Masvingo province); Goromonzi, and Uzumba Maramba Pfungwe (UMP) districts (Mashonaland East province); Tsholotsho district (Matabeleland North province)—and focused on 6,720 primary target households.[56] The baseline survey report confirmed that crop production is the most important source of livelihood. Farmers practice mixed agriculture that includes livestock keeping and crop and horticultural production. Most households have access to approximately two hectares of land; many are very poor, with limited land and labour. The Programme sites are located in agro-ecological regions II-V[57]; region II is characterised by high rainfall (750–1 000 mm per year) and moderate temperatures for crop production, whilst region V is semi-arid to arid, with low and erratic rainfall (< 450 mm per year). In these different regions, only a small percentage of the Programme areas (16% of the UMP district) is located in an area suitable for crop production. The area is located in agro-ecological region II, with good granitic loam soils. Maize is the major cereal crop and the staple diet of Zimbabwe. Ninety percent of the arable land in the four districts is dedicated to maize,[58] and ninety-eight percent of households in all districts grow it: it is a preferred food, it is important to economic and food security, and the government provides incentives. Despite being highly subsidised, access to good quality seeds and suitable maize varieties is a challenge. Farmers in the Programme districts struggle with recurring drought and maize crop failures. In fact, climatic conditions in Chiredzi, Tsholotsho, and some parts of UMP are not suitable for maize production. Lack of suitable crop varieties is cited as a reason crops can fail.[59] For crops other than maize, farmers seem to be relatively seed secure. Farmers' seed systems supply nearly all the seeds planted by farmers each season, such as sorghum, pearl and finger millets, legumes (groundnuts, bambara nuts,

[56] Initial target beneficiary was 3,800 households. So there is an increase of 2,920 households.

[57] Zimbabwe is divided into five agro-ecological regions: I to V with sub-divisions, based on rainfall levels (among other factors).

[58] In Goromonzi, Tsholotsho, and UMP, maize is grown on holdings of 0.4–0.8 ha; in Chiredzi it is grown on holdings of more than 0.8 ha. Smaller plots of land (below 0.4 ha) are normally used to cultivate groundnuts, round nuts, and cowpeas.

[59] CTDT (2013).

cowpeas), and indigenous vegetables.[60] As a country that depends mainly on rain-fed agriculture, Zimbabwe is extremely vulnerable to climate variability and change. A recent UNEP[61] report cited that with 4 °C warming, annual precipitation in southern Africa is projected to decrease by up to 30%, and with warming exceeding 3 °C, globally, virtually all the present maize, millet, and sorghum cropping areas across Africa could become unsuitable for the current portfolio of cultivars. It is predicted, therefore, that climate change will have a significant impact on Zimbabwe's agriculture sector. The baseline survey confirmed this prediction. It showed that in all districts, 95% of farmers have observed that the first rains now fall in different months, and 90% reported that unpredictable, dry spells were more common than before. According to the farmers, these dry spells are also lasting longer: two–three weeks, sometimes up to a month, compared to a maximum of two weeks before the year 2000. The shifting of the dry spell has resulted in poorer crop yields, which is compromising food security. Eighty percent of the farmers have experienced drought and flooding, which they attribute to natural processes, including climate change. Flooding, although less frequent than drought, has also been experienced in the four districts, and is also attributed to natural processes and climate change.

3.2 WOMEN'S TRADITIONAL KNOWLEDGE OF WEATHER FORECASTING

As observed in Peru and Vietnam, results from Zimbabwe showed that women farmers play a key role in crop diversity management. Women manage diversity of vegetables and small grains, and men manage diversity of crops that have a high market value. Traditionally, women are more concerned with household nutrition, while men focus on household assets and income.[62] As the main providers of food, women are more resourceful and continue to turn to traditional knowledge when managing crop diversity, so they can adapt to climate uncertainties. They have developed and used plant varieties with traits that allow adaptation to local environments and climates, and resistance to pests and diseases. Knowledge of, and skills in, weather forecasting are also important for adaptation; women apply traditional knowledge gained from observing

[60] Ibid.
[61] United Nations Environment Programme. 2013.
[62] CTDT. 2013.

several local indicators. The most commonly used indicators are: animal behaviour, tree phenology, pre-season heating and cooling, prevailing wind direction, and cloud systems. The women confirmed that cloud type and wind direction are the most frequently used indicators of planting time.

Both women and men farmers in Zimbabwe plan their production cycles from one year to the next. Planning is based on observable environmental conditions, and the climate information derived is used to inform decisions on when, and which variety, to plant. This ability to predict, or forecast, is fundamental to their survival and adaptation to new environmental conditions. It was pointed out during focus group discussions[63] that women and men share and use the same knowledge and forecasting methods, to indicate the best time to plant.

The baseline survey shows that, in addition to traditional knowledge, farmers have reasonably good access to weather information provided by the public system. Approximately 80% have access to weather information from the Zimbabwe Meteorological Services Department (ZMSD), mostly through radio and Agritex (government extension services) personnel. Although the farmers can understand the weather information, and some use it when planning their agricultural activities, the survey results showed that generally the ZMSD weather information and the farmers' traditional forecasts do not match. For example, some farmers perceived a marked decrease in rainfall, while weather data indicated that average rainfall remained the same. The women farmers (confirming they still prefer to use traditional methods to determine planting time) argued that this is because formal weather forecasts (and data) normally relate to wider areas (i.e., more than one province), but rainfall has become more localised. Nowadays it can be raining in one locality, while in another—just two kilometres away—it remains very dry.

To cope with climate variability, women farmers in the drier districts of Chiredzi, Tsholotsho, and UMP have responded to more frequent drought conditions by growing short duration varieties and more small grain cereals. Increasingly, farmers are now growing, on average, five–six different crops and three–four different varieties per crop, although they also use a mix of traditional and modern varieties. Greater on-farm crop diversity was reported in the drier districts of Chiredzi and Tsholotsho than in the other districts.[64] This has been interpreted as a measure to counter climate-induced risks.

3.3 INNOVATION AND RESULTS

FFS AS A FORUM FOR INCREASING WOMEN'S CROP DIVERSITY FOR CLIMATE ADAPTATION

The baseline survey showed that traditional, locally-developed practices and knowledge of observable natural and/or environmental indicators were the main tools used by farmers to predict weather. The perceived changes in these observable indicators, over time, formed farmers' opinions and perceptions of a changing climate, which subsequently informed their adaptation strategies. The increasing challenges posed by climate change make it essential to compare farmers' perceived changes with data from meteorological records. An analysis of the differences between the two may lead to an improved understanding of weather patterns, agronomic practices, and farmers' coping strategies.

The Programme in Zimbabwe and the Agricultural Meteorology Group of the University of Zimbabwe have jointly trained 122 extension officers in weather data collection and recording, and distributed 44 rain gauges to model farmers and the FFS. (The gauges complement farmers' existing simple rain gauges). The extension officers are the primary channels through which government agricultural information is shared

[63] In Chiredzi and Goromonzi districts. CTDT (2015).
[64] Oxfam Novib et.al. 2014.

BOX 4. WOMEN'S TRADITIONAL KNOWLEDGE IN WEATHER FORECASTING

Tree phenology: women associate an abundance of wild fruits (*tsambatsi*) with the early arrival of the rains—around 15 November—and that planting should commence between 15 and 20 November.

In two districts, Goromonzi and Chiredzi, women consider very hot conditions, followed by a strong humid wind, blowing from north to south, to be an indication that the rains will come within three–five days and that planting should commence immediately. Usually, farmers with adequate seed can plant their maize even before the rains fall (dry planting).

A prolonged winter season, ending around mid-September, is an observable indicator used by women to predict that the rainy season will start late (end of November/beginning of December) and planting will usually start in early December. The growing season will normally be poor quality, characterised by a long mid-season drought, lasting more than two weeks (anywhere from mid-January to end of February). Such prolonged dry periods indicate that the season will also end abruptly (around the end of February), resulting in a very short growing season.

When women farmers observe migrant stock birds in the area, they know the rains are coming in the next few days, and make plans to start planting.

Women consider mist (smoke) on top of a nearby mountain in Goromonzi to be an indication that the rains will come soon and planting dates can be determined. (The mist usually occurs two weeks before the on-set of the rainy season.)

Source: Focus Group Discussion in Chiredzi and Goromonzi. CTDT (2015).

with farmers, thus they play an important role in interpreting and disseminating agro-meteorological information, including climate forecasts. Programme support to improve farmers' understanding of weather forecasts (and any discrepancies that exist between those forecasts and farmers' perceptions), could be used to help farmers plan their agricultural calendar and manage their plant genetic resources. Farmers' greater access to weather forecast information has been ensured by formalising a partnership with one of the largest providers of telecommunication services in Zimbabwe, Econet Wireless. This partnership has initially enabled 450 farmers to access up-to-date agricultural information services, including weather forecasts, through its new service, *EcoFarmer*. *EcoFarmer* promotes the use of mobile technology for farming. Future work should further evaluate whether women have access to—and are likely to gain benefits from—this facility. Collaboration between farmers and scientists from the University of Zimbabwe on weather forecasts will be integrated into FFS activities, through the Climate Farmer School (CFS).

An initial analysis of formal weather forecasts and farmers' traditional forecasts was carried out, but as a more systematic approach is needed, this will be included in the FFS curriculum. Follow up FFS activities should look into ways of building on people's perceptions and traditional knowledge, to strengthen the use of weather forecasts in farmers' adaptation strategies. It will also enable the scientific community to address inconsistencies between meteorological data and people's perceptions.[65]

Taking account of the challenges posed by climate change (illustrated by the many failed maize crops in the drier areas of Zimbabwe), the FFS in Zimbabwe focused on the (re) introduction of additional crops to the farming systems, particularly staple crops—cereals, pulses, and root and tuber crops—that had traditionally played a role in the farming system, and crops that were important to women. As was the case in Peru and Vietnam, the Programme in Zimbabwe also ensured cooperation between farmers and public sector institutions. Two sorghum varieties were repatriated from the national gene bank (the Department of Research and Specialist Services of the Ministry of Agriculture) to farmers in the Chiredzi district. Four local sorghum varieties were repatriated to project communities in the UMP district. The varieties involved had been inadvertently lost from their

[65] Oxfam Novib, ANDES, CTDT, SEARICE, CGN-WUR. 2013.

farming systems. In collaboration with the Matopos Research Station of the Crop Breeding Institute of the Ministry of Agriculture, twelve sorghum and six pearl millet advanced breeding lines, and additional varieties of other crops such as maize and cowpeas[66] (both farmers' varieties and formal sector varieties), were introduced to farmers' fields. While small grains such as cowpeas, groundnuts, and round nuts are normally grown in a small area of land, they are important at times of food shortage.[67] By introducing new varieties and advanced lines within the Programme, the number of varieties cultivated per household in the Goromonzi district has increased from three to five.

3.4 LESSONS

To facilitate climate change adaptation, it is essential to help farmers enhance biodiversity management, mainly by integrating more crops and varieties into their farming systems. In Zimbabwe, this is done through linking farmers to (national) gene banks and public plant breeding institutions like CBI, CIMMYT, and ICRISAT.

In addition, multi-stakeholder, multi-disciplinary platforms and/or capacity building efforts that support interaction between farmers and experts in meteorology, climate, and agriculture (as currently being integrated into the Zimbabwe CFS) are fundamental to addressing farmers' decision-making requirements within a changing climate. The platforms aim to facilitate an open dialogue between climate and agriculture experts, allowing both to work together, to translate climate data and farmers' perceptions on climate variability into useful advice for farmers.

Integrating meteorological information with local traditional knowledge is important, to guarantee local relevance and optimal use of climate information. Farmers' knowledge[68] of the climate and observable environmental indicators is an important entry point and base for the CFS, and is documented using participatory rural appraisal tools. Therefore, the Programme will integrate climate change modules and disaster management into the PGRFA[69] participatory toolkit[70] and the FFS curriculum, to help mainstream climate change awareness and the options for coping with changes; also to facilitate continued dialogue and exchange between farmers and experts on climate, agriculture, and plant genetic resources.

[66] Respectively nine different varieties in Chiredzi, UMP, and Tsholotsho districts and a further eighteen different varieties in Goromonzi District.

[67] CTDT. 2013.

[68] both women's and men's

[69] Plant Genetic Resources for Food and Agriculture

[70] Season calendars will be used to measure weather patterns and crop performance.

Farmer Marjory Jeke observing the rain gauge in Zimbabwe

Photo: Shepherd Tozvireva/Oxfam Novib

4. CONCLUSIONS

All three case studies confirm the importance of women's roles and traditional knowledge in seed management. Women in the three countries continue to develop genetic diversity—preserving and improving cultivars—to meet their family subsistence needs and market demands. They have been involved actively in plant genetic resources management, including selection, saving seeds for the next planting season, and managing vegetative propagated materials and plant species for intercropping. The case studies revealed that women and men have different knowledge and different selection preferences. The selection criteria have developed as a result of years of experience, and aim to help manage risks such as climate variability and pests and diseases while optimising productivity. Women, however, ultimately make choices that will help guarantee daily household food and nutrition security. As illustrated in Vietnam, careful selection of breeding lines during FFS sessions, enabled the women in Son La province to develop an improved drought tolerant rice variety that withstood the severe drought of 2015 and outperformed other cultivars in the province. Women's capacity to pay meticulous attention to detail was deemed indispensable when selecting from the breeding lines; also in performing the painstaking operations required in cross-breeding (e.g. handling very small crop flowers). This has been substantiated by the Plant Protection Department in Son La, which reported that the Chieng Sinh commune is now providing 15% of the commune's total seed demand whereas, in the past, farmers had to rely solely on the market to obtain their seeds. The FFS in Vietnam demonstrated that women farmers were able to improve their skills by working with several different crop varieties that had been selected, developed, crossed, multiplied, and produced. It also confirmed that farmers (many of whom were women) could become plant breeders and, with good training support, proficient seed producers. The case studies in Peru and Vietnam confirmed that women's seed selection takes into account those characteristics and traits that meet daily households' nutrition security needs. In times of food shortage, women in Zimbabwe resorted to planting diverse crops as a coping strategy.

The FFS in Peru illustrated that, although both women and men rely on traditional knowledge of seed management, they use different biocultural indicators. Women are specialised in observing plant behaviour, to determine site selection (plant indicators determine soil fertility), while men observe the colour and size of the land.

The FFS in Zimbabwe reported that women's traditional knowledge on weather forecasting

is indispensable to managing crop diversity for climate change adaptation. Although women and men use the same knowledge and methods to predict the right time for planting, it seemed that as a survival strategy, women paid meticulous attention to directly observable environmental conditions. They reported that rainfall had become more localised, hence their particular attention to local indicators.

Women are often responsible for the informal seed exchange systems (including knowledge exchange). Acknowledging this, the Programme has built on women's social networks to strengthen farmer-to-farmer knowledge and skills transfer. The case studies showed that women's tradition of *sharing and exchange* can form an integral part of strengthening farmers' seed systems. Exchange between women has enabled further dissemination of technical capacities (e.g., on-farm management and plant breeding, the production of good quality seeds, and the maintenance of associated knowledge) to communities outside the Programme's target areas.

The challenges brought about by climate change mean farmers have to respond and adapt continually to irregular weather patterns; they do this by opting, where possible, for other varieties or crops that are better adapted to the new conditions.

The three case studies show, however, that farmers' capacity to adapt is also limited. Some of the diversity needed to cope with changing weather conditions may not be available in the communities, or easily accessible from external sources. By forging the collaboration between farmers and the public sector, the Programme aimed to address this gap. The case studies confirm that women, in particular, have benefited from collaboration with the formal sector (facilitated by the FFS). In Peru, they have been able to access the native cultivars that were lost from their fields. In Vietnam, they have exploited a number of new varieties and/or early segregating materials for selection and adaptation to their local conditions. And in Zimbabwe they have been able to provide additional staple crops (such as cereal and pulses) that are important for household food security.

The three case studies reaffirmed that women play an important role in making crop-production decisions and, in particular, managing plant genetic resources, to ensure household food and nutrition security. Through the Programme, the indispensable role of women in these areas has been strengthened, and become better valued. For example, in Bao Ai commune in Vietnam, the women participants obtained good harvests when they planted the improved rice varieties selected during FFS sessions. This success

helped the women gain the confidence and trust of their husbands, meaning they can now make decisions independently on which variety to plant. Previously, they had to make such decisions jointly with their husbands.

As illustrated in all three cases, because of the importance of women's inclusion and participation, three Programme innovations have been developed. The first example of innovation is *the inclusion of women's preferences when defining communities' breeding objectives*. The women in the three countries have detailed knowledge of, and strong preferences for, specific crop traits. This is confirmed by other studies showing that men and women often have markedly different preferences for, and knowledge of, crops. As a result, the Programme modified the participatory tools used in FFS, to make them more gender-sensitive and to ensure they better accommodate women's needs and preferences. This includes the integration of climate change modules, to promote further exchange between farmers (women and men) and experts in climate, agriculture, and plant genetic resources, in order to find local solutions to climate change issues.

The second example of innovation is *the improvement of learning methodologies and exercises on gender role awareness in the FFS curriculum*. The curriculum can be improved further, to include both gender and social inclusion perspectives. Important factors in the development and management of a gender-sensitive PGRFA Participatory Toolkit include: consciously selecting women participants; having women enumerators, gender disaggregated data, and gender balance in focus group discussions; and Training of Trainer (ToT) sessions for women, with an accompanying user-friendly and gender-sensitive ToT manual. The fact that FFS are conducted locally means women cannot be excluded for such reasons as not being able to reach the training site. In Vietnam, it has been confirmed that household negotiations will be required, to ensure that women are relieved from their household chores one morning per week. Data collection from the FFS sites is best done just after sunrise, when insects are easier to observe or gather. This time of the day usually overlapped with women's household activities.

The third example of innovation is that the Programme helped empower women by strengthening their technical knowledge and increasing their self-confidence. This is demonstrated in acknowledgement from peers and government officials of their technical capacities and their contribution to increasing access to plant genetic resources in their communities.

Zimbabwean women farmer performs the weekly analysis of the crops and the conditions in the field of her FFS.

Photo: Sacha de Boer/Oxfam Novib

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Indigenous women take a rest on their way to the communal plot in the higher mountainous areas of the Andes.

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