Alliance

Report of a Policy Dialogue Workshop on Open Source Seed Systems for Climate Change Adaptation in East Africa

19-22 November 2019, Entebbe, Uganda

Authors*: Gloria Otieno[1], Tobias Recha[1], Ronnie Vernooy[1], Carlo Fadda[1], Yosef Gebrehawaryat Kidane[1] and Michael Halewood[1]

[1] The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)

*With chapter contributions from:
Fernando Hernandez (BothEnds), Nout van der Vaart (Hivos, The Netherlands), Anne Majani and Boniface Kiome (Hivos, East Africa) , Desterio Nyamongo and Patrick Wahome (KALRO, Kenya), John Mulumba and Joyce Adokorach (NARO, Uganda), Faith Lumonya (SEATINI), Babirye Grace (VEDCO, Uganda)

The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) delivers research-based solutions that address the global crises of malnutrition, climate change, biodiversity loss, and environmental degradation.

The Alliance focuses on the nexus of agriculture, nutrition and environment. We work with local, national, and multinational partners across Africa, Asia, and Latin America and the Caribbean, and with the public and private sectors and civil society. With novel partnerships, the Alliance generates evidence and mainstreams innovations to transform food systems and landscapes so that they sustain the planet, drive prosperity, and nourish people in a climate crisis.

The Alliance is part of CGIAR, the world's largest agricultural research and innovation partnership for a food-secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.

www.bioversityinternational.org www.ciat.cgiar.org www.cgiar.org

Citation: Otieno G, Recha T, Vernooy R, Fadda C, Yosef GK and Halewood M (2020) Report of a Policy Dialogue Workshop on Open Source Seed Systems for Climate Change Adaptation in East Africa, 19–22 November 2019, Entebbe, Uganda. The Alliance of Bioversity International and CIAT, Rome, Italy.

Design and layout: Luca Pierotti

Cover Photo: Launch of Hoima community seed bank on 4th August 2019.
Credit: Alliance of Bioversity International and CIAT/G. Otieno

ISBN: 978-92-9255-193-3

Via dei Tre Denari 472/a
00054 Maccarese
Rome, ITALY

https://www.bioversityinternational.org/

Acknowledgments

We acknowledge the financial support and collaboration of Hivos and Particpatory Ecological Land Use Management (PELUM) Uganda during organization of the workshop. We also appreciate inputs from the Plant Genetic Resource Center of the National Agricultural Research Organization of Uganda (NARO-PGRC); Bulindi Zonal Agricultural Research and Develpment Institute of the National Agricultural Research Organisation (NARO-BUZARDI); the Genetic Resources Research Institute of Kenya Agricultural and Livestock Research Organization (GeRRI-KALRO); Seed Savers Network Kenya; Farmers from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) sites in Hoima, Uganda and Nyando, Kenya; Volunteer Efforts for Development Concerns (VEDCO), Uganda; The Southern and Eastern Africa Trade Information and Negotiations Institute (SEATINI), Uganda; BothEnds, the Netherlands; Food and Agriculture Organization (FAO) of the United Nations, Uganda Office; ISSD Africa – Uganda programme; and TROCAIRE Uganda.

We would like to thank the Netherlands Organization for Scientific Research (NWO) and the FAO International Treaty's Benefit-sharing Fund for funding this workshop. This work was implemented as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is carried out with support from the CGIAR Trust Fund and through bilateral funding agreements. For details please visit https://ccafs.cgiar.org/donors. The views expressed in this document cannot be taken to reflect the official opinions of these organizations.

We acknowledge Olga Spellman (The Alliance of Bioversity International and CIAT) for technical inputs and English editing of this report, and Luca Pierotti for the design and layout.

Contents

List of Abbreviations

ARIPO	African Regional Intellectual Property Organization
BSF	Benefit-sharing Fund
CCAFS	Climate Change, Agriculture and Food Security
CGIAR	Consultative Group for International Agricultural Research
COMESA	Common Market for Eastern and Southern Africa
CMSS	Community-managed Seed System
CSB	Community Seed Bank
CSO	Civil Society Organization
DUS	Distinctiveness, Uniformity and Stability
EAC	East African Community
FAO	Food and Agriculture Organisation of the United Nations
FFS	Farmer Field School
FGD	Focus Group Discussion
FMSS	Farmer-Managed Seed System
FSE	Food Security and Environmental
FTA	Free Trade Agreement
GeRRI	Genetic Resources Research Institute (Kenya)
GWAS	Genome-wide Association Study
IP	intellectual property
IPCC	Intergovernmental Panel on Climate Change
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
KALRO	Kenya Agriculture and Livestock Research Organization
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MDAs	Ministries, Departments and Agencies
MLS	Multilateral System
NARO-PGRC	National Agricultural Research Organization- Plant Genetic Resources Conservation (Uganda)
NARO-BUZARDI	National Agricultural Research Organization-Bulindi Zonal Agricultural and Research Development Institute (Uganda)
NDP	National Development Plan of Uganda
NGO	Non-Governmental Organization
NPGRC	National Plant Genetic Resources Centre (Tanzania)

NSP	National Seed Policy
NVRC	National Variety Release Committee (Ethiopia)
NWO	Netherlands Organization for Scientific Research
NYACOSEB	Nyando Community Seed Bank (Kenya)
OSSS	Open Source Seed Systems
OWC	Operation Wealth Creation
PELUM	Participatory Ecological Land Use Management (Uganda)
PBR	Plant Breeders' Rights
PGRFA	Plant Genetic Resources for Food and Agriculture
PPB	Participatory Plant Breeding
PVE	Participatory Varietal Evaluation
PVP	Plant Variety Protection
PVR	Plant Variety Rights
PVS	Participatory Varietal Selection
QDS	Quality Declared Seed
SACCOs	Savings and Credit Co-Operative
SEATINI	Southern and East African Trade Information and Negotiations
SMTA	Standard Material Transfer Agreement
TPGRC	Tanzania Plant Genetic Resources Center
TRIPS	(WTO Agreement on) Trade Related Aspects of Intellectual Property Rights
UNGB	Uganda National Gene Bank
UPOV	International Convention for the Protection of New Varieties of Plants
VEDCO	Volunteer Efforts for Development Concerns (Uganda)
WFD	World Food Day
WTO	World Trade Organization

Executive Summary

Climate change has led to a decline in global food production, especially in Africa where agricultural production is heavily rainfed. This has affected food security and price stability, particularly in the last decade. One way of adapting to climate change and building resilience is by improving access to a wide range of genetic diversity that is adapted to current and future predicted climate change scenarios. This diversity is often held in national genebanks, community seed banks and farmers' fields and possesses important traits such as drought tolerance, early maturity, and resistance to pests and diseases. Varieties with these traits can be accessed and made available to farmers for participatory varietal testing. Through two projects implemented in Ethiopia, Kenya, Tanzania and Uganda, a total of 400 accessions of beans, finger millet and sorghum, were obtained from the genebanks in Kenya, Tanzania and Uganda and exchanged between the three countries using the Standard Material Transfer Agreement (SMTA) adopted for use under the International Treaty on Plant Genetic Resources for Food and Agriculture ('Plant Treaty'). At the same time, the national genebank in Ethiopia provided barley and wheat to farmers in Ethiopia for the evaluation of several traits. After a series of participatory evaluations, the best performing varieties were selected based on their agronomic, organoleptic and nutritional traits. Catalogues with best performing varieties were prepared and disseminated to farmers and breeders.

We report here on a policy workshop that was held in December 2019 to discuss the complex issues related to access to and use of genetic resources for climate change adaptation. In particular, the workshop focussed on policies to support the further use in research and breeding, or possible 'direct use in cultivation' of materials that performed well in participatory trials supported by these projects. The workshop brought together practitioners from Ethiopia, Kenya, Tanzania and Uganda from various non-governmental organizations (NGOs) and advocacy groups, policy makers from government departments, seed inspection and certification services and researchers and breeders.

Cover Photo: Launch of Hoima community seed bank on 4th August 2019.
Credit: Alliance of Bioversity International and CIAT/G. Otieno

1. Background

Climate change poses a serious and ever-growing threat to the food and nutrition security of resource-poor farmers globally. In Ethiopia, Kenya, Tanzania and Uganda, climate change has led to increased pests and diseases, low agricultural productivity, food insecurity and general loss of genetic diversity. As a result, farmers have a very narrow gene pool from which to depend on. One of the strategies to enable smallholder farmers to adapt to climate change is the introduction of new crop diversity through breeding and commercialization.

Two projects have been implemented in Ethiopia, Kenya, Tanzania and Uganda aimed at enabling smallholder farmers to adapt to climate change through increased varietal diversity. The first project "Promoting Open Source Seed Systems for Beans, Millet and Sorghum for Climate Change Adaptation in Kenya, Tanzania and Uganda" was supported by the Benefit-sharing Fund (BSF) established under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, referred to in this paper as 'Plant Treaty') and implemented by Bioversity International, National Plant Genetic Resources Centre (NPGRC – Tanzania), National Agricultural Research Organization's Plant Genetic Resources Center (NARO-PGRC-Uganda), The Genetic Resources Research Institute (GeRRI) of Kenya's Agricultural Research and Livestock Organization, Hivos (The Netherlands), and Sustainable Agriculture and Natural Resource Management Africa (SANREM-AFRICA). The project ended in October 2019. The second project "Citizen's Science approach to climate-smart and nutrition-sensitive seed value chains for food and nutrition security in Uganda and Ethiopia", funded by the Netherlands Organization for Scientific Research (NWO), led by Bioversity International in collaboration with Bulindi Zonal Agricultural and Research Development Institute of the National Agricultural Research Organization (NARO-BUZARDI), the National Plant Genetic Resources Centre of National Agricultural Research Organization (NARO-PGRC), Participatory Ecological Land Use Management (PELUM) Uganda and Mekele University in Ethiopia, is due to end in December 2020.

The main elements of the two projects consisted in identification of potentially-adapted materials from a pool of 63 bean and 44 finger millet varieties in Hoima, Uganda; 24 sorghum varieties in Hombolo and Singida, Tanzania; and 52 finger millet and 49 sorghum varieties in Nyando, Kenya—through the open source seed systems project. From these potential varieties, farmers in Hoima, Uganda identified and selected seven bean and seven finger millet varieties, those in Hombolo and Singida, Tanzania selected ten sorghum varieties and in Nyando, Kenya, farmers selected ten finger millet and ten sorghum varieties. The identification and selection took place between 2017 to 2019 through crowdsourcing[1] and participatory varietal selection (PVS) under both of the above-cited projects.

Through the second project, in Ethiopia, 20 varieties of wheat were evaluated though crowdsourcing and 6 were selected by farmers in two sites, namely Alaje and Deguateben districts. This activity was supported under the now-funded project "Citizen's Science approach to climate-smart and nutrition-sensitive seed value chains for food and nutrition security in Uganda and Ethiopia". Under this project, more activities including PVS, organoleptic testing and nutritional analysis of the selected varieties in

[1] van Etten, J. et al. (2016) First experiences with a novel farmer citizen science approach: crowdsourcing participatory variety selection through on-farm triadic comparisons of technologies (tricot). https://pdfs.semanticscholar.org/5ebb/c4eb3d46d7bd721bdfb25b7cd0f93edcbd56.pdf

Uganda were conducted, a full list of which is provided below:

- Testing the performance of the selected varieties in farmers' fields and 'on station' using participatory, crowdsourcing methods that engage farmers as citizen scientists
- Identifying useful agro-morphological attributes through diverse participatory varietal selection activities with farmers.
- Organoleptic testing of materials identified as having high potential for consumer uptake
- Nutritional analysis and testing of promising climate-adapted varieties
- Creating catalogues with information to help farmers use a portfolio of best performing varieties with desirable agronomic, nutritional and organoleptic attributes
- Disseminating the selected varieties to farmers beyond the project using channels such as community seed bank networks, seed fairs and exhibitions, and through farmer field school events.
- Promoting the selected varieties through value chains for increased incomes to farmers.
- Influencing an enabling policy environment for:
    - Recognition of farmer-managed seed varieties
    - Establishment of a functional seed system that caters for farmers' needs, while also allowing the use of materials for breeding
    - Institutional coordination, collaboration, networking and awareness creation
    - Enactment of policies that protect farmers' rights to save, exchange and use seeds
    - Commercialization of farmer-managed seed varieties through a quality-declared seed (QDS) system by applying minimal distinctiveness, uniformity and stability (DUS) standards.

This report considers options for revising seed policies to enable smallholder farmers to commercialize the varieties they have developed and conserved. For many years, research programmes have primarily paid attention to promoting the use of high-value commercial seed varieties developed by the 'formal sector' organizations with only minimal research being carried out on enhancing farmers' varieties with farmers' participation and contribution. Furthermore, plant variety protection laws only favour breeders, giving them rights to protect plant varieties even though they may have derived them from farmers' varieties and made use of the traditional knowledge they hold.[2]

This report outlines the presentations, discussions and the proposed policy-related interventions by stakeholders who attended the project meeting concerning the promoting and scaling-up of Open-Source Seed Systems (OSSS). The OSSS concept —though still not definitively defined— has gained momentum in many countries due to concerns over the rise in patenting of plant varieties or optimized traits included in crop varieties. The OSSS concept is inspired from the free and 'open source software movements' and advocates maintaining fair and open access to plant genetic resources to ensure their continued availability to farmers, breeders and communities. OSSS is inspired by the debate on 'anti-commons', which favours a no-restrictions-on-use regime that is applied by an ever-growing community

[2] Otieno, G. and Westphal, I. (2018) Building resilience through "Open Source Seed Systems" for climate change adaptation in Kenya, Uganda, and Tanzania: What are the options for policy? 8 p. https://cgspace.cgiar.org/bitstream/handle/10568/100157/Building_Otieno_2018.pdf

through a chain of bilateral commitments such as licenses (Louafi et al, 2018). This approach differs from the public domain, whereby anyone has free and open access to the seeds, with the inevitable risk of free appropriation. On the Contrary, the open source approach is based on viral effects (i.e. the same conditions apply for any subsequent use) and introduces negotiated terms of access with the aim of keeping seeds in a 'protected commons' (Kloppenburg, 2014). However, some authors argue that the OSSS approach tends to limit innovations because it limits breeders' exemptions and may limit access to genetic resources much like patenting does (Louwaars, 2019).

The report also highlights the discussions of local-, national- and international-level policy options to enhance seed systems by facilitating registration and commercialization of local varieties. Pursuant to Article 12.4 of the Plant Treaty, facilitated access to plant genetic resources for food and agriculture (PGRFA) in the Multilateral System of Access and Benefit-sharing (MLS, or multilateral system) shall be provided by contracting parties using the Standard Material Transfer Agreement (SMTA) adopted by the ITPGRFA's Governing Body. Article 6.1 of the SMTA stipulates that the recipient shall use or conserve the materials transferred under the SMTA only for purposes of research, breeding and training for food and agriculture. Furthermore, if the recipient conserves the material, they agree to pass it on to others who request it using the SMTA. Furthermore, if they recipient of materials under the SMTA a) uses them to develop new PGRA Products (e.g. a new crop variety), b commercializes that variety, and c) does not allow others to use then new Product for further research and breeding, the recipient agrees to pay a fixed percentage of the sales of the commercialized product to the Benefit Sharing Fund. If the recipient commercializes the Product without making any restrictions to its access by others for the purposes of research and breeding, then the recipient is encouraged under the SMTA to make voluntary contributions to the Benefit-sharing Fund.

2. Workshop Sessions

2.1 Introduction to the Policy Workshop

Nout van der Vaart, Hivos, The Netherlands; Carlo Fadda, The Alliance of Bioversity International and CIAT, Kenya Office

As their opening remarks, both speakers highlighted the importance of diversity in seed systems and subsequently diversity in the food system and in diets for better nutrition and health. To achieve this diversity, there is a need to promote an open source seed system that removes restrictions on access to genetic materials by farmers. The current situation is that in many developing countries 80% of farmers depend on informal seed systems by saving their own seed, exchanging seed in their own networks and accessing seed through local markets where little distinction is made between seed and grain (Kusena et al., 2017). In many countries, national seed policies seeking to guarantee that farmers have access to quality seed only allow seed of registered varieties to be sold on the market. Registration requirements are often stringent requiring 99% distinctiveness, uniformity and stability (DUS). These criteria can end up excluding farmers' varieties from being registered and consequently from being legally commercialized, even though they may possess superior and desirable characteristics. Additionally, seed inspection systems are often limited to cover seeds of registered varieties often with a strict protocol for quality requirements, which also limits the commercialization and subsequent availability of seed of farmers' varieties.[3]

Furthermore, climate change and soil degradation are contributing to the food production challenges being faced by farmers. Despite these challenges, farmers are still required to produce more food for the ever-growing population. To help tackle these challenges, there is a need to address the issue of farmers' access to quality seed to a diverse range of varieties. One solution is the use of available plant genetic resources that have been developed by farmers over millennia. Also, through natural selection, farmers have discovered varieties that are adapted to their local environment, are resistant to diseases and tolerant to drought. These genetic materials have undergone very significant evolution over ten of thousands of years and have adapted to climatic changes. The problem is how to make seed systems more effective, to ensure that farmers have better access to quality (clean) seed of these adapted varieties. How can we deploy a system that ensures that farmers have quick access to diversity? The breeders can contribute through further improvement of these materials, but how can we make use of new scientific developments? For example, the genetic revolution that is taking place that can help farmers adapt faster to changing climatic conditions in order to produce more nutritious food.

The main intervention to increase production is to guarantee access by farmers to diverse and ecologically adapted seeds and, second, to prevent subsequent users of those materials from exercising exclusive and monopolistic rights over those materials by placing them under open access. Seeds should be kept in the public domain and remain accessible and affordable to farmers and other users. Free and fair exchange of knowledge and plant genetic resources ensure that communities remain resilient.

Taking cognizance of the provisions of Article 6.1 of the Plant Treaty's Standard Material Transfer Agreement (SMTA), which allows for the use of materials for research, breeding and training for food

[3] Powerpoint presentation: https://drive.google.com/open?id=1mRvr1xtyf2CUvRoEi8v9tTs4nF8AOI42

and agriculture, and Article 6.2, which states that the recipient shall not claim intellectual property rights that limit facilitated access to materials in the form received from the multilateral system, the SMTA ensures the continuous access of materials exchanged in the multilateral system by all users, like farmers, researchers and breeders for further development.

Articles 6.7 and 6.8 of the SMTA further outline the terms of commercialization of varieties derived from PGR from the multilateral system. In the case that breeders develop new varieties and commercialize them, and the material is available to others only with restrictions, the recipients shall pay a fixed percentage of sales to the multilateral system. However, if commercialization of the materials is allowed without restrictions imposed, then the breeder or other user is encouraged to make voluntary contributions to the Plant Treaty's Benefit Sharing Fund. Thus, many CGIAR Centers occasionally enter into agreements with downstream organizations whereby they allow those organizations semi-exclusive control over varieties for limited periods and in limited geographies as part of a strategy to effectively distribute those materials.

The projects "Promoting Open Source Seed Systems For Climate Change Adaptation" and "Citizen's Science Approach to Climate-Smart and Nutrition-Sensitive Seed Value Chains" succeeded in providing key pathways through which seed from the multilateral system is made more easily available to users such as farmers and breeders though 'open source' arrangements. For instance, during the projects' implementation, varieties of beans, finger millet and sorghum were exchanged using SMTAs among the national genebanks of Kenya, Tanzania and Uganda and then deployed to the farming communities in Hoima, Uganda, Nyando, Kenya, and Dodoma and Singida Tanzania. In Ethiopia, wheat varieties were accessed from the Ethiopian Biodiversity Institute and tested and evaluated by communities in Alaje and Deguateben districts. The idea was to provide farmers with a pool of genetic resources with different traits necessary for climate change adaptation.

The first step in both projects was to identify promising varieties from other countries and test them through crowdsourcing with farmers. The second step was disseminating these materials to a wider population of smallholder farmers. The project was able to establish two community seed banks (CSBs), one in Nyando, Kenya, and another in Hoima, Uganda as one way of disseminating the promising varieties to the communities for direct use. Another way is for breeders to improve on the varieties and release them under 'open access' conditions therefore not placing any form of restriction on their further use. These CSBs allow farmers to use and exchange these varieties without any restrictions, however, they cannot commercialize them due to national policy restrictions. Given the limited purposes of use specified in Article 6.1 of the SMTA —e.g. research training and plant breeding—varieties that performed well in the evaluations that were exchanged between the three countries under the SMTA were not further promoted for use on a wide scale because 'direct use in cultivation' is not one of the purposes for which facilitated access under the multilateral system was set up and thus is not among the use purposes mentioned in the SMTA. Of course, it is potentially possible for the providers to provide additional/alternatives prior informed consent for such uses, but they would have to do so following applicable national laws. In practice, many Contracting Parties of the International Treaty are open to providing access to farmers for direct us for cultivation, under certain requirements and without the SMTA. This is discussed in more detail in section 5 below. There are varieties of beans from the Tanzania genebank that were transferred under the SMTA that performed well in the Ugandan trials. But they cannot simply be widely multiplied and distributed for sale in Uganda 'in the form they were received' under the SMTA unless there are further agreements with providers to allow for their commercialization. In addition, national level policies especially with regard to commercialization of plant varieties and seed

quality may also hinder the availability and commercial exploitation of these varieties if they don't satisfy national variety registration standards. This workshop intended to analyse options to build on existing laws and standards to scale-up access and use (including direct use in cultivation and commercialization) of of materials that were found through the project to have good potential for helping famers adapt to climate change.

2.2 Objectives of the Policy Workshop

- To identify, strengths, gaps and opportunities in current legal and policy frameworks affecting availability and use of genetic materials which were exchanged in the two projects To reflect on the potential of crowdsourcing as part of the variety release process
- To develop a road map to further strengthen the open source seed system approach.

2.3 Expected outputs of the Policy workshop

- A detailed workshop report on possible policy-related interventions to scale-up OSSS, develop, smallholder seed businesses and register and disseminate seed of promising varieties
- A policy brief on the importance of national genebanks and the Multilateral System for Access and Benefit-sharing on increasing availability of seed diversity for smallholder farmers in East Africa. (This brief was not yet finalized when this report was published).

3. Open Source Seed Systems

3.1 Project Outcomes and Policy Implications for Kenya, Tanzania and Uganda

Tobias Recha, The Alliance of Bioversity International and CIAT, Uganda; Anne Majani and Boniface Kiome, Hivos, East Africa

After the inception meeting of the project "Promoting Open Source Seed Systems For Climate Change Adaptation", supported by the Plant Treaty's Benefit-Sharing Fund, a regional workshop was held in Ethiopia in 2016 to build a team to advocate for improving smallholder farmers' access to seed. Thematic areas were also identified, which included exploring best practices for scaling of crop/varietal diversity to support agricultural adaptation to climate change; building multi-stakeholder platforms that contribute to policy change, specifically for the Open Source Seed Systems (OSSS). This was immediately followed by three Stakeholder workshops in Uganda in 2016, and in Tanzania and Kenya in 2017, to inspire and build leadership on improving access to seeds for smallholder farmers in these countries through exploring and developing OSSS.[4] The workshops brought together a range of stakeholders, including farmers, researchers, government staff, private sector and Non-Governmental Organizations to introduce them to the concept of OSSS. More thematic focus areas at country level were identified during these workshops. Themes/Initiatives identified for further work in Tanzania included how to document farmers' varieties, access to quality seeds, creating multi-stakeholder platforms, entrepreneurship for OSSS and improving the national policy and legal frameworks for OSSS. Similarly for Kenya, the themes identified included documenting farmers' varieties, seed policy and legal reforms, establishment of a multi-stakeholder initiative for OSSS in Kenya and creating a viable and sustainable entrepreneurship for OSSS. Themes for Uganda included improving the policy and legislative framework for OSSS, establishing multi-stakeholder initiatives for a functioning OSSS and identifying the best practices (for scaling up).

To underpin these themes, the project supporting the assembly of a large pool of accessions of sorghum, millet and beans, which were tested by farmers in their fields. Some of the accessions performed well and were selected by farmers for further multiplication and use in their households. Surprisingly, the majority of the best-performing varieties that were selected were sourced from other countries (Table 1). All sorghum accession materials that were taken from Uganda to Tanzania performed well. The top-ranked varieties are now being grown by farmers and shared within their social networks, including at the community seed bank. The same scenario occurred in Kenya and Uganda. In Kenya, millet and sorghum were tested by farmers. Out of ten top-ranking millet varieties, five came from Uganda and five from Kenya. For sorghum varieties, three came from Uganda, three from Tanzania and five from Kenya. In Uganda, bean and millet were tested by farmers. Of the bean varieties that were ranked high, four varieties came from Tanzania and three from Uganda. For millet, two varieties came from Uganda, one from Kenya and four from Tanzania.

[4] Powerpoint presentations: https://drive.google.com/open?id=114LZJ1OdXrPvxj_ATlOc88NrUh_dU6ay And https://drive.google.com/open?id=1mRUp0dWz9n5sW5J1jXBzaw9QQe-V0IgA

Table 1: Summary of the number of evaluated and selected varieties

Project Sites	Hoima, Uganda		Hombolo and Singida, Tanzania	Nyando, Kenya	
Crops tested	Millet	Beans	Sorghum	Millet	Sorghum
Total Tested	44	34	24	52	48
Total selected	7	7	10	10	10
Origin of selected varieties					
From Uganda	2	3	10	5	3
From Kenya	1	0	0	5	4
From Tanzania	4	4	0	0	3

Some of these promising materials can be used in participatory plant breeding (PPB) to produce elite lines. In furtherance of the concept of 'open access seed systems' the improved materials should not be subjected to IPRs. In addition, ideally, these materials could be registered as farmers' varieties and be commercialized subject to national variety release mechanisms seed could be commercialized under alternative quality assurance mechanisms such as Quality Declared Seed (QDS). Other materials appear to be adapted for use in their current form, without further improvement.

The workshop participants discussion of options for policies to support these activities are set out in Section 7 below.

Research on seed policy and legislation

Hivos and Bioversity International organized an OSSS Workshop on 13-16 March 2018 in Nairobi, Kenya and to which policy makers, experts and key policy advocacy partners from Kenya, Uganda and Tanzania were invited to participate. The aim was to: (i) analyse gaps and opportunities in current legislation and policy frameworks, (ii) synthesize the main policy issues in East Africa and identify policy recommendations to improve the freedom of access to seeds through OSSS, and (iii) possible directions that can be adopted for recognition and implementation of OSSS in legislation and policy frameworks in East Africa. Two main issues were discussed during the workshop: (i) strengths, gaps and opportunities of in existing policies and legislation, and (ii) exclusion of smallholder farmers from national research, documentation and lack of policy support for farmers engagement in R&D activities.

The workshop produced a number of recommendations, which included:

- Developing policies and legislation that facilitate the establishment of functional open source seed systems
- Establishing farmer-inclusive regimes to prevent monopolies that use IPRs to prevent further use and development of varieties for the benefit of farmers
- Creating an institutional coordination, collaboration, networking and awareness mechanism for a harmonized and functional national genetic resources coordination system
- Promoting research and development for the establishment and growth of OSSS that includes documentation, characterization and evaluation of genetic biodiversity managed by farmers, as well as the development of climate-smart varieties
- Mobilizing and allocating resources for the development of OSSS; recognition of farmer-managed seed varieties

- Establishing a functional OSSS; enactment of policies that protect farmers' rights to save, exchange and use seeds
- Institutional coordination, collaboration, networking and awareness, in addition to research and development for the establishment and growth of OSSS; this includes the documentation, characterization and evaluation of genetic biodiversity managed by farmers, as well as the development of climate-smart varieties.

The main output of the workshop was the drafting of a policy brief entitled "Building Resilience through Open Source Seed Systems for climate change adaptation in Kenya, Uganda and Tanzania: What are the options for policy?"[5]

This workshop was a follow-up to previous policy workshops aimed at further synthesizing pending policy issues related to how the best-performing materials can be bred, commercialized, released or registered and accessed.

3.2 Experiences from Uganda

3.2.1 The Open Source Seed Systems Project and Seed Policies

John Mulumba and Joyce Adokorach, NARO, Uganda

Uganda aims to achieve the UN sustainable Development Goal 2 that aims to end hunger, achieve food security with improved nutrition and promote sustainable agriculture. In the second National Development Plan (NDP II) 2015/2016 – 2019/2020, under its post-2015 goals and targets, the government intended that by 2020, Uganda would be able to "...maintain the genetic diversity of seeds, cultivated plants and related wild species, including through soundly manage and diversified seed and plant banks at national, regional and international levels and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge as internationally agreed".[6] In 2019 Uganda launched a national seed policy that envisions a profitable and sustainable seed sector from which farmers can access affordable and quality seed and planting materials. As such the seed policy has provisions that allow for the commercialization of farmers' varieties which is a positive step towards achieving the goals of the NDP II.

Policy priority areas and strategies

Section 3 of the National Seed Policy (2016) includes a number of sub-sections defining priorities. These include:

- Section 3.1.2 on sustainable utilization and protection of Uganda's national plant genetic resources states that the government shall ensure a viable and effective protection and exchange of germplasm for crop improvement
- Section 3.2.2 on enhancing production of quality seed within the informal seed system states that the government shall strengthen the capacity for production of quality seed for crops that have low profit margins for seed companies

[5] Policy brief: Otieno, G.; Westphal, I. (2018) Building resilience through "Open Source Seed Systems" for climate change adaptation in Kenya, Uganda, and Tanzania: What are the options for policy? 8 p. https://cgspace.cgiar.org/bitstream/handle/10568/100157/Building_Otieno_2018.pdf

[6] Powerpoint presentation: https://drive.google.com/open?id=18a1pWuW-dcYgzc-bLcqfBMhO2xOoChiz

- Section 3.2.3 on strengthening seed distribution and marketing to enhance commercialization of quality seed states that the government shall promote an effective delivery mechanism for quality seeds to enhance uptake by smallholder farmers
- Section 3.3.2 on quality control for Quality Declared Seed states that the government shall put in place appropriate seed quality standards and mechanism for regulation, production and sale of quality declared seed. The target is that traditional varieties will be listed in the National List by 2020.

Legal and Regulatory Targets for 2022 from the National Policy on Plant Genetic Resources for Food and Agriculture

The draft PGFRA policy has been submitted for approval by the cabinet. Once this is approved it will provide specific provisions for farmer-managed seed systems (FMSS) that allow for the protection of their local seeds and related indigenous knowledge. In addition, the Plant Varieties Protection Act of 1994 and the Seeds and Plants Act of 1994 make provisions for breeders to protect their varieties at the expense of farmers. This has received considerable criticism and is currently under review. In general, Uganda is moving towards policies that enhance the use and commercialization of farmers' varieties.

Strategies for achieving the desired results based on the NARO Strategic Plan 2018–2028

To enhance conservation and harnessing of genetic resources, the National Agricultural Research Organization of Uganda (NARO) recognizes the importance of indigenous genetic resources. Therefore, efforts will be intensified to protect, preserve and conserve Uganda's agricultural genetic resources.

NARO aims to enhance Natural Resources Management. Natural resources are the basis upon which agricultural technologies and innovations are built. NARO will continue to develop technologies, innovations and management practices that enhance environmental resilience and sustainability of natural resources, including the sustainable use and management of genetic resources.

Lessons learned from Uganda

1. ***It is important to understand the existing national, regional and international policy and legal frameworks that focus on the issue of seeds and genetic resources.*** This enables us to understand the extent to which national legislation enhances or limits the implementation of international policy instruments such as the ITPGRFA or the Convention on Biological Diversity (CBD)/Nagoya Protocol.
2. ***Understanding government aspirations:*** It is important to know what the government is intending to implement during the period of your project lifecycle and how your efforts contribute to those aspirations, especially in regard to long-term national development plans such as NDP II 2015-2019. Therefore, the best approach is to identify how to implement policies in line with government's aspirations.
3. ***It is extremely important to map the key stakeholders and understand their needs and aspirations.*** The seed system stakeholders have their own needs and aspirations. Farmers need access to quality and diverse seeds to be able to cope with climate change; breeders also need access to genetic resources to enable them to develop new, resilient varieties. These aspirations all need to align with or fall within the context of existing legislation and active international legal instruments. Working in collaboration with government institutions, like national seed certification systems, will ease the process of commercializing farmers' varieties. Once stakeholders have been mapped, it is important to create evidence-based awareness among them about the importance of a supportive policy environment for the sustainable use of genetic resources. Best evidence is inviting

these stakeholders to seed fairs and the launch of community seed banks as was the case in the OSSS project.

4. ***Creating alliances, especially for policy advocacy*** i.e. with parliament, ministers, different key advocacy institutions and stakeholders through various multi-stakeholder platforms that bring the politicians on board to create awareness about the policies and their importance but also to smooth the way for the implementation of laws and regulations.

3.2.2 Enhancing Citizens' Engagement for Sustainable Diets in Gulu district, Northern Uganda

Babirye Grace, VEDCO, Uganda

About VEDCO[7]

Volunteer Efforts for Development Concerns (VEDCO) Is an Independent, Non-governmental and not-for-profit agricultural organization, founded in 1986 by a group of university students in response to the challenges of poverty, as a result of the social and economic disruptions caused by the military conflicts of 1980-86. VEDCOs mission is to Equitably Empower Small- and Medium-Holder Farmers for Food Security and Nutrition Security, Agricultural Trade and Organizational Development.

VEDCO, in partnership with Hivos, The Netherlands, is implementing a project to Enhance Citizens' Engagement for Sustainable Diets in Gulu district, Northern Uganda. With an estimated population of 40.3 million, stunting levels in Uganda are at 28.9%, and overweight rates in under-fives at 3.7%. According to food consumption survey of 2008, Uganda's population has inadequate intake levels for five vitamins and minerals critical to good health and the development of social capital and economic productivity. Micronutrient deficiencies are also common among Ugandan children of whom 28% are deficient in vitamin A and 73% are anaemic primarily due to iron deficiency. The project's goal is to contribute to improved food and nutrition security through sustainable production and consumption of diverse, healthy, local vegetables.

VEDCO conducted a study on "Advocacy for Increased Nutrition Planning" that looked at the current seed systems and policies, and at how they affect the availability, use, management and conservation of indigenous vegetables in Gulu district (Musiime & Nakayima, 2013). From the study, VEDCO identified a number of advocacy issues, which included limited research and documentation of indigenous seed, especially vegetables; lack of an enabling environment for farmers to produce, preserve and market indigenous seed; and lastly limited efforts by government and other stakeholders towards the recognition and promotion of indigenous seed. In addition, smallholder farmers had not received any support from the district officials, including extension service providers, on indigenous vegetable seed production and marketing. Not much attention was given to indigenous vegetables seed in the National Seed Policy 2019 despite it acknowledging the importance of farmers' varieties.

[7] http://www.vedcouganda.org/
Powerpoint presentation: https://drive.google.com/open?id=1VbH9xA6hN91wzXGLzmasZ2j8JKI7xs3C

Advocacy to support the promotion of indigenous foods

There are two key issues that are being advocated for by VEDCO and other local stakeholders. The prioritization of indigenous foods by local leaders and a call for Gulu district to increase budget allocation to support production and consumption of local vegetables and access to seed of indigenous vegetables. The capacity of 40 "diet champions"—including farmers, local leaders, religious and cultural leaders— was built to spearhead advocacy actions on indigenous foods, including at policy level, especially with regard to recognizing, registering and commercializing of farmers' varieties, which include indigenous vegetables.

The Gulu district chief accounting officer committed to include local vegetables on the priority list of crops to be promoted by the subsidy programme known as 'Operation Wealth Creation' (OWC). 'Diet champions' and farmers are now being engaged in the planning and budgeting process to include local vegetable seed production and distribution under alternative quality assurance mechanisms in the plans and budgets for 2020/2021. In this regard, VEDCO also trained the seed producer groups on seed production, quality aspects and marketing. Demonstration sites have been established to serve as learning/technology transfer and seed multiplication centres. The seeds which are produced are being sold in open village markets. This has led to increased access to seeds and production of local diverse indigenous vegetables.

3.2.3 Farmers' Seed Rights and Seed Policy in Uganda

Joshua Aijuka, PELUM, Uganda

About PELUM[8]

PELUM is the acronym for Participatory Ecological Land Use Management. It is an Association made up of a network of over 250 civil society organizations (CSOs) across 12 countries in East, Central and Southern Africa working towards improving the lives of smallholder farming communities. PELUM was established in 1995 to facilitate networking, capacity building and collective advocacy. PELUM Uganda[9] is a Network of 55 Non-governmental Organizations (NGOs) with a collective outreach of 3 million smallholder farmers in 102 districts of Uganda. PELUM Uganda's current strategic plan (2017–2021) focuses on the following thematic areas: Sustainable farming systems; Agricultural market development; and Advocacy and institutional capacity strengthening.

3.3 Overview of Uganda's Seed Sector

Seed is a key agricultural input and was under government control until the Ugandan Trade Liberalization regime in 1987. The seed programme started in 1968 and the seed multiplication scheme in 1970. This programme turned into Uganda's Seed Project in 1999 and later into Uganda Seed Ltd. Liberalization of seeds led to increased private seed sector participation and dominance. Until 2018, all seed-related activities were guided by the Uganda National Seed Strategy 2014/2015–2019/20 and the Seed and Plants Act, 2006. A new Seed Policy was also approved in 2018 and it recognizes both formal and informal seed systems.

[8] https://www.pelumuganda.org/

[9] Powerpoint presentation: https://drive.google.com/open?id=1mcitLfQQ_XGVylwopGLjFQSyF7uQZ3Jf

The seed sector in Uganda has two seed supply systems. The first is the informal system, which has no organized seed production chain and is heavily unregulated. It largely comprises indigenous seeds and contributes 85% of seed used by the farming community. However, the source and quality of the seed produced is usually not known because it is largely based on community seed production (using farm-saved seed).

The second channel is the formal seed system, which is commercially oriented and involves the entire production cycle and certification process. This system produces seed of high genetic purity and is regulated by the government. Unfortunately, it only contributes 15% to the seed supply and 80% of which is maize.

3.3.1 Importance of smallholder farmers' seed sovereignty and seed security

Seed sovereignty and security provides protection of farmers' rights. It increases food and nutrition security (Right to Food) for smallholder farmers. Farmers are able to counter 'fake seeds', which are essentially grain packed and sold as seed, and therefore have access to seed with high resilience and suitability to local conditions. Also, they are able to conserve local varieties therefore halting the loss of agrobiodiversity.

3.3.2 Challenges to smallholder farmers' access and control of seed

The national subsidy programme, which supplies only hybrid seeds and therefore has led to a loss of traditional seeds, and the formal and informal seed sectors are both subject to commoditization. Secondly, there is a negative mindset towards the farmer-managed seed system (FMSS) where farmers' varieties are termed 'informal' hence 'inferior'. This belief is backed by poorly-documented evidence of the negative contribution of FMSS to socio-economic development.

Generational gaps have led to loss of rich indigenous knowledge. The current generation is less interested in agriculture or agriculture-related and conservation knowledge. Additionally, farmers have limited access to foundation and breeders' seed for production using alternative quality assurance mechanisms. Seed policy implementation and law enforcement is also poor, added to which climate change has affected unsuspecting farmers who have lost their seeds and have to rely on relief seed from government agencies, non-governmental organizations and civil society organizations.

To ensure seed security, PELUM Uganda is conducting a number of activities which include capacity building of farmers, piloting of seed security initiatives, documentation and dissemination of best practices, development and piloting of the community-managed seed system (CMSS) model, Out/up scaling of the CMSS model, and carrying out policy advocacy.

3.3.3 Seed rights-related interventions

PELUM Uganda has been implementing a project on securing land and seed rights for smallholder farmers to realize the Right to Food in Uganda (2016 – 2020). The project aims to contribute to poverty alleviation of vulnerable women and men and enable them to obtain their right to food, thus attaining livelihood stability. The long-term outcome of the programme is that food producers, especially women, pastoralists and their communities, enjoy greater local, national and global public and private sector policies that protect and promote their prosperity and resilience through land and seed rights. The project includes national level and sub-national level engagements.

In the project, the core seed rights intervention activities include: (i) capacity strengthening for CSOs and farmers in policy engagement; (ii) case and evidence generation for responsive gender-inclusive seed systems interventions; (iii) alliance building for a strengthened voice (FMSS actors' platform and Farmer Seed Rights Movement; (iv) showcasing events (through local, sub-national and national seed fairs); and (v) seed policy engagements especially with the (National Seed Policy (NSP) 2018, draft PGRFA Policy and the Seed and plants Act 2006,.

The project has had a number of successes. They include reviewing QDS guidelines; increased responsiveness of policy makers towards FMSS; mainstreaming of Seed Rights engagements in projects; increased farmer-to-researcher collaborations; and increased engagement in policy processes by farmers with district-level officials.

Proposed next steps target:

- Operationalization of the FMSS platform and the Farmer Seed Rights Movement
- Strengthening engagements towards passing of the PGRFA policy and review of the National Seed Act; Pushing for registration of farmers' varieties
- Providing more multi-stakeholder engagements for dialogues and experience sharing (increasing the scaling-out of seed fairs to at least 20 per year)
- Further awareness and scaling out of the CMSS Model to strengthen the case for FMSS and seed rights; Scaling-out CSBs
- Operationalization of a National Agroecology Actors' Platform; Co-development of a National Strategy for scaling-out agroecology; and
- Further promoting participatory plant breeding (PPB) participatory varietal evaluation (PVE) and PVS using the farmer field school (FFS) approach.

3.4 Policy Environment for Farmers' Seed Systems in Kenya

Desterio Nyamongo and Patrick Wahome, KALRO, Kenya

Kenya has made commendable progress in terms of recognizing the rights of farmers to use and exchange seeds, a step which is against the background of a very strong plant breeders' rights. In 2010, the government adopted Article 9 of the Plant Treaty in its new constitution. Article 11.3 part B of the Kenyan constitution states that the state shall recognize and protect the ownership of indigenous seeds and plant varieties, their genetic and diverse characteristics and their use by communities of Kenya. There is also article 69 C which talks about genetic resources, biodiversity and communities. In 2016, the Seeds and Plant Varieties Act was revised to incorporate the issues of genetic resources in the seed legislation. The amendment of the seeds and plant variety act led to the establishment of the Genetic Resources Research Institute (GeRRI), which is the institution that oversees the implementation of that amendment. The Seeds and Plant Variety Act also included indigenous seeds, which are now being recognized by law as seeds of the Kenyan communities. At the moment, regulations are being formulated to operationalize this act which is still in draft form. The Seeds and Plant Varieties Act is an Act of parliament: to confer power to regulate transactions for seed, including provision for the testing and certification of seed; for the establishment of an index of plant variety names; to impose a restriction on the introduction of new varieties; to control the importation of seeds; to authorize

measures to prevent injurious cross-pollination; to grant proprietary rights to persons breeding or discovering new varieties; to establish a tribunal to hear appeals and other proceedings; and for connected purposes. The Act stipulates that only breeders can register varieties and therefore place IPRs on seeds. It also restricts the sale of seed that has not been registered or certified by the Kenyan authorities. This restricts the commercialization of farmers' varieties.

3.5 Experiences from Ethiopia: Seeds for Needs

By Yosef Gebrehawaryat Gidane, The Alliance of Bioversity International and CIAT, Ethiopia Office

Farmlands ranging from 1 to 3 ha are defined as smallholder farms and comprise the vast majority of the worlds' agriculture, especially in developing countries. According FAO (2014) and Graeub et al. (2016), 98% of the world's farms are smallholdings with 70% of the food produced globally coming from these farms. There are more people being fed from smallholding farms than out of big farms; and this trend is set to continue. These farms are characterized by extremely varied agroecologies, low input agriculture, and most rely on rainfall for production, have poor access to seed and are affected by political instability. This provokes some questions, such as: Is smallholder farming marginal? Is breeding addressing these themes in full? Is smallholder farming a burden or a resource? Can we effectively bring together modern technology and traditional farming?

Bioversity International used a genome-wide association study (GWAS) to identify traits of interest to farmers for a durum wheat genome.[10] This study aimed to identify the right wheat for Ethiopian farmers. Whether tall, short, early maturing or late maturing, the farmers know the varieties well. The GWAS study therefore explored opportunities to use farmers' traditional knowledge to identify breeding targets in wheat for farmers' appreciation. This study was conducted in two agroecological sites (Hagreselam and Geregera) with the participation of 15 men and 15 women. At each site, 400 Ethiopian genotyped wheat accessions (373 farmers' varieties and 27 improved varieties) were laid down in a replicated lattice design. The farmers selected the most important traits they wanted to use, like early tillering capacity and spike morphology. The farmers were able to provide 192,000 data points and then 8,000 data points were received from breeders or agronomists. The two data sets were merged. Breeders also took all the necessary data and carried out genotyping with 90,000 SNP markers. The results showed that 21% averaged traits of the landraces were superior to the best performing improved variety. It also showed that many landraces matured earlier than the improved varieties and had a yield advantage of 62% obtained from the best landrace over the best improved variety. This raised the question as to why landraces have been ignored for so long. The data confirms that many landraces show superior performance and yet there are still reluctance to promote their further use. In addition, it is true that farmers are the custodians of some of the varieties that perform best under climate and weather vagaries.

Farmers' traditional knowledge can be used to produce wheat by addressing local needs through genomic selection. Crowdsourcing trials were also carried out with 600 farmers in 12 different villages in Geregera. Within four seasons the project was able to engage more than 1700 farmers and 0.5 ha of land (original farmer). Currently, an average of 11 different varieties are being cultivated by each participating farmer. Different needs and climate change are the driving force behind farmers maintaining these varieties. These materials are further being conserved in the community seed bank.

[10] Powerpoint presentation: https://drive.google.com/open?id=1Gb4PHd0bsyxCWKfr-ayf5c2cOmZTND78

3.5.1 Farmer variety registration in Ethiopia

The steps which are taken for formal variety release in Ethiopia include evaluation of a group of genotypes including farmers' varieties in at least three locations over two seasons. Data is collected, analysed and submitted to the National Variety Release Committee (NVRC) of Ethiopia. A verification trial is then conducted and evaluated by the committee. A workshop is organized and the decision is announced. If approved, the releasing institute is responsible for maintaining the variety and providing pre-basic seed. Through this process many varieties have been released, including two Durum wheat varieties.

3.5.2 Characterization of farmers' varieties, their registration and QDS production

Farmers' varieties can be identified by the Office of Agriculture, research centres or NGOs. The nearby research centre or University can apply for registration. In this case, only one year's characterization will take place. A report is compiled and submitted to NVRC and approved. QDS production has to be sent to the seed certification and inspection unit. Once accepted and approved, it can be distributed using the informal seed system and the centre registering the variety is responsible for maintaining it. However, this option of registration and subsequent commercialization through QDS is pending approval.

4. Policy Support for Climate-Resilient Seed Systems

Michael Halewood, The Alliance of Bioversity International and CIAT , Rome Office, Italy

Climate change is expected to continue negatively impacting agriculture. It is predicted that global temperature rise will exceed 2° C by the last two decades of this century. In addition, there have been rising cases of unpredictable rainfall patterns, increased incidence and changing patterns of pests and diseases, and shifting, shorter, and/or disappearing growing seasons. The consequences of this are lower food productivity resulting in food insecurity. In order to adapt to climate change, the Intergovernmental Panel on Climate Change (IPCC) has recommended a number of actions, which include improving crop tolerance to new conditions, improving access to genebank-developed varieties with appropriate adaptive characteristics and promoting indigenous knowledge which has developed adaptive strategies, thus contributing to food security in many parts of the world[11].

In recent years, the Alliance of Bioversity and CIAT, under the framework of the CGIAR Research Programme on Climate Change Agriculture and Food Security (CCAFS) has been working with partners in a number of countries to demonstrate the utility of the Plant Treaty in helping farmers, plant breeders and researchers to access crop genetic diversity for climate change adaptation (Halewood et al., 2016). The methodology we have developed starts with conducting community-level vulnerability analyses with teams of farmers (and scientists/plant breeders from national agricultural research programmes) looking at the impact of climate change on food security crops and identifying traits that those crops need to perform better under changing climate stresses. Then we look to three different 'levels' of sources of crop genetic materials as sources of those identified traits (Otieno, 2019). First, we look at identifying local varieties that are performing well and consider means by which we can work with the community and other organizations to promote their wider availability and use. The next potential source we investigate for potentially adaptive germplasm is the national genebank of the country concerned. Here we provide an example from the second phase of the Genetic Resources policy Initiative (GRPI 2) project, using case studies of Chikankata in Zambia and Tsholotsho in Zimbabwe. The case studies conducted modelling using crop suitability and climate models to identify maize and sorghum accessions in the national genebanks that can be useful and potentially adapted to the local conditions both under current and future climate conditions predicted for 2050. In both cases, we found that the number of maize and sorghum accessions currently in the respective national genebanks, that are potentially adapted for predicted climate conditions in the two communities in 2050, dropped precipitously. This suggests that the genebanks themselves will need to gather and conserve a wider range of potentially useful materials for their users under predicted climates change scenarios, or that users themselves will need to look farther afield for adapted materials as climates change advances more and more over time. Indeed, this is consistent with the overall findings in the literature that climate change is further increasing countries' interdependence on germplasm to sustain and improve agricultural production systems (Otieno, 2019).

Based on these results, we then look to a third level of potential sources of germplasm with traits adapted to current and or future climate conditions it the case study communities. Here we are referring

[11] Powerpoint presentation: https://drive.google.com/open?id=1n7b2UrfkCoFrmTFEJMlW8hnGmZqosjRf

to national genebanks in other countries and international crop collections hosted by organizations like CGIAR Centers. For information about these collections, we look to GeneSys, (https://www.genesys-pgr.org/), which includes accession-level information for crop collections hosted by CGIAR Centers as well as a growing number of national genebanks in the Americas, Europe, Asia and Africa. Because these collections hold a much larger amount of maize and sorghum germplasm collected from all around the world than the national genebank, we were able to identify a larger pool of potentially adapted material for testing/use in Chikankata and Tsholotsho. Much of that material is available from these genebanks under the standard material transfer agreement (SMTA) adopted for use under the ITPGRFA (which I will discuss more below).

Through this method, community organizations and their research and development partners are able to identify, assemble and test the performance portfolios of materials in farmers' fields and on station scenarios. The materials tested are sourced from a combination of those held by the communities concerned, from the national genebanks and from other countries' and international genebanks all around the world.

The results of these exercises working with multistakeholder teams in Chikankata Zambia, and Tsholotsho, Zimbabwe are set out in the following diagrams and figures,

As depicted in figures 1a, 1b and 1c, the national genebank has 98 maize accessions, out of which only 34 are potentially adapted for present climatic conditions in Chikankata and 11 accessions are potentially adapted to predicted future climatic conditions in 2015.

Figure 1a: Genebank collections of maize in Zambia. Source: Otieno, 2019

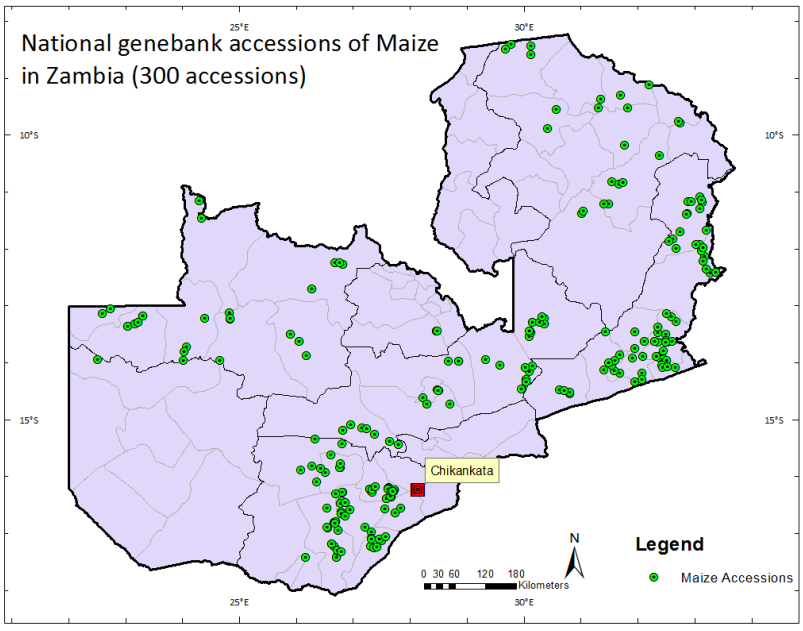


Figure 1b: Potentially adaptable accessions of maize for present climate conditions in Chikankata, Zambia. Source: Otieno, 2019

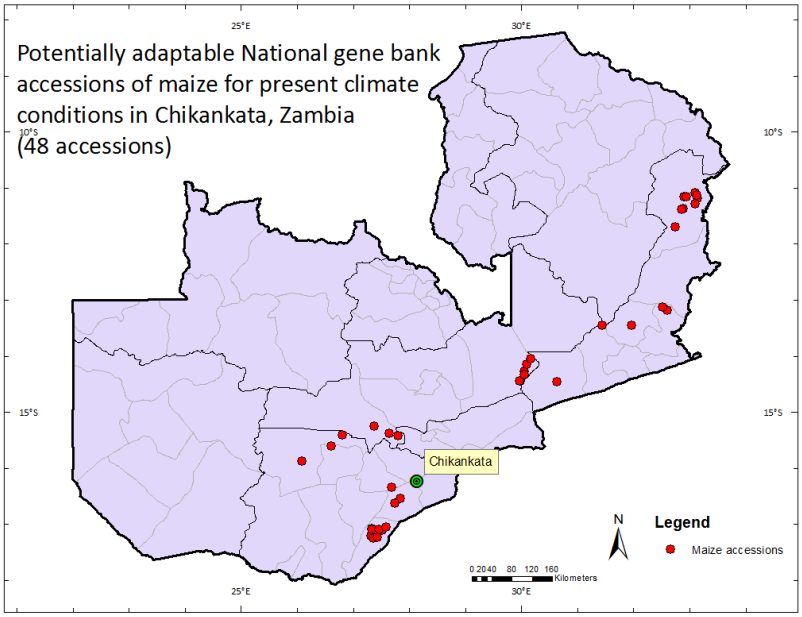
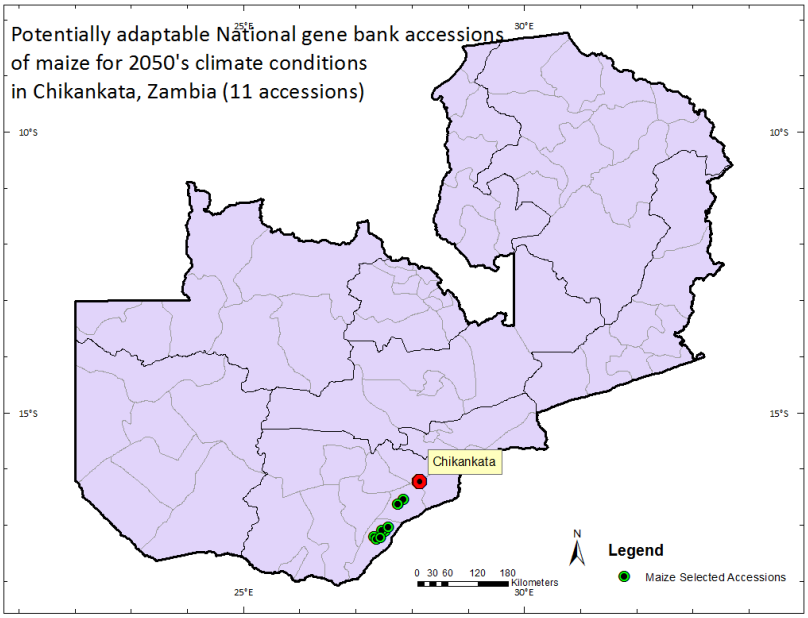


Figure 1c: Potentially-adaptable accessions of maize for 2050's climate conditions in Chikankata, Zambia. Source: Otieno, 2019



A further look at national and international collections of maize germplasm from GeneSys reveals that there are many more accessions stored around the world that are potentially adapted for present and future climatic conditions in Chikankata. (Figures 2a,b & c).

Figure 2a: Internationally held collections of maize. Source: GeneSys

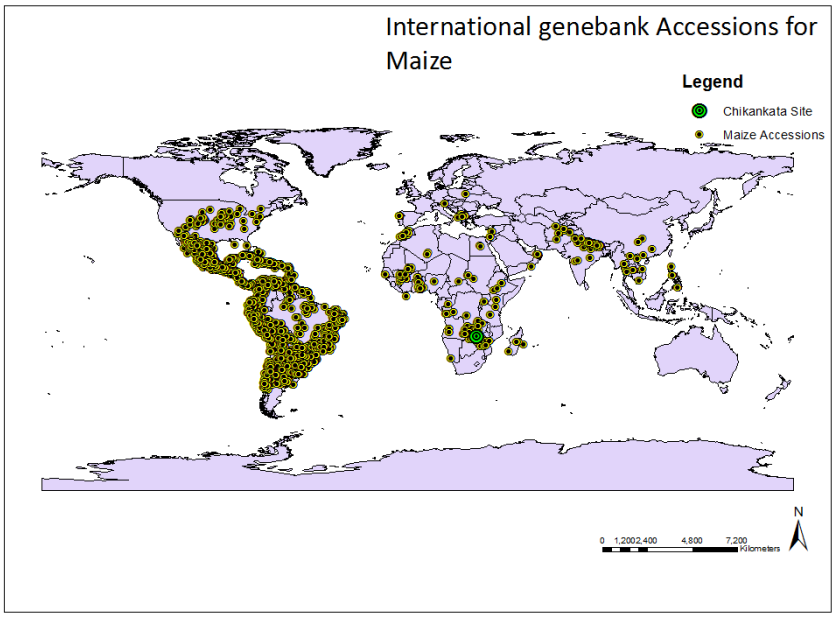


Figure 2b: International maize collections with potential adaptability for present climate conditions in Chikankata, Zambia. Source:Otieno, 2019

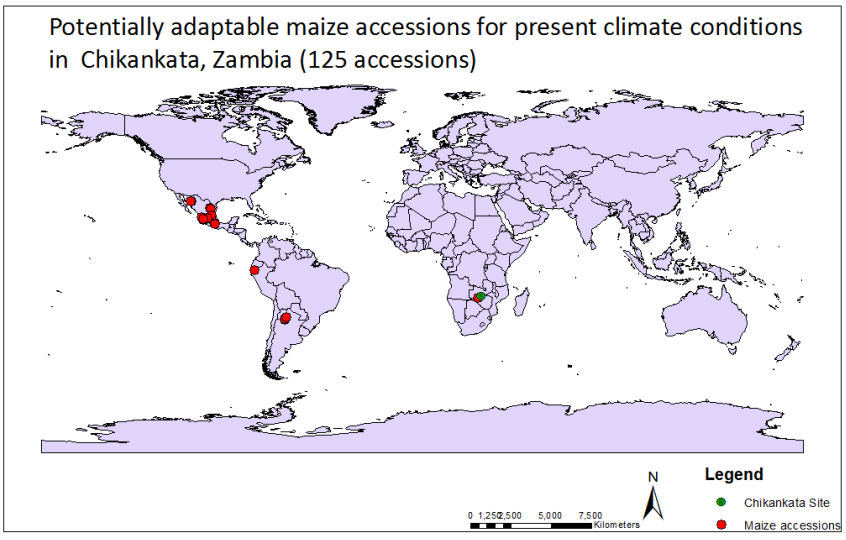
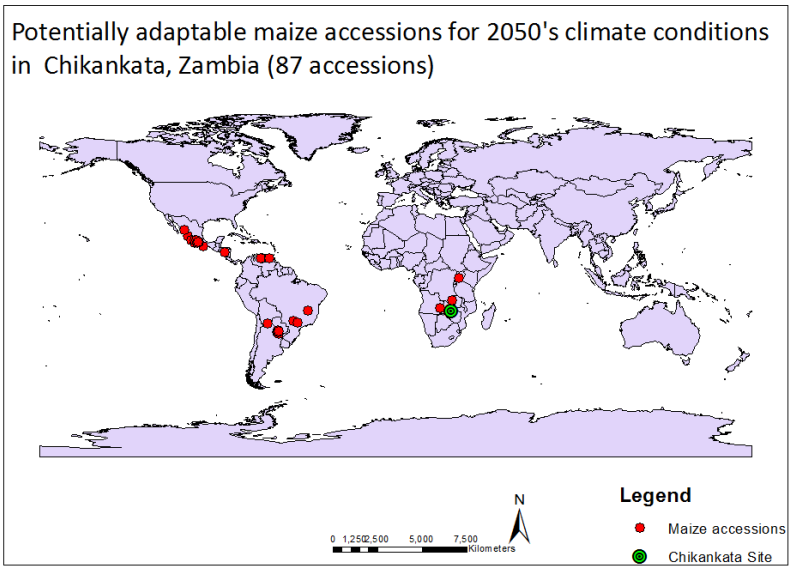


Figure 2c: Number of potentially adapted accession held in international maize collections suitable for predicted 2050s climate conditions in Chikankata, Zambia. Source: Otieno, 2019



Likewise, as depicted in figures 3a, 3b and 3c below, 31 of the 178 sorghum accessions in the national genebank were identified as being potentially adapted to present climate conditions Tsholotsho, Zambia. Under the predicted conditions for 2050, the number of potentially adapted sorghum accessions identified by the research teams was reduced to 20. The number of potentially adapted sorghum accessions for present climate conditions available from international sources was also assessed: 514 accessions were identified as potentially adapted to Tsholotsho's present climatic conditions and 242 were identified as potential adapted for for Tsholotsho's predicted climate in 2050 (Figure 3).

Figure 3a: Origin of Sorghum collections held in the National Genebank of Zimbabwe. Source: Otieno, 2019

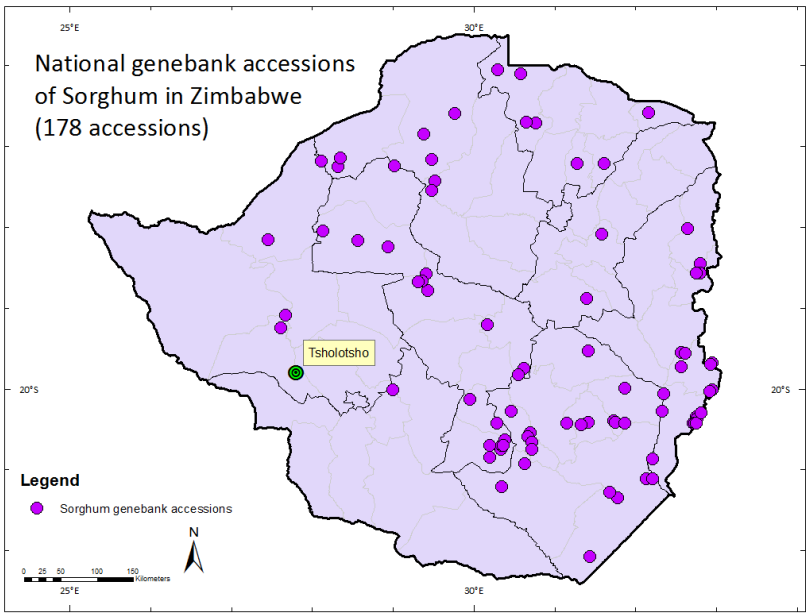


Figure 3b: Sorghum collections with potential for present climate conditions in Tsholotso, Zimbabwe. Source: Otieno, 2019

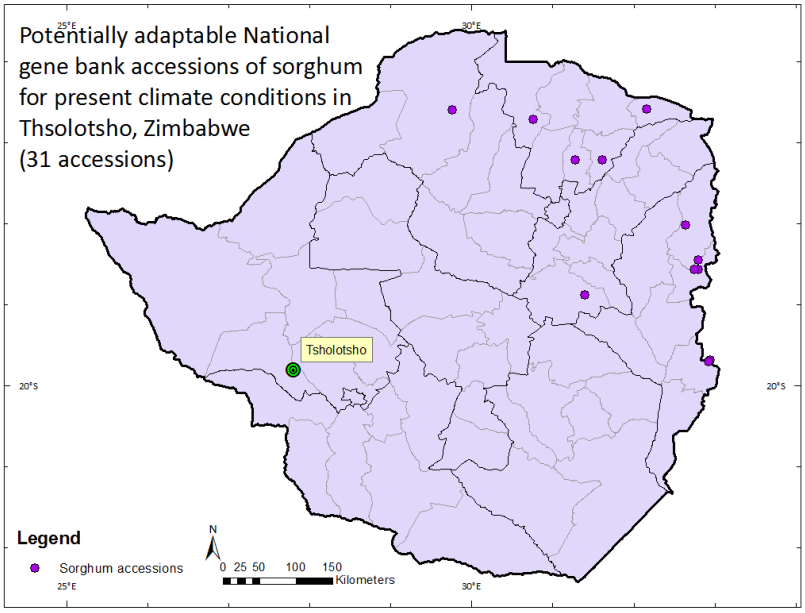


Figure 3c: Potentially adapted sorghum accessions from the national genebank for predicted 2050s climate conditions in Tsholotsho, Zimbabwe. Source: Otieno, 2019

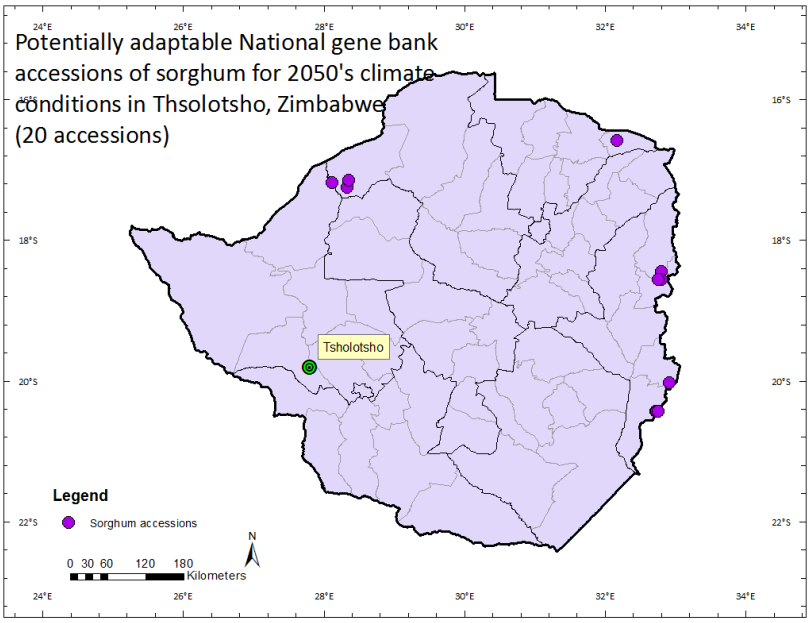


Figure 4a: International collections of Sorghum accessions (22,000 in total). Source: Otieno, 2019

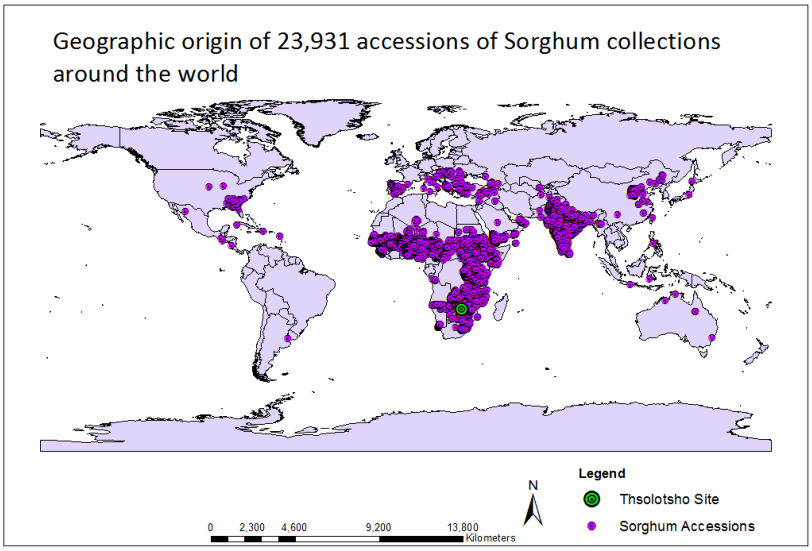


Figure 4b: International collections of sorghum with potential for adaptation to present climate conditions in Tsholotsho, Zimbabwe. Source: Otieno, 2019

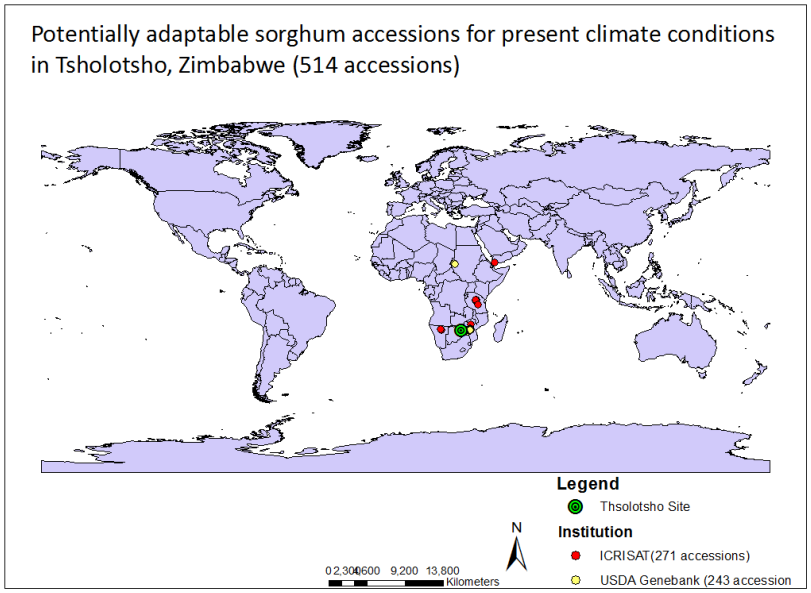
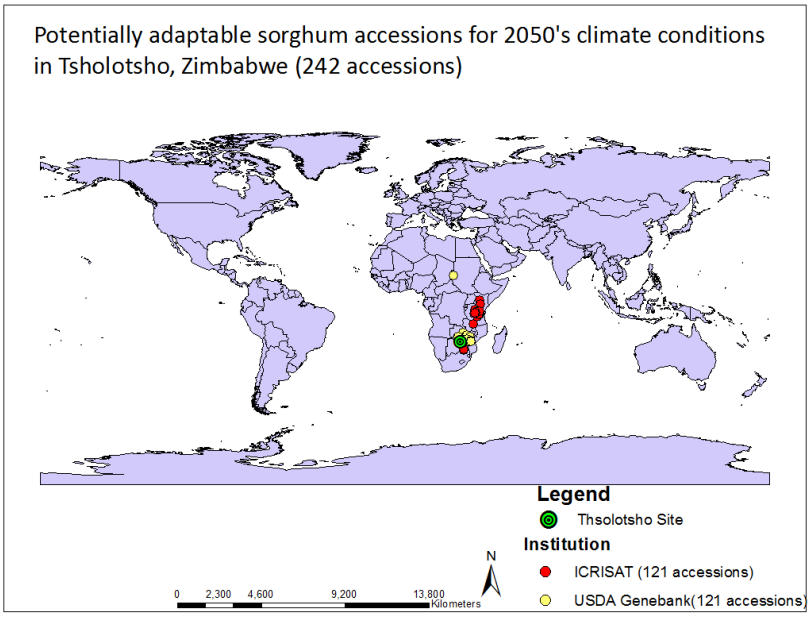


Figure 4c: Sorghum accessions from international sources with potential for adaptation to 2050s climate conditions in Tsholotsho, Zimbabwe. Source: Otieno,2019



4.1 Multilateral System of Access and Benefit-sharing

The International Treaty on Plant Genetic Resourced for Food and Agriculture (ITPGRFA) created the Multilateral System of Access and Benefit-sharing (multilateral system). There are currently approximately 2.3 million accessions of the 64 crops and forages listed in Annex 1 of the ITPGRFA that are available without charge, or for minimal administrative costs (such as processing fees) through the multilateral system. The multilateral system includes PGRFA of the 64 crops and forages listed in Annex I that are: i) 'under the management and control of the Contracting Party and in the public domain' (ITPGRFA Article 11.1); ii) voluntary included by natural and legal persons; iii) in collections hosted by international organizations like CGIAR Centers that sign agreements with the Plant Treaty's governing Body. Kenya, Tanzania and Uganda are all contracting parties to the International Treaty. Anyone, including farmers, farmer organizations, NGOs, companies, in any Treaty member country has the right to ask for and receive facilitated access to all materials in the multilateral system, to use for the purposes of research, training and breeding. It is an amazing system that provides access to an extraordinary diversity of materials worldwide. The trick lies in building the capacity of farmer organizations, NGOs, national agricultural research organizations to understand how the system works, how to identify what materials in the system are potentially useful to them and then request the materials.

The OSSS project is an excellent example of how farmers, national programmes and international organizations can work together to take advantage of the multilateral system to find and evaluate materials that are potentially adapted to changing local conditions. Participating partners from Kenya, Tanzania and Uganda pooled and exchanged crop genetic resources from their respective national genebanks, that are included in the multilateral system, using the SMTA. Presumably, the fact that all of the three countries had ratified the Plant Treaty, and that all the materials were already in the national genebanks, made it relatively easy to provide access to each country's materials using the SMTA.

Of course, this begs the question, would it have been possible to assemble materials to exchange between countries in the OSSS project from farmers, companies or NGOs? In most countries, such materials are not automatically included in the multilateral system because they are not 'under the management and control' of the national government and in the public domain. So, to obtain permission to use materials from farmers, companies and NGOs, it would be necessary to develop separate access and benefit-sharing agreements with those providers pursuant to whatever other laws apply in the countries concerned. Since almost all countries' agricultural biodiversity laws are different, and many countries do not have any access and benefit-sharing laws, it can be potentially very time-consuming and difficult to come to final agreements about accessing such materials.

4.2 Complying with and building on the Plant Treaty and SMTA in the context of our project work

Under Article 6 of the SMTA, used for all exchanges of materials in the Plant Treaty's multilateral system, the recipient undertakes that the Material shall be used or conserved only for the purposes of research, breeding and training for food and agriculture. Such purposes shall not include chemical, pharmaceutical and/or other non-food/feed industrial uses. This article does not provide permission

for large scale cultivation/production or commercialization of materials 'in the form received' under the SMTA. However, the recipient can use the materials received to develop new PGRFA, which they can pass on to others with the SMTA for still further research and breeding, or can commercialize as a new PGRFA product.

Section 6.7 of the SMTA indicates that, in case the Recipient commercializes a product that is a Plant Genetic Resource for Food and Agriculture and which incorporates Material as referred to in Article 3 of this Agreement and where such Product is not available without restriction to others for further research and breeding, the Recipient shall pay a fixed percentage of the Sales of the commercialized Product into the mechanism established by the Governing Body for this purpose, in accordance with Annex 2 to this Agreement. That amount has been set at 1.1% of gross sales.

So, the multilateral system and SMTA provide excellent policy support for accessing and pooling portfolios of genetic materials from around the world for experimentation and evaluation through projects like the OSSS, and for making evaluated materials available for inclusion in crop improvement programmes. Of course, all subsequent use of materials derived from germplasm accessed from the multilateral system must comply with, and pass on, the legal terms and conditions related to uses and monetary benefit sharing. In addition, the developers of the new products may want to impose other conditions —in addition to those originating from the Plant Treaty and SMTA— over the use of the materials they have developed. They may wish to seek IPRs over them, register them in national seed registries, or they may wish to ensure that they always remain public and free for use by all.

In this context it is important to pause and consider the situation where materials received under the SMTA are found to be ready to scale-up for use in production in the form in which they were received under the SMTA either for direct use in cultivation or for commercialization. . These uses of the materials is not included in the scope of the SMTA. So, it may be that other rules apply to those materials, depending on the laws in place in the countries from which they were obtained, at the time they were obtained. It is necessary to investigate if the materials are subject to such laws/restrictions, and if they are, to seek permission from the legal providers of those materials (and from whomever else may be required under the national law). Of course, this process can be complicated and time consuming, and may ultimately lead to a refusal to consider or agree to a request to use the materials as desired. Associated uncertainties and transaction costs could potentially undermine a project from the beginning. Variations of these questions were considered by the Ad Hoc Technical Advisory Committee on the Multilateral System and the Standard Material Transfer Agreement (TAC-MLS/SMTA. As its name suggests, this body was created by the Plant Treaty's Governing Body to consider legal issues associated with daily operation of the multilateral system and the use of the SMTA. In its published 'Opinion 10', the TAC-MLS/SMTA opined, among other things, that

- "PGRFA received under the SMTA can be made available to farmers for direct use for cultivation only if there is a separate express permission allowing for such distribution from the provider that included such material in the Multilateral System.
- No such permission would be required where germplasm is being restored to farmers that originally provided it.

PGRFA distributed to farmers for direct use for cultivation should not be transferred with the SMTA. They

should be transferred with a statement that the material can be used directly for cultivation."[12] One way to address this situation proactively, early on in the life cycle of a research and development project or programme is to develop framework agreements with research consortium partners wherein as many of these issues as possible are considered and resolved before research activities are started. This is easier where the consortium research partners are also the germplasm providers, as in the case of the OSSS project, where the national genebanks are providers of the materials. They can be engaged, in advance, to agree to allowing materials to be used for direct use in cultivation/production. In such a case, they might agree to provide the material to one another with both an SMTA and an agreement saying the materials can be used directly in production if it is discovered that they perform well under the research carried out under the SMTA. That assumes that the genebanks have the legal right to provide such access, or that they obtain it from competent authorities in their country who are responsible for access and benefit sharing laws that apply for uses of materials not covered by the SMTA. In that context, they may also agree, up front, to a percentage of sales being shared back with the country of origin (again, recalling that this arrangement is not within the scope of the SMTA, which has its own benefit-sharing conditions). Similarly, consortium partners can agree, in advance, on the conditions that they will apply to research products (in addition to those conditions from the SMTA). In support of longer-duration, scaled-up cooperation projects involving movements of materials and information between countries, it may be advisable to develop framework agreements endorsed by national competent authorities from the participating countries to set the scene for streamlined, low-transaction cost, transparent research and development programmes. Indeed, under the framework of this project, and other related projects in East and Southern Africa, we are exploring developing guiding principles for sub-regional cooperation in projects designed to exchange, evaluate and use crop diversity for climate change adaptation.

[12] The full collections of Opinions of the Ad Hoc Technical Advisory Committee on the Multilateral System and the Standard Material Transfer Agreement (TAC-MLS/SMTA) are published on the Plant Treaty website at http://www.fao.org/3/a-i4578e.pdf

5. Sharing Experiences of Regional and International Trade Deals/Legal Frameworks and Smallholder Access to Seeds

Faith Lumonya, SEATINI, and Fernando Hernandez, BothEnds

5.1 About BothEnds[13]

BothEnds is a global civil society whose mission is to strengthen global civil society to gain decisive influence on the use of nature and the environment, thus contributing to societies that remain within our planetary boundaries and respect all human rights, including the rights to water, food and a safe living environment. BothEnds works through signalling harmful policy and investment decisions and then translates signals into advocacy and offers alternatives in favour of sustainable development.

5.2 About SEATINI[14]

The Southern and Eastern Africa Trade Information and Negotiations Institute (SEATINI), was established in 2001. SEATINI Uganda is one of the leading NGOs working on issues of trade, fiscal and development issues. SEATINI Uganda focuses on strengthening stakeholders' capacity to influence trade, fiscal and related policies and processes at national, regional and international levels for sustainable development and improved livelihoods in Uganda and the East African region. The SEATINI Mission is to strengthen stakeholders' capacity to influence trade, fiscal, and related policies and processes through information generation and dissemination, capacity building and advocacy, alliance building and networking.

5.3 Why you should be interested in global and regional trade deals

The ITPGRFA recognises farmers' rights, including the right to save, use, exchange and sell seeds and other propagating material. These rights are extremely important for smallholder farmers around the world whose livelihoods for a large part depend on the informal seed system.

These rights are similarly vital if we wish to keep promoting agroecological approaches to farming that will lead to more resilient and sustainable farming systems globally. The UPOV Convention, however, limits these important farmers' rights in several ways. First, farmers need authorisation from plant breeders to stock or use protected seeds unless they do so for private and non-commercial purposes. UPOV defines such purposes in a narrow way and has consistently disapproved of provisions in national legislation that promote the freedom to save, exchange and sell seed and propagating material, even if among smallholder farmers. The breeder's right, in other words, is very strong and takes precedence

[13] https://www.bothends.org/en/
BothEnds PowerPoint presentation: https://drive.google.com/open?id=1hGJQ68ug6Mr3Efs5765Fgp2_KhvSgIGZ

[14] https://www.seatiniuganda.org/
SEATINI PowerPoint presentation: https://drive.google.com/open?id=1EajIoTLf4duwYyRfPgIZlIEpAIItnkD_

over farmers' rights. Secondly, while Article 15(2) of UPOV 91 provides an optional restriction of the breeder's right, this again is defined narrowly, aiming only at selected crops where there is a common practice among farmers to save harvested material for further propagation. Thirdly, UPOV claims that the Convention allows subsistence farmers to exchange protected seeds against other vital goods within the local community. However, since subsistence farmers will try to sell or barter that part of the harvest that they do not need to use themselves with people both within and outside their local communities, this too seems like a restricting definition[15].

5.4 What kind of legal frameworks do we want?

Any legal/policy framework that speaks about private ownership and rights of control of varieties and seeds concerns farmers' rights and can adversely impact them.

While much focus has been placed on influencing the way frameworks at the national levels are designed, regional and international levels have been left to the elites and a few interested parties.

5.5 Farmers' rights

The concept of farmers' rights resulted from debates in FAO that started in the early 1980s in response to the increase in emphasis on private intellectual property rights over agricultural resources and the focus on rewarding the world farmers for their contribution to maintaining and using agricultural biodiversity. They thus provide them with the incentives to continue nurturing, sustainably utilizing and making available these resources for future generations.

The definition of farmers' rights included protection of traditional knowledge relevant to plant genetic resources, equitable sharing of benefits arising from their use, participation of farmers in decision making processes touching on the conservation and sustainable use of these resources and the right to save, use, exchange and sell farm-saved seed/propagating material of farmers' varieties. The concept of farmers' rights was developed to reflect the contributions that traditional farmers, particularly in the developing world, have made to the preservation and improvement of plant genetic resources.

In the late 1950s, a special system of Plant Variety Rights (PVR) for the legal protection of new varieties was established in a number of countries and regulated internationally by the 'International Union for the Protection of New Varieties of Plants' (the UPOV Convention of 1961). Plant breeders' rights (PBR), also known as plant variety rights, are rights granted to the breeders of a new variety of plant that give the breeder exclusive control over the propagating material (including seed, cuttings, divisions and tissue culture) and harvested material (cut flowers, fruit and foliage) of a new variety for a number of years(approximately 20 years).

With these rights, the breeder can choose to become the exclusive marketer of the variety, or to license the variety to others. In order to qualify for these exclusive rights, a variety must be New, i.e. it has not been commercialized for more than one year in the country of protection; Distinct, i.e. it differs from all other known varieties by one or more important botanical characteristics, such as height, maturity,

[15] UPOV 91 and trade agreements, compromising farmers' rights to save and sell seeds https://www.bothends.org/uploaded_files/document/1LR_UPOV91_brochure_A4.pdf

colour, etc.; Uniform, whereby the plant characteristics are consistent from plant to plant within the variety; Stable, as in the plant characteristics are genetically fixed and therefore remain the same from generation to generation, or after a cycle of reproduction in the case of hybrid varieties.

5.6 Regional and global-free trade agreements

We have a number of regional and global free trade agreements (FTAs) which are affecting farmers. These include COMESA Seed Trade Harmonization Law & Regulations, the Seed and plant varieties protection Bill of EAC, the African Regional Intellectual Property Organization (ARIPO) Plant Variety Protection (PVP) Law on continental free trade area, the TRIPs Agreement of the World Trade Organization (WTO) and the UPOV 91.

These agreements have led to the erosion of farmers' rights to use, re-use, save and exchange genetic materials. According to this view, although farmers have better access to improved varieties from breeding, *in situ* conservation by indigenous farmers diminished as they began to rely more on commercial plant breeders.

6. Group discussions

6.1 Group 1: Roles and Responsibilities of Stakeholders in Scaling-up OSSS

Stakeholders	Roles and responsibilities	Opportunities
Farmers	Engage in participatory research especially on the indigenous seeds Engage in SACCOs to access funds Engage their local leaders on the issues of seed banks Indigenous farmers making up a network Strengthening partnerships among seed banks Using existing farmer groups to push for some crop varieties to be placed under open source seed system Understand national situations in terms of production, regulation and innovation	Farmers selling directly to the consumers High demand for the organic and indigenous seeds
CSOs	Raise awareness of farmers about OSSS Build capacities of extension workers to train farmers Championing the rights of farmers through advocacy Lobby for government seed certification bodies to support open source systems Fundraising for community seed banks Link smallholder farmers to agro-dealers	Form coalitions and platforms Come together towards a specific advocacy agenda
Government ministries, departments and agencies (NARO/ KALRO/GeRRI/TPGRC)	Allocate more funds to the agencies doing research Encourage seed quality Demonstrate empirical evidence to support policy development	
Financial Institutions	Provide farmers with credit at a low interest Provide farmers with financial literacy training	Pool of organized farmers for easy funding

Stakeholders	Roles and responsibilities	Opportunities
Media	Publicize OSSS Offer airtime on OSSS, especially on local radio stations Raise awareness and capacity building Address the disappearance of seeds within farmers	Willingness of the public to listen Bigger constituencies that they attract
Local & National governments	Lobby funds for farmers Encourage indigenous seed saving Address the disappearance of seeds within farmers Roles of local authorities in functioning seed systems Enforce and implement policies Enforcing standards	Annual funding received from government Direct grants (e.g. World Bank grant in Kenya) National funds e.g. women funds, youth funds
Academia	Create research that supports OSSS	Integrate OSSS in curriculum

6.2 Group 2: Smallholder Seed Business Development in the Context of Regional and International Trade and Investment Treaties/Deals and National Policy Frameworks

What is needed to make the system work for smallholder business development? What legislative frameworks and policies impede or facilitate smallholder business development?

Stakeholders need to advocate for an official open source seed system that would be upheld and owned by the government, which would allow for the registration of farmers' varieties as public property ('public seeds') that cannot be patented. It would allow for the use, reuse, exchange and multiplication of farmer-saved seeds. This should be backed by a government agency that checks on and controls quality, safety and phytosanitary standards. Declaring farmers' varieties open source will protect them from privatization. Stakeholders need to propose a tightening of legislation so that private persons or companies will not be able to privatize farmer-saved varieties.

We need to advocate for our countries to not sign any regional or international (trade) agreements that would go against the interest of smallholder farmers or undermine farmers' rights; for instance, subscribing to ARIPO. Such agreements undermine farmers' rights. In terms of advancing open source seed system in countries, we recommend proposing that both the intellectual property rights system and open source seed system coexist so that the system is not radically changed but is exploring avenues of coexistence within the current system.

In Kenya, the stakeholders need to advocate for advanced regulation on recognition and protection of farmer-managed systems with reference to the Kenyan constitution. The constitution recognizes farmers' rights and farmers' ownership of local varieties. Amendments need to be made so that the Plant Varieties Act will anchor these provisions.

In addition, international and regional treaties and trade agreements like UPOV91/WTO, ITPGRFA and Nagoya Protocol/CBD currently deal with different issues related to management of PGRFA. There is need therefore for countries to adopt strategies to ensure that there is consistency in the way they are implemented.

6.3 Group 3: Registration and dissemination of selected varieties

What is a farmer variety? There is no one single definition of 'farmer variety', however, a number of terms can be used to define it. A farmer variety is whatever a farmer is harvesting and selecting for planting in the next season after several years of selection for various attributes such as adaptability, nutrition, yield, etc. It could be a landrace or obsolete variety[16].

Registering farmers' varieties comes with numerous advantages. It facilitates transfer of genetic materials between national and community genebanks, mitigates against bio-piracy and enhances benefit sharing and lastly allows commercialization. But who should register these materials and how can they be registered? A government certification agency is responsible for varietal registration. As to how to register, an individual farmer can submit the seed variety to the community seed bank and then the CSB takes it to a research institution. The research institution can help farmers with characterizing and documenting a report about the varieties. It then then sends the report to the national genebank, which submits it to the certification agency for registration. However, each country can develop its own legal context to register these varieties.

Another question is whether these varieties can be commercialized. Yes, they can be commercialised through the Quality Declared Seed guidelines within the farmer-managed seed systems. But what will happen if private companies develop interest and want to commercialize them? In such a case, a regulatory framework should be developed at the community seed banks level to provide for how such companies can access these seeds.

[16] Citation: Recha T, Muwanika C, Otieno G and De Jonge, B (2019) Report of the International Workshop on Registration of Farmers' Varieties, 4-7 December 2018, Entebbe, Uganda. Bioversity International, Rome and Oxfam Novib, The Hague.

Appendix 1: Workshop programme

Day 1: Thursday, 21 November 2019

Time	Programme & Session lead:	Session topics
	Session 1: Preliminaries	
09:00 - 9:30	Introduction of the participants and Welcome Remarks *John Mulumba, NARO and Nout van der Vaart, Hivos*	
09:30 – 9.40	Opening Remarks *Jean-Marie Byakweli, FAO*	
	Session 2: Setting the scene	
9.40 – 10.15	• Background of the project. • Farmer experiences • Objectives of the workshop *Carlo Fadda, The Alliance of Bioversity International and CIAT*	Goal of the project, objectives of the project, implementing partners, and results achieved so far. *5 minutes* Invite Farmers from Kenya and Uganda (1 hour session) *20 minutes* Project Outputs highlighting some of the policy implications- high level international and sub-regional policy framework/context *10 minutes*
10:15-10:45	OSSS Policy highlights *Anne Majani, Hivos; Boniface Kiome, Hivos* *Tobias Recha, The Alliance of Bioversity International and CIAT*	Highlights of some of the activities covered Stakeholders' workshop, research, engagements, policy write-shop and development of brief agenda setting
10:45-11:15	Coffee/Tea break	
	Session 3: Partner experience on seed policy- and legislation-related work	
11:15-11:30	OSSS and seed policies in Uganda: *John Waswa, NARO PGRC, Uganda*	Overview of the seed policy and legislative framework
11:30-11:45	OSSS and seed policies in Kenya: *Desterio Nyamongo, GeRRI, KALRO, Kenya*	
11.45 –12.05	Sharing experiences of Pelum Uganda projects in Farmers rights and Seed Policy Uganda *Joshua Aijuka, PELUM, Uganda*	Highlights of experiences and their work with farmers and civil society and platforms on farmer-managed seed systems and farmers' seed rights and contribution of this towards existing sub-regional policies
12:05-12:25	Sharing experiences of Bioversity International's projects in Farmers rights and Seed Policy Ethiopia *Yosef Gebrehawaryat, Alliance of Bioversity International and CIAT*	
12.25– 13.00	Sharing experiences of regional and international trade deals/legal frameworks and smallholder access to seeds *Jane/Faith, SEATINI, Fernando, BothEnds*	*Linking the access to seeds and international/ regional trade agendas*
13:00-14:00	Lunch break	

14:00-15:30	Break-out groups discussing three topics in depth: 1. Role and responsibilities of stakeholders in scaling up OSSS (on all levels) 2. (Smallholder) seed business development in the context of international, regional treaties, trade agreements and national legislation (Nout/SEATINI) 3. Registration and dissemination of selected varieties (Desterio Nyamongo, GeRRI, John Mulumba, NARO, Brenda MAAIF) 45 mins group discussion; 45 mins presentation and plenary discussion.	Guiding questions: 1. Define stakeholders, interests, power/ influence? 2. How do current legal frameworks and policies impede or facilitate smallholder seed business development? What impedes growth/development of smallholder seed business? 3. What is the most efficient way to register and release local varieties?
15:30-16:00	Synthesis emerging issues: Policy support for climate resilient seed systems: Michael Halewood, *The Alliance of Bioversity International and CIAT*	
16:00-16:30	Coffee/Tea Break	
16:30-17:00	Continuation of discussion and presentation of emerging issues	
	Closing of the day	

Day 2: Friday Morning, 22 November 2019

Time	Programme & Session lead:	
	Session 5: Contributions to a regional policy brief	
9:00-9:20	Variety release and registration process *Brenda Kisingiri, MAAIF*	
9:20-10:30	Presentation of group work. *Nout van der Vaart, Hivos and* *Tobias Recha, The Alliance of Bioversity International and CIAT*	Questions and answers
10:30-11:00	Coffee/Tea Break	
11:00-12:00	CSO statements and sharing *Each organization 5minutes* *Food Rights Alliance, AFSA, Slow Food and Seedsavers, VEDCO, Troicare,* *Very specific in emerging issues*	• Share some of the work they do in their organisations • How would discussions we had fit in with their current work on seeds and farmers rights?
	Session 6: Next Steps (Action Plans), Evaluation and Closure	
12:00-12.30	*Carlo Fadda, The Alliance of Bioversity International and CIAT and John Mulumba, NARO PGRC, Uganda*	
12.30:-1:30	Lunch	

References

Food and Agriculture Organization of the United Nations (FAO). (2014) The state of food and agriculture: Innovations in Family farming. Available at: http://www.fao.org/3/a-i4040e.pdf.

Graeub B E, Chappell M J, Wittman H, Ledermann S, Kerr R B and Gemmill-Herren B (2016) The state of family farms in the world *World Dev*. 87 1–15Halewood, M., Otieno, G., Nkhoma, C., Kasasa, P., Mulumba, J.W., Gapusi, J., de Jonge, B. (2016) Access and benefit sharing policies for climate resilient seed systems: matching global commitments with national realities. ISSD Africa Synthesis Paper. [12 Sep 2016]. ISSD, 19 p.

Kloppenburg J. (2014). Re-purposing the master's tools: the open source seed initiative and the struggle for seed sovereignty. The Journal of Peasant Studies 41 (6): 1 225-1 246. https://doi.org/10.1080/03066150.2013.875897.

Kusena W., Beckedahl H. & Desai S. (2017) Civil Society and Residents' Coping Strategies with Water Shortages and Household Food Insecurity in Gweru, Zimbabwe. Journal of Arts and Humanities Vol. 06 issue 02, 2017, 91-103.

Louafi S., Westphal I., Montenegro M., Manzella D., Otieno G., Steigerwald S., Kloppenburg J. (2018). Open Source for Seeds and Genetic Sequence Data: Practical experience and future strategies. CIRAD, Montpellier, Perspective 49. https://doi.org/10.19182/agritrop/00063.

Louwaars N. (2019). Open Source Seed, a Revolution in Breeding or Yet Another Attack on the Breeder's Exemption? Frontiers in Plant Science Vol. 10 (1127) https://www.frontiersin.org/article/10.3389/fpls.2019.01127.
DOI=10.3389/fpls.2019.01127

Musiime E. & Nakayima E. (2013) Advocacy for increased nutrition programming: Good Practices, Lessons learned and Key Messaged. UNNGOF Policy Brief No.6, 2013. Available at: http://vedcouganda.org/3015/downloads/Mapping-Nutrition-Policy-Brief.pdf.

Otieno G. (2019). Chapter 21: Accessing Genetic Diversity for Food Security and Climate change adaptation in select communities in Africa. Book Chapter in Food Security and Climate Change Eds Shyam S. Yadav Robert J. Redden, Jerry L. Hatfield, Andreas W. Ebert & Danny Hunter
Available at https://onlinelibrary.wiley.com/doi/book/10.1002/9781119180661.

Bioversity International and the International Center for Tropical Agriculture (CIAT) are part of CGIAR, a global research partnership for a food-secure future.

Bioversity International is the operating name of the International Plant Genetic Resources Institute (IPGRI).

Bioversity International Headquarters - Rome, Italy
Via dei Tre Denari, 472/a
00054 Maccarese (Fiumicino), Italy
Tel. (39-06) 61181
Fax. (39-06) 6118402

www.bioversityinternational.org
www.ciat.cgiar.org
www.cgiar.org