IFAD
Investing in rural people

Lessons learned

Supporting smallholder seed systems

Agronomy

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These notes are “living” documents and will be updated periodically based on new experiences and feedback. If you have any comments or suggestions, please contact the originators.

Originators

Wafaa El Khoury
Lead Technical Specialist, Agronomy
Policy and Technical Advisory Division
E-mail: w.elkhoury@ifad.org

Robert Delve
Senior Technical Specialist, Agronomy
Policy and Technical Advisory Division
E-mail: r.delve@ifad.org

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Contact

Maria-Elena Mangiafico
Knowledge Management and Grants Officer
Policy and Technical Advisory Division
E-mail: PTAKMmailbox@ifad.org

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Uganda - Vegetable Oil Development Project

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Acronyms and abbreviations

ARC	Agricultural Research Corporation
CSP	community seed production
FAO	Food and Agriculture Organization of the United Nations
FFS	farmer field school
FSA	Federal Seed Administration
HTDN	How To Do Note
ICARDA	International Centre for Agricultural Research in Dry Areas
IRRI	International Rice Research Institute
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
KUBK-ISFP	Improved Seeds for Farmers Programme (Nepal)
NARC	National Agricultural Research Council
NGO	non-governmental organization
PEPB	participatory evolutionary plant breeding
PGRFA	plant genetic resources for food and agriculture
PPB	participatory plant breeding
PVP	plant variety protection
PVS	participatory varietal selection
SDP	Seed Development Programme (Sudan)
SRR	seed replacement rate
SQCC	Seed Quality Control Center
UPOV	Union for the Protection of New Varieties of Plants

Introduction

Facilitating farmers' access to quality seed of improved varieties is often viewed as a strategy to better the livelihoods of smallholder farmers. Unfortunately, the complexity of national seed systems, of including farmers' seed needs and linking farmers to the other elements of increased productivity have often not been well incorporated into seed development projects or the seed activities of larger projects. In this series we are attempting to address these concerns. The Seed Teaser provides an introduction to national seed systems. This publication, Lessons Learned, presents some key lessons from the experiences of IFAD and the United Nations Food and Agriculture Organization (FAO), and other seed-related development projects. These lessons will help the reader of the How To Do Note (HTDN) to have a greater understanding and appreciation of the framework for analysing national seed systems and how to use the HTDN to inform the design and implementation of more effective seed projects.

Lessons learned

1. Understanding farming households' seed needs is critical when considering seed-related project activites,

Most seed-related projects assume the problem with increasing the adoption of new varieties is related to an insufficient supply of seed of improved varieties. Consequently, if seed supply is increased, the problem will be solved and farmers will increase productivity and production. In reality, the issue is much more complex since farmers have a number of seed sources that they can use, including their own seed (including local **landraces** and improved varieties) saved from the previous harvests, social networks and the local market, which collectively are referred to as the **community/informal seed system**. This seed system is normally the main source of seed for smallholder farmers. Even in the case of seed shortages due to drought or other external shocks (abiotic, biotic causes or civil unrest, etc.), farmers normally source seed from the informal seed system. Farmers often have a strong preference for the varieties they are using, based on agronomic and culinary characteristics. Adopting a new variety requires farmers to see the new seed and grow it, as outlined below, so just increasing supply may not have the anticipated impact.

Box 1. Seed replacement rate

Seed replacement rate (SRR) for a particular crop is the percentage of seed planted that is certified, truthfully labelled or commercial seed. SRR varies greatly depending on the crop and the particular characteristics of the agriculture sector. The SRR of hybrid crops is very high since farmers need to purchase seed every year because the seed is very different from the parents (i.e. the seed that was planted). The SRR is very low for self-pollinated crops like wheat, rice or legumes since the seed is genetically identical (or very similar) to the parents and farmers can save and replant harvested seed. Understanding the SRR is critical to understanding farmer seed demand and how to design seed interventions to increase productivity and production. Though SRR can be a useful indicator for enhanced crop productivity, what is more important at early stages in the development of the agricultural sector is whether farmers are using the best adapted varieties rather than how often they are buying new seed rather than using their saved seed from the previous season.

The **formal seed system** for certified (or quality-declared) seed consists of seed supplied by agrovets/input dealers, seed companies, the government or non-governmental organizations (NGOs), but it accounts for only a small portion of the seed that farmers plant. For farmers to purchase seed from the formal sector rather than source seed from the informal seed system, there needs to be a good reason, i.e. it needs to be a good investment that will provide them with a reasonable return. This good reason for using quality seed of a preferred variety will also depend on access (ability to purchase) and availability (at the right time and location). The decision to buy seed from the formal seed system also needs to be viewed in the larger context of agricultural production, since a reasonable return will depend on whether farmers can maximize the value of the improved seed through the necessary good agricultural practices, such as soil fertility management, weed control, water availability and integrated pest management, and whether farmers have access to markets to sell what they produce at a profit.

Many IFAD seed-related projects rely on formal seed system data and literature to assess farmers' needs. For example, the Improved Seed for Farmers Programme in Nepal (KUBK-ISFP) bases its seed needs assumptions on the SRR (Box 1) in the project area (refer to Box 2 and the Nepal case study below), and the project performance indicator is related to the increase in this rate. Annual assessments of seed demand in KUBK-ISFP, and by Nepal's National Agricultural Research Council (NARC) for the production of foundation seed, are based on official assessments for district levels coming from the formal sector (seed companies and agrovets). Similarly, the SRR measurement is based on information from the formal sector and only reflects market demand and purchase of certified or **truthfully labelled seed**. However, field discussions undertaken during various missions of KUBK-ISFP, revealed that:

a. Farmers are exchanging and buying seed from each other, including truthfully labelled seed produced by farmer groups supported by the project which should have entered the formal market.

b. Farmers may not buy truthfully labelled seeds from agro-dealers because they do not always trust them, the seed is too expensive or because they need to travel long distances to reach them.

c. Farmers buy new seed from the formal sector once they notice deterioration in the quality and uniformity of their crop. The frequency of buying new seeds could range from every 1-2 years (SRR of 50-100 per cent) for many vegetable varieties to every 3-6 years for wheat and **open-pollinated** (OP) maize varieties (SRR of 16-33 per cent).

d. The availability of new adapted varieties to farmers can temporarily increase SRRs until the farmer starts saving seeds of the new variety from the harvest or obtain it from the informal seed system.

At the design stage of seed related projects, the importance of seed exchange through the informal seed system should be taken into consideration in assessing farmers' needs and hence seed demand, in determining project seed production targets and the corresponding impact on farmers' livelihoods and income as a result of introducing quality seeds.

*Please review the HTDN section – **Analysis of farming households as seed users and producers** – and Annex 1 that provides more detailed questions for farming households. It should be considered to conduct surveys of farmers' seed needs using focus-group discussions with farming households or gather information from secondary sources to design an effective seed project (See also: http://www.issdseed.org/resource/issd-technical-note-2-seed-systems-analysis).*

The two case studies at the end of this publication provide examples of projects that did not have a detailed understanding of farmers' seed needs during the project design. The Seed Development Project (SDP) in Sudan conducted a farmer seed survey during its implementation to improve the performance of the project. The midterm review of KUBK-ISFP recommended that the Government of Nepal monitor farmer seed purchases and the renewal of varieties (refer to and the case study of the Nepal project later in this document).

2. A pipeline of improved crop varieties adapted to farming households' needs is an essential element in an effective seed sector which improves farmers' agricultural productivity

What crop varieties are farmers presently using and are there new varieties that would better meet their needs? Project designers need to know farmers' cropping systems and their seed needs, and to determine if newly released improved varieties will be superior to what they already have. Improved varieties may have characteristics that farmers like, such as higher yields, earlier maturity, drought or heat tolerance, or pest and disease resistance. Other farmers' preferred characteristics, which are not always obvious, include straw quality (for animal feed or construction), resistance to post-harvest losses, cooking quality, nutrition content, taste and colour, etc. Despite weak breeding programmes in many developing countries, released improved varities from national research institutes or the private sector have been tested for their adaptation to local conditions in multi-location trials and officially released. However, these new varieties may not have been tested in marginal agro-ecologies and under low-input agriculture, i.e. no mineral fertilizer or pesticides, so they may not perform well under some smallholder situations when compared to local landraces.

Consequently, farmers require direct experience with new varieties through demonstrations, **farmer field schools (FFS)**, on-farm trials or seeing the crop in a neighbour's field before they will decide to try it and potentially adopt it. Since planting a new variety without first seeing its performance in the field (and usually over more than one season) can be a big risk, farmers normally try a new variety in a small area before deciding to adopt it on a larger scale. If there are new varieties adapted to the farmers' needs and which farmers are not aware of, then this is an opportunity to create farmer awareness of the new varieties through on-farm demonstrations. Projects should, however, consider the time lag between the exposure of farmers to new varieties, their acceptance of these varieties for adoption and the time needed for the national seed system (government, private seed companies or communities) to produce sufficient quantities of seed to fulfil their needs. This will depend on the efficiency of the extension services to conduct demonstrations and of the seed sector to timely produce the required quantities of seed. These elements need to be assessed during project design and taken into consideration in crop models and in the economic analysis of the project. Lack of consideration of the many years/seasons needed to do this is a common mistake observed in several IFAD projects.

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Nepal - High-Value Agriculture Project in Hill and Mountain Areas

The adoption of new varieties by farmers should result in an initial increase in farmers' seed demand for a variety. However, a sustainable increase in demand will depend on the accessibility and availability of seed from the formal and informal seed systems. This demand can be assessed through an analysis of farmers' needs as seed users, savers and producers.

Where improved varieties may not be adapted to the marginal agroecologies in the project target area and where farming communities may not be able to afford the use of external inputs, working with local landraces and the informal seed system should be considered. Please refer to point 5 below on linking the formal and informal/community seed systems and to the Iran case study.

*Please review the HTDN sections on the Analysis of farming households as seed users and producers, and the **Analysis of the institutions supporting the seed sector**, including Development of new varieties and Variety testing and release,as well as the detailed questions in this Lessons Learned publication (Annex 1). (See also: http://www.issdseed.org/resource/issd-technical-note-3-seed-value-chain-analysis). Based on the answers to these questions, the design team will have a better understanding of the acceptability of recently released improved varieties and the role they can play in a seed project to increase production and productivity of smallholder farmers.*

3. Community seed production can increase local seed supply but it is challenging to create sustainable community seed enterprises

A much-used strategy to increase farmers' seed supply at the local level is via community seed production (CSP) (FAO, 2010). CSP, in which farmers individually or in community groups produce, store, process and market seed, may be promoted in remote areas that seed companies and agrovets may not be interested in reaching, either due to the high transport and transaction costs, or due to low demand for **certified seeds**. Substantial effort can be required to establish CSP, such as training of farmers and their groups in seed production, business management and marketing, linking them to source seed, and the provision of seed production supplies, equipment and infrastructure. The findings of discussions during the FAO Community Seed Production Workshop in December 2013, which explored this topic based on case studies from Africa, Asia and Latin America, indicated that CSP can successfully provide seeds and new varieties to farmers, but that the factors favouring sustainable CSP are very site specific. Challenges to be addressed in building the sustainability of CSP include poor business management skills, weak quality control of seed production, the limited range of varieties produced, poor marketing skills, lack of long-term support and a limited local market.

Sustainable CSP has been difficult to achieve except in countries like India, where CSP is part of a larger cooperative structure, which can help overcome the issues mentioned above. A recurrent problem is that when CSP is initiated the demand for new varieties can be very high, because the varieties were not previously available to the farmers. However, the demand for seed can decrease when farmers start saving seed from their harvest rather than buying it, reducing the local seed market. To address this issue, consideration needs to be given to marketing of seed through seed fairs, local markets and in other communities, or allowing CSP groups to function as contract growers for established seed companies. As mentioned in point 2 above, the flexibility to produce new varieties will also help sustain demand. The use of small packages (2-5kg) of improved varieties for farmers to plant and test before deciding to adopt can be used with community seed banks, local markets and farmer field schools (FFS).

Please review HTDN section Analysis of farming households as seed users and producers and Analysis of the formal seed system and the correspnding detailed questions in Annex 1. In addition, the publications listed below could provide further specific information on the topic.

- *Community Seed Production and Promoting the Growth and Development of Smallholder Seed Enterprises for Food Security Crops: Best practices and options for decision making FAO 2010 http://www.fao.org/docrep/013/i1839e/i1839e00.pdf*
- *Community Seed Production,* FAO and ICRISAT, 2015, Workshop Proceedings 9-11 December 2013. http://www.fao.org/publications/card/en/c/94d9baaf-14f4-4382-8387-fe274d11a7f6/

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India - Tamil Nadu Women's Development Project

4. The inclusion of the informal seed system in the development of agricultural policy is particularly important for low-input agriculture in marginal agroecologies.

Farmers often use both the formal and the informal seed systems to source the seed they need. Arguably, most seed development projects have focused on how to improve the formal seed system either through support to the seed regulatory system, improving the capacity of seed certification agencies, development of new varieties or support to seed companies. Less attention has been given to linking the formal seed system to informal seed systems, where farmers source most of their seed. Some of the issues regarding CSP have been highlighted previously. Below are some initiatives that help link formal and informal seed systems. In all these suggested initiatives, particular attention needs to be given to the gender dimension since women often have an important role in selecting varieties, harvesting, drying, cleaning and storing of farm-saved seed (for improved varieties and local landraces). Since landraces often are food crops, the cooking and nutritional aspects need to be considered. Some key lessons learned are:

a. It is essential that new varieties are adapted to the needs of smallholder farmers, including for use in marginal agro-ecologies under low-input agriculture. To address this, the project could use **participatory plant breeding (PPB)** or **participatory variety selection (PVS)**, which include the testing and selection of potential varieties in the farmer's own field conditions. Field demonstrations could be followed by cooking demonstrations with women and men to ensure the new variety had the cooking and taste properties compatable with local preferences. Such demonstration is often overlooked and can result in rejection of the new variety that otherwise has good agronomic characteristics.

b. If new varieties are adpated to farmers needs, a useful stategy for remote areas is to incorporate the new varieties in the informal seed system rather than try to create a sustained demand for the improved variety in the formal sector. This could start with the demonstrations mentioned above followed by the sale of seed in small packets to farmers who show interest in testing the new varieties when they observe them during field days.

c. A greater appreciation of farmers' landraces is needed. Why do they prefer these landraces? What is the role of these landraces in household nutrition? or as a cash crop or for other uses? There should be a systematic effort to characterize and conserve these landraces in gene banks, farmers' fields and community seed banks, and to use these landraces in developing new varieties, taking into account farmer access and benefit-sharing rights. Another option is improving the landraces through systematic selection (**mass selection**). Also, there may be options to improve the way landrace seed is produced, harvested, dried, cleaned and stored. Improved production practices can lead to a greater supply of these landraces and sharing of the landrace through social networks, community seed banks, seed fairs and local markets.

d. Especially under low-input conditions or under organic production, genetic resources, including landraces and improved varieties, could also be mixed and planted in farmers' fields. Farmers select seeds at harvest for specific characteristics such as yield (for grain or straw), disease and drought resistance, and then the harvested seeds are mixed again and replanted. Over few years (depending on the crop), these seed mixtures will adapt to the the local agro-ecology, environmental conditions, and changes in the climate, and will start producing stable yields that are commonly higher than those of local landraces or improved varieties that are not adapted to low-input conditions. Seeds in this case are purposely not purified, but rather used as mixtures of relatively uniform crop populations (see the case study on **evolutionary plant breeding (EPB**).

e. Ensure that the informal/community seed system is included in national seed policy and farmers participate in seed policy formulation. National seed policy should include how to strengthen the informal/community seed system and how to adequately address farmers' rights regarding their own local varieties. Policies considerations could include revisions of seed systems and/or varietal registration and release procedures to allow for the wider use and promotion of local varieties and composite population.

Please review HTDN section on Analysis of farming households as seed users and producers, the section on Analysis of institutions supporting the seed sector and the section on Analysis of seed policy, laws and regulations and the related detailed question on these topic in Annex 1. Based on the answers to these questions, the design team will have a better understanding of the possibility of including linkages between the formal and community-based seed systems in a potential project.

5. Seed companies can be an important link to get newly developed and released varieties to farmers. They require sustained demand to be viable enterprises.

Local seed companies are in direct contact with the farmers they serve and have a deep understanding of their needs and the crops and varieties they use. Over time, the farmers develop trust in the seed companies to provide high-quality seed of the right varieties, and this kind of trust and customer loyalty is important to the companies. Seed companies often engage progressive farmers to be contract seed producers, which provides an income for the farmer and a way of demonstrating new varieties in the community. Seed companies often focus on crops with a high SRR, such as hybrid maize or vegetables. They are less interested in self-pollinated crops for which farmers often use their own saved seeds rather than purchase seeds every season. For the self-pollinated crops, seed companies must often demonstrate new varieties each year to generate demand for the varieties and hence the seed.

Local seed companies play the essential role of taking new varieties and getting them into the hands of farmers, but they require sufficient **early generation seed** to produce certified seed to fulfill this role. There is often a bottleneck because early generation seed, i.e. basic (foundation) and certified 1 (registered) seed, is often produced by government agencies, and predicting seed demand and producing the right varieties can be difficult to coordinate. National public agencies are often lacking in personnel and funding to produce sufficient early generation seeds, especially when new projects supporting local seed companies require additional seed from them (refer to Box 2 and the Nepal project later in this document). It is important to assess the capacities of these relevant government agencies and plan to support them according to the anticipated needs for seed.

Box 2. The Improved Seed for Farmers Programme in Nepal (KUBK-ISFP)

An example of the difficulties in procuring early generation seed through national seed agencies is that of the KUBK-ISFP in Nepal (see details in the Nepal case study at the end of this document). The National Agricultural Research Council (NARC) was mandated to produce early generation seed, but was not able to deliver quality basic (foundation) seed since the seed produced lacked genetic purity due to mixing of seeds at harvest. This jeopardized the whole formal seed system because seed companies and seed multiplication groups were not able to produce high-quality certified seeds from the basic seeds. NARC has limited human, technical and financial resources, and despite the financial support of KUBK-ISFP, it was not able to produce the quantities of **basic (foundation) seeds** or the quality of **certified (registered) seed** needed for the KUBK-ISFP. Programmes should assess whether there is a potential problem through discussions with national seed agencies, the private sector and seed-producer groups using the basic (foundation) seeds and, where needed, solutions could be proposed and activities funded to genetically purify the seeds. This could be through allowing private seed companies to produce basic seed under the close supervision of the national seed certification agency.

Seed projects typically provide the needed assistance to local seed enterprises in areas related to credit, supplies, equipment and facilities, training in business, seed marketing, demand creation and seed production in support of the formal seed system. This is the case in the Sudan and Nepal case studies below as well as in many other IFAD investment projects and other development projects with seed components. An example of a long-term successful seed development initiative is the FAO seed programme in Afghanistan (see Box 3).

Box 3. Afghanistan seed sector development

Through a series of FAO projects and other donor support, the seed sector in Afghanistan has developed substantially, including through variety screening, testing and release, early generation seed production, the development of local seed companies and the establishment of a national seed association within the context of a new seed policy. These are remarkable achievements, but most of the certified seed produced by local seed companies is purchased by the government and donor agencies/projects for distribution to farmers rather than purchased by the farmers themselves. The issue for consideration in the future is what will happen when the donor funding for seed purchases is diminished? Seed companies need a marketing strategies that increases their direct sales to farmers and that diversifies the crops and varieties they sell to farmers..

Source: *25 years of FAO Technical Assistance in Developing the Afghanistan Seed Sector*, FAO, 2014. http://www.fao.org/publications/card/en/c/28bd5c32-6eb6-45d1-ac59-bafc646eba5e/

*Please see the HTDN section on **Analysis of the formal seed system and** in the section on **Analysis of the institutions supporting the Seed Sector** - **Early generation seed production** and the related detailed qustions in Annex 1. The findings of these questions will help to determine the role and the needs of seed companies in a seed project.*

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Philippines - Rapid Food Production Enhancement Programme (RaFPEP)

6. Poor quality will deter farmers from buying certified seed.

Seed quality (germination, varietal purity, cleanliness, low moisture content, absence of pests and diseases) is achieved through standardized seed production practices by seed companies and contract growers. The seed quality is then verified by specialized seed inspectors from the national seed certification agency, or similar body, through field inspection and sampling and testing of seed in the laboratory after harvest. However, this system does not always work effectively. Typical weaknesses of the system include limited training of seed inspectors on the standard techniques, limited resources for them to conduct their work (their number, mobility funds, vehicles, remuneration, etc.), underfunding of seed laboratories, which may have limited staff and cannot function properly, and improper seed sampling techniques, which can result in seed quality problems not being detected (see details from the KUBK programme in Nepal at the end of this document).

Similarly, all seed producers, i.e. seed companies, seed-producer groups or the national system, can have problems during seed production that lead to poor seed quality; this could be due to unfavorable weather conditions, inadequate isolation of the seed production fields, mixing of seed of different varieties during harvesting and poor post-harvest handling or storage conditions for the seed. Problems of poor quality (especially poor storage conditions, germination, etc.) could also arise at the level of the agrovets selling on behalf of companies or producer groups due to poor storage conditions. Persistent issues with seed quality sold to farmers will damage the credibility of the seed companies or other seed multiplying agencies, the national seed certification agency and the whole formal seed system. For this reason, national seed certification agencies need to have trained staff and provide them with the needed resources to perform their roles. Seed companies and seed-producer groups need to understand and follow the protocols and procedures to produce quality seed. It is also recommended that seed producers have access to irrigation systems to avoid poor quality during seed production due to drought. Training of agrovets and controlling the quality of seed storage and selling conditions are important to support the whole seed system.

*Please see the HTDN section on **Analysis of institutions supporting the seed sector- Seed quality control** and the section **Analysis of the formal seed system.** This information will assist decisions about the role and needs of the national seed certification agency in a seed project and seed quality problems faced by the seed companies.*

7. Issues of seed insecurity due to acute or chronic crises require determining the nature of the problem before taking action

In a situation of seed insecurity due to a crisis, the first step should not be to give vulnerable farmers seed. Instead, it is necessary to conduct a **seed security** assessment (Box 4) to better understand the nature of the seed insecurity so that appropriate action can be taken. The crisis can be caused by drought, flood, earthquakes, tsunami, pest or disease outbreak, civil insecurity or a combination of these causes. With climate change, the frequency of natural disasters is expected to increase and therefore it is even more important to know how to address these crisis situations. In most cases seed is actually available from the formal or informal seed system in the region of the country experiencing the seed insecurity, but farmers lack the resources to purchase it. It is seldom necessary to import seed of food and nutrition security crops. Responses to the emergency situation can include input trade fairs, where seed companies, farmer seed producers and input dealers, are invited to participate and vulnerable households are provided with vouchers to purchase the inputs they need. Another approach is to provide vulnerable households with vouchers that can be redeemed by the seed companies. These kinds of interventions strengthen the local and national seed systems rather than by-pass them, which is the case when seed is imported. Also, the adaptability and quality of imported seed can be difficult to control during a crisis. If, however, there is a problem of local seed supply, and direct seed distribution is being considered from national seed sources, then it is important to ensure firstly, that the seed is of the appropriate crops and varieties and properly targets the most vulnerable households. Secondly, seed distributed in an emergency situation should still meet established seed quality standards and there should be systems in place to ensure that it does (FAO, 2011). Quality standards should never be compromised with the justification of a crisis situation, as this would create even more problems for farmers in recovering from the crisis.

*Please see the HTDN section Analysis of **farming households as seed users and producers** and the corresponding detailed questions in Annex 1 on this topic In addition, see below Box 4 on seed security, which will help in making an informed decisions about seed insecurity and how to respond.*

Box 4. Seed security

Seed security exists when men and women within a household have sufficient access at all times to quantities of good quality seed and planting materials of preferred crop varieties, in both good and bad cropping seasons. The Seed Security Conceptual Framework (SSCF) provided an improved basis for assessing and analysing seed security and developing appropriate actions to be taken and was comprised of three components: seed availability, seed access and seed quality.The revised SSCF which were based on discussions in an expert gathering in Addis Ababa in December 2013 with agreed parameters of availability, access, varietal suitability, seed quality and resilience of the seed systems.

To find out more see the Seed Security Assessment: Practitioner's Guide at http://www.fao.org/fileadmin/user_upload/food-security-capacity-building/docs/Seeds/Training_Material/FAO-SSA_PractitionersGuide-March2015.pdf

8. The formal sector market is often dominated by sales to governments, development projects, and NGOs/humanitarian organizations rather than farmers purchasing seed

The provision of seed to vulnerable households because of seed and/or food insecurity, as a gift or loan, is often the main market for seed from the formal seed sector in many fragile countries or countries with seed price subsidies, such as Ethiopia, Sudan, South Sudan, Bhutan, Nepal and Afghanistan (Box 3). This situation creates an artificial market that is not based on farmers purchasing seed but rather on the supply of seed for governments to distribute for free via NGOs/humanitarian organizations or development projects. When funding for seed purchases diminishes, this can cause a collapse of the formal seed market and have a dramatic effect on seed companies in the country. It also encourages farmers not to purchase seed but to wait for it to be provided free. Free inputs are often not valued and the varieties provided may not be ones known to or requested by the farmers. Governments sometimes subsidize the cost of seed for farmers to stimulate demand or for other rural and agricultural development or poverty-alleviation reasons. Governments and aid organizations should exercise good judgment when considering interventions in the formal seed market in order to avoid creating eventual problems that may be difficult to solve. If seed subsidies are being considered, then there needs to be clarity on who the target beneficiaries are and why the subsidy is being provided, as well as a clear strategy as to when and how the seed subsidy will be phased out. The formal seed market should be based on farmers purchasing seed and not provision of free seed to farmers. See Box 3 on the development of the seed sector in Afghanistan for additional insight into this issue.

*Please see the HTDN section on A**nalysis of formal seed system** and the detailed questions in the Annex on the Formal sector seed markets.From this will emerge a better understanding of the market in your particular country and how to address the situation in a seed project.*

Nepal case study

The IFAD-supported loan on Improved Seed for Farmers programme in Nepal (KUBK-ISFP (2012–2019) has the development objective of improving rural household incomes through sustainable, market-driven agricultural productivity improvements. The programme aims at developing the formal seed sector (cereals and vegetables), as well as improving smallholder livestock (goats and dairy) through partnerships with the private sector in Nepal.

The seed component of the project focuses on the expansion of the formal seed system (for maize, rice, wheat and vegetables). The project target area is 204,000 ha in the mid-hill zone of Nepal, consisting of four districts in the Mid-Western region and two districts in the Western region.

The project has a comprehensive approach to developing the seed sector in the project area. It includes support to farmer seed-producer groups (SPGs) through farmer field schools and linking them to the market. It also foresees demand enhancement by promoting new varieties through the organization of fairs, on farm demonstrations, and through farmer field schools. The demonstrations include comparing local crop varieties with QDS seed of improved varieties. There is also participatory variety selection (PVS) trials by the National Agricultural Research Council (NARC). Training and matching grants are being provided to community SPGs with a target of 15,000 farmers in up to 400 groups. The groups are being linked, as contract seed producers, to agrovets/input dealers and seed companies. Seed companies and agrovets, linking with the seed-producer groups, are being assisted through matching grants to help them expand their production and marketing in the project area. The project is also assisting the two regional laboratories of the Seed Quality Control Center (SQCC) for seed testing and quality control in the project area. The NARC is being assisted to produce breeder and basic seed. Project field staff are working with District Agricultural Development Office (DADO) field staff in each of the six districts to implement the field activities with farmers and seed-producer groups. The project has also participated in the national dialogue for the development of a national seed policy, Seed Vision 2025, and implementation of new seed regulations.

A summary of the main findings and the lessons learnt are described below following the four areas described in the HTDN:

1. **Farmers as seed users and producers**

   - As part of the project pre-planning to guide the implementation of the project, the market for seeds in the area has been assessed. However, there had been no proper survey of farmer seed needs and demand that included the informal sector. The Seed Replacement Rate assessments did not take into consideration the seed replacement by farmers using the informal sector to access improved varieties.

     Lessons learned: Annual seed-demand assessment should consider the informal seed sector directly involving farmers, preferably through surveys. In addition, more variety trials with attention to improved production practices need to be implemented to increase farmer awareness and demand for new varieties.

2. **Formal seed supply**

   - While the strategy of linking seed-producer groups to the private sector is highly justified, the project design has been too ambitious to target 400 groups, with the available extension capacity and remoteness of the target areas.

     Lessons learned: KUBK-ISFP should have targeted fewer groups (estimated around 200) in order to improve the quality of technical support and follow-up that can be provided to these groups by national staff. Engaging with fewer groups with stronger links to the private sector will enhance the project's impact and sustainability of the groups after the project finishes. Many of the varieties being promoted by KUBK are not new and Nepal would benefit from more attention to the continuous development and release of new varieties to boost farmer demand and benefit for the farmers.

Lessons learned: More investment in breeding programmes or in testing potential varieties available from centres operated by the Consultative Group on International Agricultural Research (CGIAR) in multiple locations in Nepal is needed.

3. Institutions supporting the seed sector

- The project seems to have overestimated the capacity of the NARC to produce the required quantity and quality of foundation or **breeder seed**, especially with the expansion in the number of seed-producer groups. It was noted that only around 50 per cent of the planned area for planting with cereals by producer groups was actually planted, which was due to the lack of sufficient foundation seeds available for the groups.

  Lessons learned: Based on the institutional analysis and identified capacity, KUBK-ISFP should have provided support to the NARC to concentrate on the production of breeder seed (rather than breeder and foundation seeds). Technical support and funds could have been allocated for join work by the Association of the seed companies and the NARC to purify varieties to the technical standards of breeder seed. This collaboration could have also been expanded to subcontracting seed companies and selected qualified seed producer groups production for foundation seed.

- KUBK-ISFP supported two regional seed laboratories with equipment and vehicles to enable field inspection and testing of seed samples for quality control. Additional human resources have also been planned for the laboratories. However, based on discussions with farmers and on field observations, the seed sampling process from the field lots, which is often done by farmers themselves rather than inspectors, appears to be the weakest point in the quality control system, resulting in low quality seeds that are not marketable.

  Lessons learned: Further support had to be provided by KUBK-ISFP for the SQCC to speed up the process in the promotion of private seed inspectors, something that has already been anticipated by the government, to ensure sufficient seed inspection.

4. Seed sector policies, laws and regulations

- During the regular district meetings for seed demand assessments, KUBK-ISFP is able to identify some areas for potential policy dialogue in support to the use of certified and truthfully-labelled seeds. However, the role of the informal sector in reaching out to smallholder farmers in remote areas remains limited in these discussions.

  Lessons learned: A more robust monitoring and evaluation system in the project is needed to gather the information necessary for assessing progress and piloting seed information systems for the government. More documentation of lessons learned from the field and those arising from discussions during seed assessments is needed to initiate a policy dialogue with the authorities in support of a functional seed sector, especially with respect to the needs of smallholder farmers and the assessment of the importance and role of the informal seed system for the targeted areas and crops.

Sudan case study

The Seed Development Programme (SDP) is being implemented by the Ministry of Agriculture in Sudan. Its goal is to improve food security, incomes and resilience to shocks of smallholder producers (including youth and women). Its development objective is to increase crop productivity for 69,000 smallholders through adoption of quality seed of improved varieties in North and South Kordofan. The SDP has three components:

- Component 1 - Strengthening and development of the institutional and regulatory environment
- Component 2 - Improvement of the seed production system
- Component 3 – Support for seed market development

The primary target group is smallholder farmers who generally grow less than 15 feddans (6.3 ha) of land and engage in traditional rain-fed agriculture as their main source of livelihood. They cultivate mainly sorghum, groundnuts, sesame and cowpea, and have limited access to inputs, assets and services. The business model developed during the design was that if quality seed of improved varieties could be produced and sold in the two target states, then farmers would buy them and increase their production and productivity.

Seed sector area(s) of focus in the project, achievement and challenges

A summary of the planned interventions under the four areas described in the HTDN follows:

1. **Farmers as seed users and producers**

Seed-grower groups were established to produce improved seed for sale to local communities, and grain-producer groups were established to buy this quality seed of improved varieties to produce grain for consumption and sale. No study was conducted on farmer seed demand during or after the design process, and it was finally conducted as part of the mid-term review.

Lessons learned

- A farmer seed needs survey should be conducted during the design process to better understand the farmer seed needs and their seed markets..
- As designed, the SDP focused too much on seed supply and not enough on seed demand.
- At design, there was not sufficient understanding of the seed value chains and the target crops.
- Seed-grower group and producer-group structures are not compatible with the rural finance delivery systems supported by other IFAD projects in Sudan.

2. **Formal seed supply**

The SDP planned to give grants to private seed companies to produce improved seeds in North and South Kordofan through contracting SGGs. This did not happen because the seed companies already had their seed farms under irrigation in other parts of the country to ensure stable seed production and they did not what to undertake seed production in risky rainfed areas where there are frequent droughts.

Lessons learned

- There was little identified demand for quality seed of improved varieties and, hence, companies were reluctant to engage with the SDP.
- To engage with private-sector companies, the project itself cannot determine for them their business model, or determine where they produce the seed they want to sell.
- In Sudan, the formal seed system focus is largely on supplying quality seed of improved varieties to larger farmers and for sale to government and NGOs.
- The conceptualization of the SDP did not take sufficient account of the national seed system and was too narrowly focused.

3. Institutions supporting the seed sector

The Agricultural Research Corporation (ARC) was supported to produce breeder, foundation and registered seeds for certified seed production and to conduct participatory research and evaluation of new varieties. The capacity of the Federal Seed Administration (FSA) was improved to carry out seed-quality assurance activities. The extension services of the state ministries of agriculture were provided with training on certified seed production.

Lessons learned

- The ARC needed more, and longer-term support to be able to produce sufficient quantities of early generation seed (breeder, foundation and registered).
- Government procurement takes longer than expected and this delayed the upgrading of FSA and state seed laboratories.

4. Seed sector policies, laws and regulations

Assistance was provided on plant variety protection (PVP) legislation, national seed policy formulation and decentralization of the FSA to state level. After initial implementation, the national seed policy formulation is proceeding and plant variety protection is being developed, but the latter does not meet standards set by the International Union for the Protection of New Varieties of Plants **(UPOV)**.

Lessons learned

- Decentralization of FSA was hampered by lack of staff to be based in North and South Kordofan. Once this was overcome, by seconding state agriculture staff as seed inspectors, there was a large increase in demand for its seed certification services from the SDP and private seed companies.

Using agricultural biodiversity and farmers' knowledge to adapt crops to climate change – IFAD grant in Iran

Seed is central to ensure food and nutritional security both as a source of adapted and productive genetic material and as a source for cultivation and crop production. This is especially true with the increasing pressure on the earth's natural resources and the impact of climate change. Evolutionary plant breeding is one possible strategy to cope with such challenges, while maintaining and increasing agricultural biodiversity and reversing the tendency of modern plant breeding towards uniform varieties. This approach was successfully implemented in Iran through the IFAD grant Using Agricultural Biodiversity and Farmers' Knowledge to Adapt Crops to Climate Change (US$200,000, 2010-2014). This grant was implemented by Cenesta (Centre for Sustainable Development), an Iranian NGO, along with the Iranian Dryland Agriculture Research Institute (DARI), the Rice Research Institute, the Department of Agriculture of the provinces of Kermanshah and Fars and local farmers' groups. International technical support and germplasm were provided by the International Centre for Agricultural Research in Dry Areas (ICARDA), the International Rice Research Institute (IRRI) and the Global Crop Diversity Trust. The initiative was also supported by the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) benefit-sharing fund.

The goal of the grant project was to increase the resilience of poor and smallholder farmers to current and future climate change shocks by increasing the adaptation of important food and feed crops through the evolutionary participatory plant breeding (EPPB) strategy. Evolutionary plant breeding is a dynamic and inexpensive strategy that quickly enhances crop adaptation to climate change and crop pests. It uses natural selection supplemented by farmer selection to identify adapted germplasm for further multiplication, thus using the seed populations as a living gene bank in farmers' fields.

This methodology consists in creating mixtures of different genotypes of the same crops, preferably, but not necessarily, using early breeding generations, but also landraces, gene bank accessions, modern varieties, etc. These populations are planted and harvested, and due to natural crossing, the genetic composition of the mixture harvested will never be the same as the genetic composition of the planted mixture. The mixture will evolve to become progressively better adapted to the environment (soil, agronomic practices, rainfall, etc.) in which it is grown. As climatic conditions vary from one year to the next, the genetic makeup of the mixture will fluctuate, but if the tendency is towards hotter and drier climatic conditions, for example, the genotypes better adapted to these conditions will become progressively more frequent.

Even though participatory plant breeding has been practiced for only about 20 years, and by relatively few groups, the effects on both biodiversity and crop production are impressive. Participatory plant breeding principles are developed further into "evolutionary plant breeding" to cope in a dynamic way with climate changes, allowing for a further increase in genetic diversity that is put back into the hands of the farmers.

At first, activities concentrated on five Iranian provinces, evaluating 160 landraces of wheat and 160 landraces of barley – repatriated from the ICARDA Gene Bank – in a participatory mode. The project quickly extended its action to 17 provinces involving more than 100 farmers, including nomadic pastoralists from Khuzestan and Fars provinces. Later, the IRRI Gene Bank provided 202 accessions of landraces of Iranian rice, which were multiplied in the Rice Research Institute of Iran in Gilan and stored in national and farmers' gene banks.

The project had different types of impact at different levels. Farmers were trained and fully involved in the project's activities from the beginning. They learned how to create new genetic material and mix it, helping them to strengthen their knowledge of local varieties and become self-sufficient in seed production. Immediate benefits were higher yields and reduced infestation by weeds, diseases and insects in the mixed-crop populations. At a second stage, bread marketing became an important income resource at household level. The barley produced had a very high protein content that was appreciated for animal feed and milk production. In addition, the bread made from the wheat flour of these "evolutionary population" landraces was very aromatic and highly appreciated for its taste. Project staff were able to involve government authorities at provincial and national levels, offering the Ministry of Agriculture opportunities to give farmers in remote areas access to highly adapted productive composite varieties.

The use of evolutionary plant breeding is ideally adapted to rainfed, low-input production systems, usually in marginal lands, that are especially vulnerable to climate change. Seed produced is a diverse mixture and hence cannot qualify as genetically pure seed to enter the formal seed system. Most seed policies and related regulations do not foresee the official selling of mixtures as "**seed**", which is an issue for consideration in countries that may adopt evolutionary plant breeding as a complementary system to the formal seed system. It is, hence, important to develop awareness of the potential impacts of different seed laws and policies on farmers' rights to save, exchange, develop and sustainably use their seeds.

Lessons learned

The major conclusion for those undertaking participatory plant breeding is that they should consider evolutionary participatory plant breeding (EPPB) because it is based more on heterogeneous populations that can respond more effectively to marginal agroecologies and abiotic and biotic stresses. Secondly, it was observed that extension staff were more open to evolutionary participatory plant breeding than the researchers involved in plant breeding since it is more of a development approach that does not conform to conventional plant breeding for distinct crop varieties. In the case of Iran, plant breeders are more focused on high-yielding varieties for irrigated areas rather than rainfed drought prone areas.

The population in Iran is a mixture of landraces, and the composition of that mix will gradually change based on environmental selection and competition between the landraces, meaning the mixtures will need to be renewed every few years. As a result in EPPB there needs to be a continuous source of appropriate germplasm from both national and international sources that meet the needs of farmers. As in most breeding systems, technical support of breeders and gene banks is required to engage with farmers in EPPB.

More work is needed to develop a regulatory framework for EPPB since it requires a different approach to access and benefit sharing, as well as methodologies to establish varietal identity of mixtures that change over time rather than remain stable.

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Glossary of terms used in the toolkit

Basic (foundation) seed: Is the progeny of pre-basic (breeder) seed and is multiplied to producer certified (registered) seed which is then used to produce certified 2 (certified) seed which is sold to farmers. It is produced by an agriculture research institute, or specialized government agency or the private sector (for details on the seed production and multiplication refer to the section in the HTDN on Early generation seed production).

Biosafety protocol: Refers to the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CBD), which is an international treaty governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another, i.e. transboundary movement only. It establishes an advance informed agreement (AIA) procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory. https://bch.cbd.int/protocol.

Breeder seed: refer to Pre-basic (breeder) seed**.**

CBD (Convention on Biological Diversity): The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding. There is a close link between the CBD and the ITPGRFA (see below). The CBD includes all biological diversity, while the ITPGRFA includes only the 64 most important agricultural species. https://www.cbd.int/

Certified seed: Seed of a prescribed standard of quality, produced under a controlled multiplication scheme, normally from certified 1 (registered) seed. It is intended for sale to farmers (refer also to Basic seed).

CGIAR (Consultative Group on International Agricultural Research): is a global partnership that unites organizations engaged in research for a food secure future carried out by 15 centres, which are members of the CGIAR Consortium. The work is done in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector.

Commercialization: Refers to the quality assurance (see below) system and standards, licensing requirements for seed producers and sellers, monitoring of seed quality in the market, along with the penalties for non-compliance, which control the seed market to ensure seed is of high quality.

Community seed-supply system: The production and saving of seed by farmers and the exchange of seed within communities and social networks and in local markets. The seed can be from landraces and uncertified improved varieties.

Cross-pollinated: Plant species in which self-pollination is prevented by mechanical, biological or other means and as a result these plants have the potential to be more heterogeneous and require greater isolation distances to produce quality seed that is genetically pure and uniform.

Cultivar: Synonymous with the term “variety” and indicates a distinct population of plants within a crop species. With improved varieties, the population is relatively uniform/homogenous.

DUS testing (distinct, uniform and stable): Refers to tests to determine the varietal identity of a variety in the sense it is distinct from other varieties; it represents a uniform population of plants that is stable over time.

Early generation seed production: Refers to the small quantities of very high-quality seed that are multiplied over a series of generations to eventually produce certified seed for sale to farmers. The names of the generation of seed is based on two systems 1) the OECD Seed Scheme that will be used in this

publication and 2) the AOSCA (Association of Official Seed Certifying Agencies), which will be indicated in parenthesis within this publication.

Environmental issues: Examples of environmental regulations related to seed include regulations regarding the safe handling and use of pesticides in seed treatment and living GMOs, referred to as LMOs (living modified organisms) in the Cartagna Protocol. For example after a living GMO is imported into a country based on the procedures of the Cartagena Protocol (see above), there are national GMO regulation and procedures for variety testing of GMO crops with isolation systems in place to prevent gene flow into the environment, environmental risk assessment of GM crops contaminating similar crops, and regulation of a GMO crop after it is released to farmers, to prevent contamination of conventional and organic crops.

Evolutionary plant breeding: An approach that consists of planting in farmers' fields mixtures (evolutionary populations) of very many different genetic types (genotypes) of the same crops (including improved varieties, landraces and genetic material from national and international gene banks). These populations will be mixed, planted and harvested year after year and due to natural crossing (higher in cross-pollinated and less in self-pollinated crops), the genetic composition of the harvested seed is never the same as that of the planted seed. Accordingly, crop population evolves to become progressively better adapted to the environment (soil type, soil fertility, agronomic practices, including organic systems, rainfall, temperature, etc.) in which it is grown. The genetic makeup of the population will change from year to year with changes in climatic conditions, but genotypes better adapted to dominating biophysical conditions will gradually become more frequent in this farming/breeding system.

Farmer field schools (FFS): The FFS approach is an innovative, participatory and interactive learning approach that emphasizes problem solving and discovery based learning. FFS aims to build farmers' capacity to analyse their production systems, identify problems, test possible solutions, and eventually encourage the participants to adopt the practices most suitable to their farming systems. This group-based learning process has been used by governments, NGOs and international agencies to promote integrated pest management (IPM) and other agriculture-related topics, including production, sales and use of quality seed.

Farmers' rights: As outlined in the ITPGRFA (below), this refers to national regulations on the protection of knowledge on PGRFA, equitable benefit sharing arising from the use of PGRFA and the right to participate in national decision making on PGRFA conservation and sustainable use.

Farming households: Rural smallholder households engaged in agriculture consisting of all family members, i.e. women, men and children, and who work as a team in all the practices related to agriculture production.

Food grain: The portion of the farmer's harvest for consumption or sale.

Formal seed system: Refers to the commercially-oriented production and supply of improved seed varieties by seed enterprises and governments using official quality assurance systems and inspections to ensure the seed produced is of high quality. High-quality seed has the attributes of high germination, physical purity, genetic purity and freedom from pests and diseases.

GMO (genetically modified organism): is any organism whose genetic material has been altered using genetic engineering techniques which is a laboratory process where genes from the DNA of one species are extracted and artificially forced into the genes of an unrelated plant or animal.

Hybrid: A variety produced by controlled cross-pollination of two distinct parents to provide "hybrid vigour". The progeny will differ from the parents, so requiring farmers to buy hybrid seed every year rather than having the option of saving seed to plant from the harvest.

Improved variety: A crop cultivar that has been developed through modern plant breeding methods and subsequently tested and selected for use by farmers based on its specific characteristics of yield, days to maturity, pest and disease resistance, culinary or nutrition, etc. These varieties are bred to be homogenous and meet the Distinct Uniform and Stable test for uniformity.

Informal seed system: Refers to farmer and community-based seed systems for producing, saving and exchanging seed of landraces and improved varieties which are not certified and for which quality could be variable. This system is a significant source of seed of preferred varieties for farming households because of proximity to the farmers. Seeds in the informal system are lower cost and farmers may receive seed as a loan, a gift or through barter.

International treaty: The International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA) governs access to plant genetic resources for food and agriculture (PGRFA) germplasm for the purpose of breeding new crop varieties. The ITPGRFA proposes guidelines for the equitable sharing of the benefits from 64 of the most important food and forage crop species, referred to as the multilateral system of access and benefit-sharing (the MLS). In addition there is a standard material transfer agreement (sMTA) to exchange germplasm for breeding of new varieties. www.planttreaty.org/.

IPR/PBR: Stands for intellectual property rights/plant breeders' rights, also referred to as PVP (plant variety protection): National systems for intellectual property rights for new plant varieties provide exclusive commercial rights (for examples royalities) to the plant breeder or institute that develops the variety for a specified number of years and, therefore, are an incentive for the development of new varieties.

ISTA (International Seed Testing Association): Is an international association with the mandate to develop and issue standard procedures for seed sampling and testing and to promote the uniform application of these procedures for evaluation of seed in international trade. This is accomplished through the publication of the international rules for seed testing, training and dissemination of knowledge in seed science and technology. It also operates an accreditation system for public and private seed testing laboratories so the accredited laboratoies can issue seed testing certificates that are widely used in international seed trade. https://www.seedtest.org/

Landraces/traditional varieties: Dynamic populations of cultivated plants that have a historical origin (i.e. that have evolved, or been selected and cultivated in the area for a long time), distinct identity and lack formal crop improvement, and are often genetically diverse, locally adapted and associated with traditional farming systems. These are often heterogeneous varieties that are adapted to marginal agroecologies and to low-input agricultural practices in which stability of yield is more important than maximum yield under optimal conditions, i.e. conditions generated by good rainfall and use of inputs.

LMO (living modified organism): As defined in the Cartagena Protocol on Biosafely is any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology. The Cartagena Protocol on Biosafety regulates international trade in living GMOs and not the broader area of GMOs as food.

Local varieties: Refers to both local landraces that are indigenous to an area and uncertified, recycled, improved varieties that have been in the hands of farmers for many years.

Low-input agriculture: Low-input agriculture refers to farming practices with minimum external inputs, such as fertilizer and pesticides, which may not be best for many modern varieties that are developed with optimal use of inputs to achieve maximum yield.

Mass selection: This method of selection depends mainly on selection of plants according to their appearance and performance; seed from selected plants are bulked for the next generation. This method is used to improve the overall population by positive or negative mass selection. Mass selection is only applied to a limited degree in self-fertilizing plants and is an effective method for the improvement of landraces.

National seed policy: A statement of principles that guides government action and explains the roles of relevant stakeholders in the coordination, structure, functioning and development of a seed system comprising both formal and informal seed sectors. Ideally seed policy should be developed with wide stakeholder participation, including farmers/farmer organizations, agricultural research institutes, national gene banks, seed certification agencies, seed companies and policymakers.

National variety catalogue: Is the national list of officially released varieties in the country with the description of their characteristics.

Nucleus seed: This is the hundred percent genetically pure seed with physical purity and produced by the original breeder/Institute. A pedigree certificate is issued by the producing breeder.

Open-pollinated: When the plants of an open-pollinated variety self-pollinate, or are pollinated by another plant of the same variety, the resulting seeds will produce plants roughly identical to their parents. Therefore, open pollinated varieties (OPV) can refer to species that are either self pollinated or cross pollinated as long as the seed is produced in controlled way such that the projeny will be idential to the parents.

Organization for Economic Cooperation and Development (OECD) Seed Schemes: Provide an international framework for the certification of seed. They aim to facilitate growth in seed trade by reducing technical barriers, improve transparency and lower transactions costs. The OECD schemes authorize the use of labels and certificates for seed produced and processed for international trade, according to agreed principles. www.oecd.org/tad/code/seeds.htm

Participatory plant breeding: A collaborative plant breeding programme between breeders and farmers, marketers, processors, consumers and policymakers (food security, health and nutrition, employment). In the developing world, participatory plant breeding involves close farmer-researcher collaboration to bring about genetic improvement within a species. It is important to develop a clear vision together with the stakeholders in the breeding process.

Participatory varietal selection: A methodology for breeders and agronomists to learn, in the early phases of the breeding cycle, which varieties perform well on-station and on-farm from the point of view of the farmers, who will be the end users, as well as other value chain actors.

Phytosanitary regulations: The regulations established by the International Plant Protection Convention (IPPC) on phytosanitary regulations to control the risk of the importation and exportation of pests and disease on or in seed. The approach is science based and uses the pest risk assessment (PRA) approach to avoid phytosanitary regulations being a barrier to trade.

Plant variety protection (PVP): Refers to national systems for intellectual property (IPR) rights for new plant varieties that provide IPR protection for a specified number of years to the plant breeder or institute that develops the variety.

Pre-basic (breeder) seed: Is produced from the nucleus seed by the agriculture research institute or other body often under the supervision of the plant breeder who developed the variety.

Quality assurance: The system by which the physical, physiological, genetic and phytosanitary quality attributes of seed are monitored during seed production to determine if the seed meets the quality standards of the country. The system includes field inspections, seed testing, post control plots and monitoring and traceability to ensure seed meets certain minimum standards. Standards vary for different quality assurance systems which include compulsory certification, quality declared seed (QDS) or truthfully labelled seed where the seed label reflects the actual quality attributes of the seed.

Quality declared seed (QDS): This system is designed to provide quality control during seed production, which is less demanding on government resources than other more developed quality control systems (e.g. certified seeds), but is adequate for the production of good quality seed within a country. QDS is locally produced and commercialized quality seed of mostly locally adapted improved varieties, locally quality controlled by local seed inspectors licensed by a national seed quality control agency. It is broadly based on four principles:

i. A national list of eligible varieties for QDS is established.
ii. Seed producers are required to be registered with the appropriate national authority.
iii. The national authority will check at least 10 per cent of the seed crop.
iv. The national authority will check at least 10 per cent of the seed offered for sale as quality declared seed.

Seed: For the purposes of this publication, seed refers to true botanical seed and not vegetative planting materials for which national seed systems are slightly different.

Seed companies: Refers mainly to both public and private, national and local, seed companies, including cooperative enterprises that produce and market seed to farmers. International seed companies are also involved in variety development, importation and production of seed.

Seed quality: In the formal seed system, this consists of four attributes – uniform and undamaged; high performance; genetic purity, which relates to specific genetic characteristics of variety; and seed health, which refers to the presence or absence of diseases and pests within the quantity of seed. In the informal sector, the definition of seed quality varies, but farmers often go by appearance – of being relatively clean, smelling fresh and being free of mold, showing minimum insect damage and not being shrivelled or discoloured. They trust their own seed – or the seed they obtain – to give reasonable germination. Farmers sometimes want heterogeneous landraces, for example, of sorghum in Ethiopia or millet in West Africa, or a mixture of varieties, like varietal mixtures of bean in Burundi, rather than genetically pure types of varieties.

Seed replacement rate: The percentage of certified seed planted compared to the total amount of seed planted for specific crops. Typically, the replacement rate in developing countries is quite low at 10-20 per cent.

Seed security: Exists when men and women within the household have sufficient access to quantities of available good quality seed and planting materials of preferred crop varieties at all times in both good and bad cropping seasons.

Self-pollinated: Plant species in which the stamen (male organ) and stigma (female organ) of the flower are in close proximity in the same flower and the pollen release is timed with the receptiveness of the stigma resulting in self-pollination. This results in varieties that are are more homogenous and maintain their genetic purity and identity from one generation to the next. Examples include rice, wheat or legumes.

Truthfully labelled seed: It refers to seed produced for which the seed complies to the quality attributes indicated on the label and not an indicated minium standard which is the case in complusary and quality declared seed certification systems.

UPOV The International Union for the Protection of New Varieties of Plants (UPOV): Is an intergovernmental organization which provides a system of plant variety protection, with the aim of encouraging the development of new varieties of plants. Most countries and intergovernmental organizations which have introduced a plant variety protection (PVP) system have chosen to base their system on the UPOV Convention in order to provide an effective, internationally recognized system. www.upov.int/members/en/

Variety: Synonymous with the term “cultivar” as defined in the International Code of Nomenclature for Cultivated Plants, 1980, Art. 10: “The international term cultivar denotes an assemblage of cultivated plants which is clearly distinguishable by a group of characters (morphological, physiological, cytological, chemical or others) and which, when reproduced (sexually or asexually), retains its distinguishing characteristics.”

Variety release: The procedures by which promising new varieties are tested and a decision is made on whether the variety should be included in the national variety register and released for use by farmers.

Variety release committee: A national committee of seed sector stakeholders which reviews the results of VCU tests of promising new varieties and decides if the variety should be included in the national variety register and released for use by farmers.

VCU testing (value for cultivation and use): Variety testing is conducted to determine if a new variety has superior characteristics to existing varieties and should be included in the national variety register and be released for use by farmers.

IFAD

International Fund for Agricultural Development
Via Paolo di Dono, 44 - 00142 Rome, Italy
Tel: +39 06 54591 - Fax: +39 06 5043463
Email: ifad@ifad.org
www.ifad.org

ifad-un.blogspot.com
www.facebook.com/ifad
instagram.com/ifadnews
www.twitter.com/ifadnews
www.youtube.com/user/ifadTV