



Food and Agriculture Organization
of the United Nations



Seed Security Assessment **A PRACTITIONER'S GUIDE**

Seed Security Assessment

A PRACTITIONER'S GUIDE

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS
Rome, 2016

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Abbreviations and Acronyms

AAP	Accountability to Affected Populations
CBO	Community-based organization
CIAT	Centro de Investigación de Agricultura Tropical
CMD	Cassava Mosaic Disease
CRS	Catholic Relief Services
DSD	Direct Seed Distribution
ECHO	European Commission Humanitarian Aid
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FFS	Farmer Field School
FSS	Formal sector seed
Ha	Hectare
Kg	Kilogram
HH	Household
IDP	Internally Displaced People
l	Liter
LMS	Local Market Survey
LoMS	Local Market Seed
MoALF	Ministry of Agriculture, livestock and Fisheries
MS	Microsoft
NGO	Non Governmental Organization
OECD	Organisation for Economical of Co-operation and Development
OPV	Open-pollinated variety
OSS	Own saved seed
PGRFA	Plant Genetic Resources for Food and Agriculture
REOA	FAO Sub-regional Emergency Office for East and Central Africa
SI	Standard Unit
SSA	Seed Security Assessment
SSSA	Seed System Security Assessment
SSCF	Seed Security Conceptual Framework
ToR	Terms of reference
ToT	Training of trainers
UN	United Nations
VPC	Vegetatively Propagated Crop
WFP	World Food Programme of the United Nations

Preface

Sufficient access to healthy and preferred seed for different crops is of fundamental importance for millions of households in the developing world. If good quality seed is scarce, then rural farming families struggle to make a sustainable livelihood, and family members are forced into coping strategies in order to meet food and income needs. These strategies may deplete assets, further reducing the ability of the family to meet its needs. Achieving and maintaining seed security is therefore an important goal.

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. Measuring seed security is important in crisis and non – crisis situations as seed insecurity is not confined to post – disaster settings, although it may be at its most acute at these times. Another important context for measuring seed security is in a protracted crisis, where the problem may be more chronic in nature. In such cases, the underlying fragile seed situation can be punctuated by acute episodes due (e.g.) to an upsurge in fighting in a particular area which can disturb local markets. Finally, seed insecurity may be chronic in nature in a non – crisis context, in situations of deep poverty and social exclusion such as that which exists for large numbers of households in peaceful parts of Africa.

Seed – related interventions are commonly based on the assumption that food security problems directly imply seed security problems. However, this may or may not be the case. Further, when problems do occur these are not necessarily related to the physical availability (supply) of seed. One of the most common problems is lack of resources to obtain seed. This can occur even when seed is available on the market. In such cases a more appropriate response to seed insecurity might be a scheme which increases household purchasing power for seed whilst not increasing the supply. This can be achieved quickly through a seed voucher scheme.

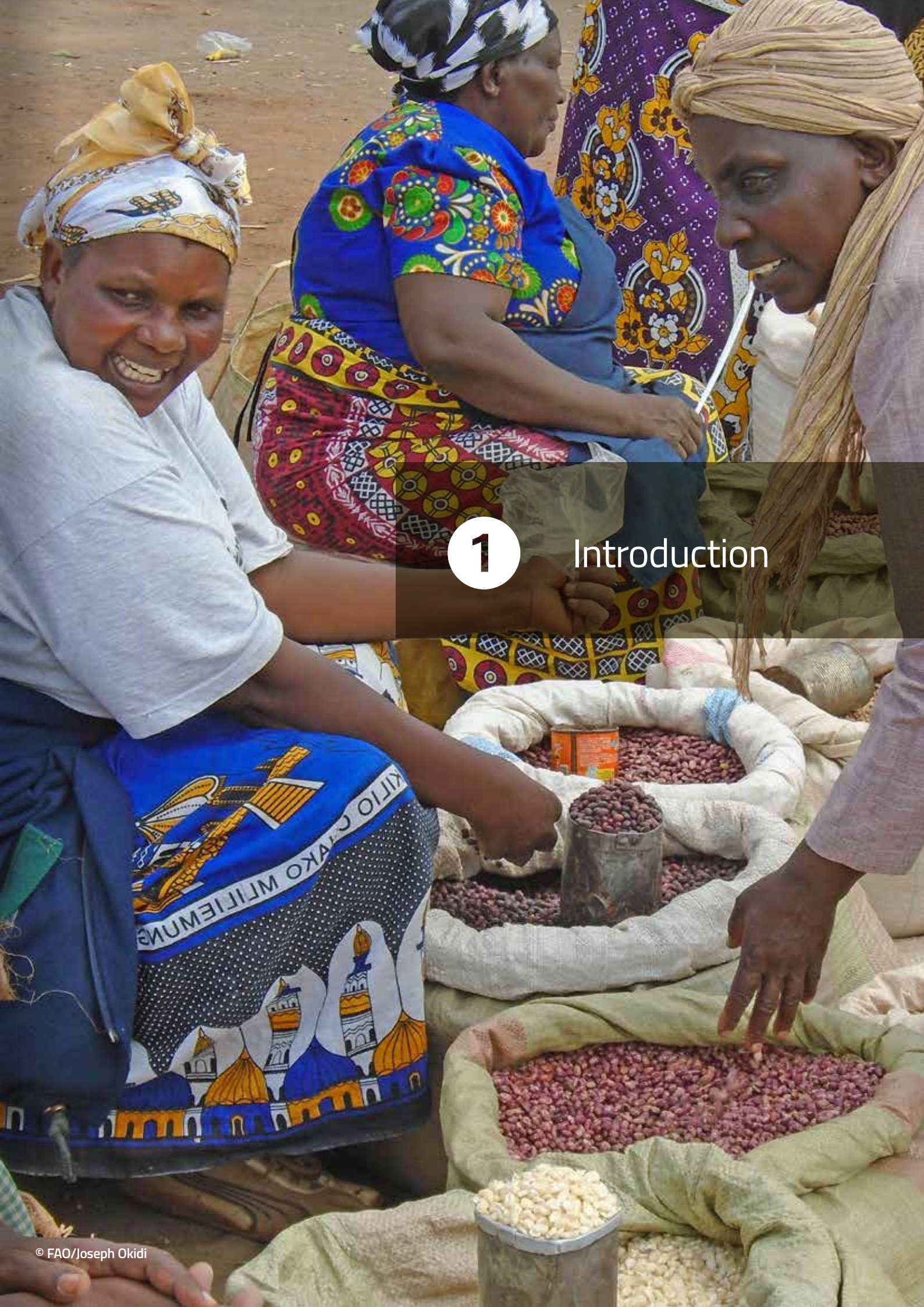
Assessments of seed security are, or should be, a fundamental pre-cursor to seed related interventions. The seed system security assessment (SSSA) methodology, developed by CIAT and CRS and formalized in the publication "When Disaster strikes. A guide to assessing Seed System Security (Sperling, 2008) attempts to do this. This tool has been used in many countries during the past 10 years including Mali, Zimbabwe, Ethiopia, Sudan (Darfur region), South Sudan, Haiti, Malawi, Kenya, DRC and Côte d'Ivoire. The SSSA methodology is rigorous, however, knowledge of how to conduct a SSSA is restricted to a very small group of practitioners, indeed, understanding of seed security and seed security assessment is still restricted to a very small group of specialists. Worryingly, a recent study undertaken in the Horn of Africa and the Sahel found that less than 10 percent of post-disaster seed related interventions were based on Seed Security Assessments (SSA).

With the benefit of funding from ECHO, and the Federal Republic of Germany FAO has supported a number of activities which seek to address this situation. Actions have included: development of revised and expanded SSA training materials; conducting national level training SSA workshops in eight countries in the Horn of Africa (Ethiopia, Kenya, Somalia, South Sudan) and the Sahel (Burkina Faso, Chad, Mali and Niger), initiating Communities of Practice for SSA in the Horn and Sahel; conducting regional level Training of Trainers (ToT)

courses and undertaking seed security assessments. This SSA practitioner's guide has been developed as part of this process.

This Practitioner's Guide has been developed by a team consisting of the following persons (in alphabetical order): Neil Marsland (FAO), Matthias Mollet (Consultant), Joseph Okidi (FAO), Lucio Olivero (FAO), Thomas Osborn (former Senior Seed Officer, FAO) and Roger Shongo (FAO). Significant contributions have also been received from David Hampson (former FAO consultant), Samuel Kugbei (FAO Seed Security Officer), Phillipe Le Coent (formerly FAO), Thomas Remington (formerly CRS) and Stephen Walsh (formerly CRS). This Guide has been enhanced by the feedback of more than 80 SSA trainees from Burkina Faso, Chad, Ethiopia, Kenya, Mali, Niger, Somalia and South Sudan who attended the SSA workshops.

The Practitioner's Guide has been produced to provide practical guidance on the theory, technical knowledge, procedures and good practices necessary to implement an SSA. This publication will provide an important reference and refresher for SSA practitioners and those seeking practical information on SSA. This is version 1 and we hope that it will be improved after a period of usage and feedback.



1

Introduction

INTRODUCTION

1

1.1 Background – What is a seed system?

The seed system refers to the various ways in which smallholder farmers obtain seed. Seed sources can be grouped into “informal” and “formal” sector sources. In terms of proportion of seeds used by small farmers, the informal sector is by far the most important, accounting for around 80–90 percent of the total stock of seed used. The formal sector provides farmers with improved/modern varieties which are the result of a series of activities, starting with plant breeding and ending with commercial seed sold on the market through seed companies, input dealers, government channels and international aid agencies. The informal sector consists of all the other ways in which farmers obtain seed namely: from their own harvest; from friends, relatives and neighbors either through barter, gift or purchase from local informal markets. The informal and formal sources are part of one overall system, the various parts of which interact with each other to determine the relative importance of different seed channels to a particular farmer. For any given farmer, seed sources may vary according to crop type, and it is not unusual for farmers to meet seed requirements for one crop from a range of sources. In situations of stress, it is often important for farmers to have the opportunity to switch between sources, so that if one source dries up, another source can be tapped to compensate.

Figure 1 below represents a typical seed system for a hypothetical small farmer in Africa, Asia or Latin America. Here the interactions between different parts of the overall system and within the different formal and informal sub-systems are clear. For certain crops at certain times only one or two of these channels might be in operation for a particular farmer. For example, for Vegetatively Propagated Crops (VPCs) e.g. cassava, sweet potato and yam, local markets are generally not used as a source, whereas for field crops such as beans and maize, local markets are often a very important source.

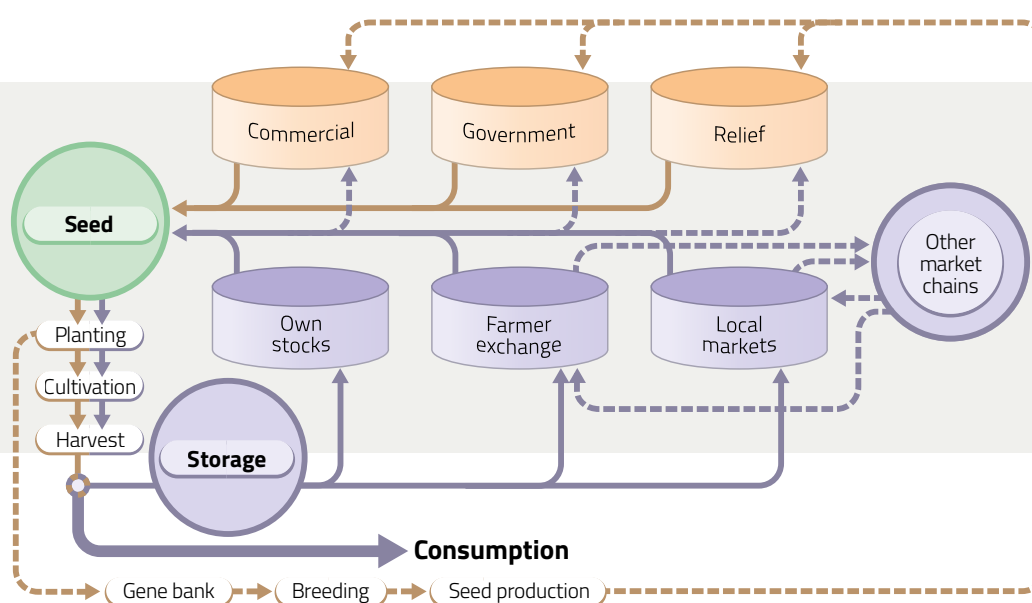


Figure 1: Smallholder farmer seed system

Source: adapted from Sperling (2008)

1.2 Overview of Seed security

Building on a 2008 FAO definition, “household seed security can be said to exist when the household has sufficient access to adequate quantities of good quality seed and planting materials of preferred crop varieties at all times following both good and bad cropping seasons”. This definition can be extended to the intra household level by substituting “household” with “men and women” as follows:

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

Seed security can be understood of as consisting of four distinct elements.

1. Seed Availability: seed supply.
2. Seed Access: means to obtain through cash, loan, barter, or gift.
3. Varietal Suitability: extent to which crop varieties are preferred and adapted to farmer conditions.
4. Seed Quality: physical, physiological attributes and seed health.

A particular individual, household or community can be said to be resilient in seed security terms if after a particular shock, series of shocks and /or longer term stresses, it is able to maintain or increase its level of seed security as defined by the four elements. In this sense, “resilience” is a quality which cuts across the four elements.

Seed insecurity exists when any of these aspects are not present. Knowing which particular aspect(s) of seed insecurity is / are present is critical for designing appropriate interventions.

1.2.1 Seed availability

Seed availability refers to the physical quantity of seed available from all sources. Under this definition, adequate availability of seed exists when there is sufficient seed from own saved seed, social networks, in local markets and the formal seed sector to meet seed needs of local households. The available seed should be in reasonable proximity to the farmer and be available in time for planting.

BOX 1: WHEN SEED AVAILABILITY IS AND IS NOT A PROBLEM

- a) There is a complex emergency characterized by of civil conflict over a wide area compounded by drought. This has disrupted usual farm-saved seed supply and operation of local markets so that seed is not available within a reasonable distance from any source. This creates a problem of seed availability.
- b) A household has limited own-saved seed for planting due to a flood and social network sources have dried up, however there is enough seed of preferred varieties and crops available in the local markets. In this case there is not a problem of seed availability.

Indicators for seed availability at household level would include:

- a) quantity of own saved seed stored at the household;
- b) quantity of seed known to exist within social networks;
- c) quantity of grain of preferred varieties and crops available in local markets at planting time which farmers could use as seed;
- d) quantity of seed available with seed companies and local seed stockists at planting time;
- e) quantity of seed available through seed aid organizations at planting time (should be applicable only when there is an identified seed access problem);
- f) prices of seed in local markets, seed companies and local seed stockists;
- g) proximity of seed sources in relation to the household – e.g. distance to local markets, local seed stockists;
- h) time in which seed is available (before, at the start, mid or late season).

1.2.2 *Seed access*

Access to seed is defined as the ability and willingness to acquire seed through cash purchase, exchange, loan, barter or use of power in social networks. In relation to the latter, whilst seed may be **available** within a social network (see above), it may not be **accessed** due to lack of power, status or influence of the household to acquire it. Seed may also be obtained through barter – i.e. in exchange for another commodity or service such as labor, and it may be given on loan, on the condition that an equal or greater quantity is returned at a later date. Finally, seed may be acquired in exchange for cash, in local markets or from seed distributors (formal sector).

BOX 2: WHEN SEED ACCESS IS AND IS NOT A PROBLEM

- a) The household does not have sufficient own-saved seed but the farmer is able to obtain a gift of seed from their social networks which indicates seed access is not a problem (i.e. lack of physical availability has been compensated for by social access).
- b) The household and its social networks do not have sufficient seed for planting and they must acquire seed from local markets but they have limited economic resources to barter or purchase seed due to the economic effects of the disaster and the market seed sellers refuse to give seed loans. This situation would indicate seed insecurity due to problems of lack of physical availability at household level plus social and economic access.
- c) A severe drought during the previous season has drastically reduced own saved seed and social network seed and the economic assets of vulnerable households. However there is seed available in the local market but at a higher price than normal. Due to the loss of income from the poor harvest, farmers lack the cash to purchase seed. This is an access problem, made worse by an availability problem which causes the higher prices.
- d) A flood has affected the crop in the field in a small area and reduced the food security and economic assets of poor households. These households need vegetable seed to plant during the dry season for food and income but they do not have the money to buy the seed. This also is an access problem.
- e) Drought then civil strife has radically reduced rice production and made the availability of rice and rice prices rise greatly. Some farmers report good rice harvest but most of the farmers cultivating smaller plots of land in these same communities report poor harvest and they predict a challenge to acquire rice seed for the next season. These farmers will be forced to depend on the market and would therefore face an access problem with prevailing prices. However, farmers with good harvest are willing to provide seed as a low cost loan. This would not be an access problem.

Indicators for seed access at household level would include:

- a) amount of seed accessible by the household through social networks (social access);
- b) level of household income obtained through different sources;
- c) wealth of household as defined by fungible assets (e.g. livestock);
- d) purchasing power of households (disposable income relative to price of seed in local markets).

1.2.3 *Varietal preferences / suitability*

This aspect of seed security refers to the ability of farmers to have seed which has the characteristics that they prefer. What qualifies as desirable characteristic might differ from household to household, or between men and women within the household. Notwithstanding this, the most commonly cited desirable characteristics include: appearance, taste, aroma, cooking quality, storability, ability to produce fodder, high income potential, high production potential, disease and pest resistance in the field, and quality for making certain derivatives such as beer.

Households require seed of crop varieties that they know, have a preference for and are confident to plant. Farmers need to trust the seed seller or giver since varieties cannot always be identified by looking at the seed. Farmers are sometimes hesitant to plant seed from an unknown origin since it is a big risk if the variety is wrong or the seed quality is poor. The situation is complicated by the fact that in some cases the varieties that farmers know may not be adapted to the current situation due to drought, pests or diseases and there is a need for farmers to be introduced to new varieties. Understanding this in a field situation can be challenging and requires a good knowledge of the context and the varieties being used.

BOX 3: WHEN VARIETAL SUITABILITY IS OR IS NOT A PROBLEM

- a) Several communities report that their current millet varieties take too long to mature and with the apparent shortening of the rainy season, they want and need shorter duration varieties. The short term varieties of millet which they had previously grown and appreciated are in short supply - they cannot plant them in the same quantity as in the past and as per their desire.
- b) Improved varieties of sorghum have been distributed following a drought. Whilst high yielding, the variety does not produce good fodder, and is therefore not liked by the targeted agro-pastoral populations.
- c) New improved varieties of cassava have high tuber yield when compared with existing local varieties but the tubers of the improved varieties do not cook well while the leaves and the leaves are unsuitable for human consumption.

Indicators for varietal suitability / preference would include:

- a) level of farmer satisfaction with the crop and varieties they are currently growing or desire to grow;
- b) specifically desired characteristics which are/ are not present in the varieties which they are currently growing;
- c) number and types of problems related to current varieties (duration, pest, disease, yield);
- d) farmer access to true and useful information about varietal suitability;
- e) substitution or replacement rate of varieties.

1.2.4 Seed quality

Seed quality includes a number of seed attributes such as germination, physical purity, moisture content, seed health, and – for some crops – varietal purity. Whilst there are objective ways of measuring these characteristics, in practice whether or not seed quality is acceptable depends on the perception of the farmer and what he or she considers normal or acceptable. Also some of these seed attributes are apparent and others are not. Seed quality attributes are an essential parameter of seed security having a positive or negative impact on the farmer's ability to successfully establish a crop in the field and to have a reasonable yield.

The key attributes of seed quality can be listed as follows.

- **Physical purity:** it is easy for farmers to see if the seed is clean, free from inert material (chaff, stones, broken seed, and dirt) damaged by insect attack and free from dead or live insects. Seed should be relatively uniform and not contain immature grains. Farmers sometimes clean seed before planting depending on the planting method. Seed can also be attacked by insects during storage creating damaged seed that may not germinate and grow.
- **Seed health:** seed can carry diseases that will later damage the plant and possibly be transmitted to other plants. Therefore it is important that seed is free of diseases. Seed health may not be determined by looking at the seed and requires seed health testing or growing the seed to the seedling stage. Seed may be damaged during storage meaning it can be more easily attacked by diseases. Monitoring of seed fields to identify and address disease problems is the main way to address seed health but seed treatment is also used.
- **Varietal purity:** varietal purity means the seed is of one variety and not a mixture of varieties or seed of various crops. For some crops such as rice this is important (due to difficulty of harvesting because of different heights and growing periods), whereas it is less important for other crops such as beans, where mixtures of varieties are sometime grown and selection of seed can be done before planting.
- **Moisture content:** moisture content is the amount of water contained in the seed sample and is expressed as a percentage of the weight of the original sample. It is one of the most important factors in maintaining seed quality and is closely related to other aspects of physiological seed quality such as seed maturity, mechanical damage, seed drying, storage life of the seed, and susceptibility to insect or disease infestation. Moisture content can be determined by electronic and hand held moisture meters in the field or by oven drying method in the laboratory.

- **Germination:** germination is the ability of the seed to produce a normal seedling. The germination rate of seed cannot be determined by looking at the seed but requires a germination test or waiting until the seed is planted. Germination rates are affected by the other attributes of seed quality, high temperatures and relative humidity during seed storage are particularly important, though the impact of adverse temperature and humidity varies by crop. Germination rates of legumes and vegetable seed for example deteriorate rapidly if moisture content is too high, whereas normally cereal crops such as rice, wheat, millet, sorghum and maize are less effected. As a general rule however, maintaining low seed moisture content is essential for maintaining high seed germination.

BOX 4: WHEN SEED QUALITY IS OR IS NOT A PROBLEM

- a) Farmers in many communities indicated that insect infestation during storage for cowpea has been a constant challenge - in some cases cutting the stored quantities by 50 percent and reducing the germination and vigor of cowpea seed planted - and this has prevented these farmers from investing more into cowpea which has a great market potential. This is a seed quality problem (germination).
- b) The traditional millet variety in the area has a great diversity in size of head of grain even after the plants are thinned. Better selection of plants at harvest over time can increase the varietal purity and potentially higher yields. In addition the seed can be cleaned before planting to eliminate small, damaged and immature seed and this can improve the overall physical purity of the seed that may increase germination and vigor of the seed. In this way, potential seed quality problems (varietal and physical purity) can be reduced.
- c) Smallholder farmer potato production is affected by disease problems. By using disease free seed potatoes, better storage of seed potatoes and field sanitation, potato yields can be dramatically increased. Thus the seed quality problem (disease) is effectively addressed.
- d) Farmers have started to use a new system of hermetic seed storage for groundnut seed to reduce the problems of insect infestation during storage. However when the seed are planted, germination is low due to high moisture content and rapid deterioration during storage. This would be a seed quality problem that can be solved by better drying before storage.

Indicators for seed quality would include:

- a) proportion of diseased seeds;
- b) rate of germination of seeds;
- c) proportion of clean, unbroken, insect free seed; proportion of seedlings/plants affected by disease (NOTE: This needs to be interpreted in the context of other non seed related factors that may lead to disease);
- d) moisture content of stored seed (as measured by portable moisture meter).

1.2.5 Resilience

In seed security terms, a farmer is resilient if he / she can resist the impact of a major shock or stress so that pre-existent levels of seed security are either maintained or quickly returned to. The degree of resilience is measured by the extent to which seed security is adversely affected by a particular shock or series of shocks. When faced with the same shock (such as drought) two farmers in the same village may exhibit different degrees of resilience to the shock in terms of their seed security. Thus one farmer may become seed insecure as a result of the drought (not resilient), whilst another remains seed secure (resilient). Some households may be susceptible to very small shocks, in which case we can say that they are highly prone to seed insecurity (very low resilience).

Resilience is manifested in the degree of seed security in terms of seed availability, seed access, seed quality and varietal suitability after a shock. Thus it can only be directly measured by changes in indicators for these aspects (see earlier sections). These changes can then be compared across different households to ascertain degrees of resilience to that shock. Further investigation will reveal **reasons** for different degrees of resilience. It is likely that the reasons will include:

- livelihood diversity (risk spreading);
- crop and varietal diversity (risk spreading);
- different abilities to switch between seed source channels – linked to: amounts of stored seed, degree of social access, proximity to local seed markets (local grain dealers and agro-input dealers);
- different levels of asset ownership and ability to liquidate assets;
- different access to information about climate, seed sources, prices;
- different policy environments (e.g. whether the informal sector is recognized as a bona fide source of seed or not in the existing policy frameworks).



2

Conducting a Seed Security Assessment

CONDUCTING A SEED SECURITY ASSESSMENT

2

2.1 Principles of Seed Security Assessment

Seed Security Assessment (SSA) entails collecting and analyzing data to allow an understanding of the parameters of seed security, as well as how best to intervene to support seed security. Whilst SSA is characteristically carried out in an emergency context shortly after a shock; it can also be executed in the context of a protracted crisis or as a baseline exercise, when there is no crisis. Whenever SSA is carried out, certain principles should always be upheld. The key principles of SSA are as follows.

Rigor: SSA should be based on a well defined sampling strategy and results should be analyzed rigorously, using standard quantitative techniques.

Triangulation: SSA consists of collecting and analyzing information from a number of sources and angles. The standard tools of SSA include:

- Household Survey (HHS) Questionnaire;
- Local Market Survey (LMS) Questionnaire;
- Focus Group Discussion (FGD) Question Guide;
- Key Informant Interview (KII) Question Guide;
- Agro-Input Dealers Questionnaire;
- Seed Growers Farmers / Groups Question Guide;
- Seed Aid Actors Question Guide;

Information gained from these tools must be triangulated – i.e. compared and contrasted, to confirm or dispel emerging indications about the nature of seed (in)security.

Participation: collecting information from various sources does not necessarily guarantee adequate participation in the SSA. The main objectives of participation are to increase ownership of the process and, through this improve the quality and the accuracy of the process and results. This is achieved in various ways including: ensuring that all parts of the community are involved in the assessment – including women, youth and marginalized; being transparent with those being interviewed about objectives and uses of the information being collected; involving staff from organizations supporting seed activity in the target area – particularly the Ministry of Agriculture.

Feedback of results: a key aspect of SSA is that strenuous efforts should always be made to provide a feedback of the results to households and communities which have been interviewed or to their representatives. This is part of being accountable to the populations served by SSA, and it may be accomplished in various ways depending on circumstances. It is recommended that wherever possible, before leaving a particular survey area (e.g. a district), the SSA field team gives a preliminary feedback of findings to people living in the district. This could be to one of the communities visited during fieldwork and / or a gathering of local leaders. As well as informing the ultimate clients of the SSA, this process presents an opportunity to discuss and verify initial findings and follow up on questions.

Practical recommendations linked to elements of seed security: a key principle of SSA is that recommendations should be practical and actionable. Proposed responses should be clearly linked to one or more of the elements of seed security (access, availability, varietal suitability and quality) and be divided into short and long term responses¹.

Links to decision-making: SSA analysis and recommendations should be presented in the right way at the right time to the right decision makers. This means that dissemination of SSA results should not consist only of the presentation of the final report to Ministry of Agriculture staff and/or members of the Food Security Cluster. As much as possible, recommendations should be targeted to specific decision-makers and institutions, and opportunities should be sought to present key findings in appropriate formats and in relevant decision making processes.

2.2 Preparation for Seed Security Assessment

Preparation for a SSA requires defining scope and objectives; identifying stakeholders; developing SSA terms of reference (ToR); logistical preparation and budgeting, and; training of assessment teams.

2.2.1 *Defining scope and objectives*

The overriding goal of the any SSA is to understand the seed security situation of the target or affected communities based on the elements of the seed security conceptual framework (SSCF): availability, access, varietal suitability and seed quality. The way in which this is done will vary according to the situation. In this regard, it is useful to think in terms of three broad kinds of situation:

(a) Post-disaster / emergency: here the current seed security situation may be compared with the situation before the disaster. This therefore requires understanding of the farming/seed system (baseline) before the occurrence of disaster as well as the current situation.

(b) Non-emergency: in this case, the SSA takes the form of a situation analysis: i.e. it focuses on current seed security without comparing to the past.

(c) Protracted crisis: in a protracted crisis, seed security may fluctuate according to periodic worsening or improvements in the situation. When there is a sudden change in seed security within the overall context of a protracted crisis, then it may be possible to apply the before and after technique used for a classic post-disaster situation to look at the impact of that particular shock within the broader crisis context. In the absence of this, it can be difficult to establish a baseline against which the current situation can be compared, especially if the crisis has been ongoing for several years. One technique which can be used is to compare the current situation to a previous time which was considered "normal" or "pre-crisis". If the crisis is limited in geographical scope, another technique is to compare the situation in crisis affected areas with areas and households which have not been affected.

A further factor having a bearing on the orientation of the SSA is the kind of cropping system

1 Further details are given in Chapter 3.

which exists in the geographical area of assessment.

Seed and seed security have to be examined in the context of the cropping system used in the area of interest. The primary cropping system is the field crops which in the majority of situations around the world are cereals and grain legumes. However in some agricultural systems vegetatively propagated crops (cassava, sweet potatoes, potatoes, bananas, etc.) are important and in other systems vegetable production is an important component of food security. The relative importance of these different cropping systems should emerge while gathering background information for conducting a SSA.

- **Cereal and Legume Cropping Systems:** this is the dominant cropping system in most countries and consists of cereal crops such as maize, rice, sorghum, millet or wheat and legume crops such as groundnut, cowpeas or beans etc. These crops are produced as mono crops or intercropped. The production is for home consumption but also for the local market.
- **Vegetable Cropping Systems:** both local and exotic vegetable crops are grown in normally intensive small scale cropping systems of high value vegetable for the local market but also for home consumption. Vegetables are sometime produced during the dry season with irrigation. Vegetable plots are often planted as home gardens in addition to cereal and legume in larger plots.
- **Vegetatively Propagated Crops:** in some parts of the developing world cassava, bananas, yams, sweet potatoes, irish potatoes, etc. are critically important crops for food security. Pests and diseases that are on or in the living tissue of vegetative planting materials can be transmitted which can potentially infect not only the other plants in the field, but also other species.

The current SSA methodology is oriented towards the cereal and legume cropping system. This is not suitable in all cases, and therefore the methodology should be adapted accordingly.

2.2.2 Identification of stakeholders

Within the target location or geographic scope, there could be many public/private organizations and institutions undertaking seed related activities or with interest in supporting seed security. These could be relevant government ministries, government research agencies, international and national Non-Governmental Organizations, Community-Based Organizations (CBOs), private sector seed companies, etc. Involvement of the different stakeholders requires a consultative process to establish consensus on the need to conduct SSA, and discuss scope and objectives. This can be done through bilateral discussions with agencies operating within the target areas and/or through a stakeholder scoping workshop. This involves inviting the potential stakeholders for presentation of the proposed SSA and having an open discussion on the scope and objectives.

Stakeholders can be categorized into direct and indirect. *Direct* stakeholders are those interested in supporting the assessment financially, logistically and technically (with human resources) while *indirect* stakeholders are those interested in the outcome of the assessments and those are most likely to use the SSA results.

2.2.3 *SSA Terms of Reference*

Once the scope and objectives have been defined and stakeholders identified, terms of reference (ToR) should be developed by the lead organization or technical personnel from within a consortium of interested organizations. The ToR for the SSA gives a brief background and justification for the assessment; defines the overall and specific objectives; the scope and assessment sites; the time frame; assigns roles and responsibilities, as well as provides a tentative budget. These ToR could then be shared with the direct stakeholders as a road map for conducting the SSA.

2.2.4 *SSA training*

SSA training can be done at two levels.

- a) *Intensive SSA training*: where capacity and skills in conducting an SSA are limited, an intensive 5-day training should be conducted by experienced facilitators (it is advisable to have at least two facilitators for this training). This training takes the participants through nine modules as follows: Seed System: basic concepts; the Seed Security Conceptual Framework; seed interventions in the recent past; the five steps of conducting a SSA; standard SSA tools; site selection and sampling; field work preparation and execution; generation of results, data management; analysis and reporting (further details in the SSA Manual for Trainees and Manual for Trainers).
- b) *Refresher SSA training*: this is done with already trained staff, and takes place just before an assessment. This training needs a minimum of three days – one day to cover theoretical aspects; one day on adaptation and pre-testing of the SSA tools and one day on planning. In this training, a sub-set of the standard nine SSA modules are used. Generally speaking the following is covered: the SSA SSCF; the five steps of conducting a SSA; adapting standard SSA tools to local context and survey objectives; site selection and sampling; fieldwork preparation.

During the two trainings it is important to establish the conversion factors table to convert local units into international standard (SI) units for measurement. This can normally be done with the support of the trainees who are familiar with the local units of measurement for area, weight and volume. These units can later be validated during actual field work by the various teams as there could be slight variation from one location to another. The common SI units for area, weight and volume are acre (ac) or hectare (ha), kilogram (kg) and liters (l), respectively.

2.2.5 *Logistics and budget*

Key to a successful SSA is a realistic budget and careful logistical planning. Logistical requirements include transport (vehicles, motorcycle, bicycles) for the SSA teams to reach the intended SSA sites; stationary materials and data collection aids (questionnaire forms, guide questions, pens, pencils, pocket calculators, clipboards large size envelopes etc.); protective gear (gumboots, raincoats, umbrella, mosquito repellents and nets) where necessary, and accommodation in the field. An example budget can be found in Annex 2.

2.2.6 *Secondary data*

The focus of secondary data is on understanding the broader context of the assessment. This includes but is not restricted to: previous SSAs; food security studies; published statistics on crop types, hectares and yields; data on markets, seed traders, input and output prices; data

on the nature and extent of a particular emergency/disaster and activities and reports of seed related interventions in a particular area or time period. Such information can be gathered from agricultural surveys and censuses, price monitoring, assessment reports, project/program reports, newspaper reports, bulletins, publications, newsletters, etc.

Note:
some secondary data can be gathered in the field during the fieldwork itself.

2.3 Field work - Data collection

2.3.1 Preparation for field work

Before any team heads to the field, each member should understand clearly the objectives of the SSA, and those responsible for collecting information from various sources should be well versed with the assessment tools and their responsibilities during data collection.

A detailed work plan is required for each team in order to reduce time and resource wastages during the assessment period. Some delays are unavoidable (e.g. funerals) others can be identified and mitigated. Various issues can lead to time delays, including:

- a. *Lack of proper arrangements for interviewing Key Informants:* prior understanding of the most probable time the various respondents will be available is necessary to minimize time wastage.
- b. *Insecurity:* proper security updates in areas prone to insecurity is required to minimize delays and plan accordingly.
- c. *Bad roads:* understanding of the road conditions to the various locations in advance helps mitigating delay. An experienced driver could be consulted on the time required to reach location A from B.
- d. *Busy market days in major trading centers:* in certain trading centers and towns, market days are sometimes celebrated once or twice a week. These days normally attract a large number of rural farmers into towns. In these circumstances, it is normally more challenging to interview grain traders and agro-input dealers who tend to be more interested in serving their customers than providing information.

2.3.2 SSA team and roles of team members

Ideally, the SSA team would be comprised of people with different backgrounds such as seed experts, agronomists, plant protection officers, agricultural economists, socio-economists and data analysts. Wherever possible, the team should be composed of both men and women. The assessment should be led by an expert familiar with every aspect of SSA. Where the assessment is to cover a wide geographic scope (regions, states or counties), it is advisable to form 2-4 sub-teams, with each sub-team having 5-6 members. The sub-team composition and roles could be defined as follows.

- *Team leader:* provides leadership to the team and ensures that the team is introduced to local authorities in the area visited. He/she provides additional support in collecting information from Key Informants (Government, NGOs officials, etc.) as well as local markets and agro-input dealers. Other oversight roles of the team leader include:
 - Guiding the enumerators on the sampling procedure to follow.
 - Checking the quality of the data being collected by the enumerators at the end of

every day. This will ensure that the enumerators are guided as early as possible as they progress with the assessment.

- Regularly checking the data being entered by the data clerk. This should be done daily after field work so that any errors or difficulties are identified and corrected.
- Facilitating discussion with other team members of the results, observations and emerging issues.
- *Focus Group Discussion (FGD) facilitator and recorder (2 persons):* this requires experienced people, preferably those with good background in seed and crop production and semi-structured interviewing techniques. It is advisable that those involved in the FGD work have also participated as enumerators for the household questionnaire during the household data collection. This will enable them to understand some critical issues at household level which can then be brought for further discussion in a focus group. Normally, the FGD will take between one and two hours. For more details on facilitating FGD see facilitator's guide handouts in the SSA Manual for Trainees.
- *Household enumerators (2-3 persons):* the household enumerators have the task of gathering the largest volume of information using a structured questionnaire. With the current tool, the Household Survey (HHS) questionnaire (see annex E.1 of the Toolbox on in the CD-ROM), each enumerator is able to conduct 4-7 interviews per day. It is important that the enumerator communicates with the respondent in a language well understood by the respondent, preferably the local language and without use of a translator.
- *Data clerk (1 person):* to speed up the process of data handling, it is advisable that each team has one data clerk who will be solely responsible for entering data as they start coming in. Apart from entering the data, the data clerk can provide useful feedback to the team leader on the clarity of the information coming from the enumerators.

2.3.3 SSA site selection

The choice of the sites depends on the scope and objective of the assessment while factoring in availability of resources (financial, staff and time) to carry out the assessment as well as constraints such as accessibility and security issues. Some important considerations include:

- Agro-ecological zone. Ensure that the major agro-ecologies within the assessment catchment are well represented;
- Disaster affected and non-affected areas. When SSA is conducted in post disaster contexts, it is useful if both the affected and non-affected households and agro-ecologies are studied. This will help in deriving a clear picture of impact of the disaster on seed security (although it might not always be possible);
- Trade links and influences of border proximity. Good links to neighboring or external markets may have significant influence on household seed security;
- Socio-cultural zones and differences. Seed security can be affected by cultural practices which influence cultivation patterns and crop choice.

2.3.4 Sampling²

In SSA, households are selected using probability sampling, whereas all other sampling units (individuals for community FGD, traders, government officials, NGO representatives, seed producers) are not. In the case of these units, representativeness relies upon purposive sampling.

Sample sizes for all aspects of SSA will be a trade-off between the theoretical best practices and the available resources – human, financial, logistics and time. In the case of the household questionnaire, once the overall sample size has been determined at one administrative level (e.g. regional/provincial level), this sample size can be divided proportionally to the populations of entities at the next administrative level down (e.g. counties or district). If geographical entities at the lower administrative level have similar population sizes, then the overall sample size can be divided equally among the selected entities. The different sizes of sample will have implications for the time required to cover each district.

Sampling of households within a village size is normally done by **systematic random sampling**, which in most cases is more efficient than simple **random sampling**.

2.3.5 Seed Security Assessment tools

A number of SSA tools have been developed. Annex E in the CD-ROM includes the different tools. These tools have been developed to facilitate effective and efficient field work, based on the elements of the SSCF. The standard SSA tools are as outlined below.

Key Informant Interview (KII) guides and questionnaires

Key Informant guides / questionnaires have been developed for the following stakeholders:

- government / NGO staff;
- formal seed sector operators (research, seed growers and agro-input dealers); and
- community based seed producers.

These instruments provide a context which helps in interpreting the findings of other SSA tools as well as in the identification of responses to support seed security. During field work, the KII should be conducted first with the government/NGOs staff. This helps the assessment team have some preliminary understanding of the farming system(s) and functioning of the seed system(s) as well as on which institutions are doing what where.

Household Survey (HHS) questionnaire

This collects primary data from sampled households. Key areas covered include: socio-economic parameters; current crops and seed system profile; major crops and seed sources; indicators of seed security: suitability of varieties; seed availability; seed access; seed quality.

Local Market Survey (LMS) questionnaire

Local markets provide alternative sources of seed to farming communities. It is therefore

2 Much more detail on sampling can be found in Annex A of the CD-ROM.

imperative that the SSA includes a local market survey. The LMS gathers information on the various aspects of the Seed Security Conceptual Framework i.e.: varietal suitability (adaptability and farmers' preference), seed availability (timing, volumes and proximity), seed access (prices and quantities obtained by the farmers) and quality (physical) of the seed available in the local market. It also looks at some of the practices such as seed cleaning/sorting and grading, additional drying and treatment.

Focus Group Discussion (FGD) guide

This guide is used at community level in the same villages as those in which the household questionnaire is being administered. The FGD is a participatory research tool in which a group of participants (6-12) jointly discuss and develop a common understanding of issues. FGDs are useful to extract in-depth information on the concepts, perceptions and ideas of a particular group e.g. resource-poor, females, males, young people – or it can be used to gather views representative of a whole community in relation to the farming and seed systems. The FGD is a useful tool to understand how the farming and seed system works within the community and how the system evolves over time. For further details see the training guide on facilitating FGD.

2.3.6 Interviews³

Irrespective of the tools to be used, the SSA practitioner should be able to clearly introduce himself/herself to the potential interviewee or discussants, clearly explain the objectives of the assessment without raising expectations. A good researcher is a good listener who asks short and simple questions such as what, how, why, when etc. without diving in, trying to explain things. Always combine your interview skills (ask, probe, confirm) with other techniques such as observations, and where you feel you need to take some photos, request permission. At the end of the every interview, the person who sacrificed his/her time in providing the information should be thanked.

- *Household survey* – the household interview is normally directed to the head of the household, and where both the husband and wife are available they can support each other in responding to the questions.
- *Local market survey* – local market interviews are normally directed to the sales person and not necessarily the owner of the business. Traders may be skeptical about being interviewed by “unknown” persons. It is always a good practice to move with a guide, preferably an official from the ministry of agriculture or trade who is familiar with the market and the traders. SSA practitioners should be very clear to the trader that they will not interfere with business, stopping the interview when required to allow the trader to serve a customer.
- *Agro-input dealer interview* – like the local market survey, the interview is best conducted with the daily sales person. A guide from the ministry of agriculture or trade could be very useful in introducing the SSA researcher. Always follow the guide questions, and where necessary probe.
- *Focus Group Discussion* - this is normally with a group of 6-12 of farmers representing the village (not political representatives or leaders). It is important to understand the

3 Much more detail on field work can be found in the Toolbox in the CD-ROM.

socio-cultural context of the community, and where women and men are not normally mixed (e.g. in predominantly Muslim communities), have separate FGDs with men and women. In some cases men and women can be mixed although at all times, care must be taken to allow all members of the FGD to voice their opinions.

- *Government staff, NGO staff* - an earlier appointment (telephone call a day before) with the key informants is necessary to avoid time wastage. An extension officer used as guide in a given location could be interviewed as you go along during the day. Always keep KII interviews to within 30-60 minutes.

2.3.7 *Final exercises in the field*

Wrap up meeting on preliminary findings

Immediately after the field work, it is good practice for the SSA team(s) to assemble for a one day wrap-up meeting. On this day, team members present their key findings (KII, FGD, HHS, LMS, Agro-input dealer interviews) for discussion. Initial impressions of the state of seed security can be shared and emerging priorities for intervention discussed.

Feedback to local leaders

Whenever possible a further half day should be taken before leaving the SSA area to give a preliminary feedback to local leaders. As well as being good practice and confirming to the principles of Accountability to Affected Populations, this exercise also allows some verification of initial findings and offers the opportunity for follow up on particular questions or issues.

BOX 5: A TYPICAL DAY IN THE FIELD

Undertaking SSA field activities requires careful planning in order to save time and collect reliable data. A typical first day of SSA field work in a particular district can be summarized as below.

- a) Team briefing:** a brief from the team leader on the site to be visited. He/she ensures that the team members have all the necessary data collection tools. The team leader, where possible, calls the contact person of that location to confirm their coming and the most probable time of their arrival.
- b) Courtesy Calls to relevant offices:** the team should make courtesy calls to county or district government offices and also sub-county/district level. For the district level, the relevant senior officer (e.g. Director of Agriculture) should be briefed on the objectives and timetable of the SSA, and present selected sites (sub-county) to the authority for quick validation. A request is then made for an interview (KII) with the officer of his/her subordinate at their convenient time. This brief should not take more than 20 minutes. At the sub-county office: a similar courtesy call can be made to the agricultural officer in charge who will assist with giving a guide to assist the team. The officer at the sub-county could also be a potential key informant who could be requested for separate interview. This brief should also not take more than 30 minutes. The lower office could be useful in getting suitable guide (preferably an extension officer) to the selected villages.
- c) Data collection at village level:** 5 - 8 hours depending on travel and season. On arrival in the village, the local leaders are notified (by the guide) of the presence of the assessment team to reduce any tension of having "strangers" within.
 - The enumerators: spend the entire hours collecting household data
 - FGD facilitators: whilst the focus is on the FGD interviews, the facilitators should also involve themselves in household interviews, market interviews and agro-input dealer interviews as appropriate and possible.
 - Team leader: goes for market trader, Key Informant and agro-input dealer interviews.

Note: sometimes agro-input dealers and local market traders are not within the village but in the nearby trading center. Therefore, the driver has to first drop the enumerators and the FGD facilitators, then go with the team leader to the trading center to interview the traders and/or KII.

- d) Team gathering for pooling and discussing:** at the end of the day, the team assembles to pool summarize and discuss data (30 minutes – 1 hour). The key focus will be on the elements of the SSCF – availability, access, quality, suitability of varieties and resilience of the community.

For subsequent days in a particular district or sub-district, steps a) and b) are skipped and the team goes straight to step c). Once every 2-3 days / once a particular district / county has been covered the team should have a session where key emerging issues and findings are discussed and synthesized, again using the SSCF as an organizing framework.

2.4 Database design, data entry and preliminary analysis

2.4.1 Database design and management

Databases are used to handle large volumes of data. A well designed database takes care of all types variables collected during a survey and should be flexible enough to accommodate introduced or derived variables before and/or during data entry. In the case of SSA, it is recommended to use MS Excel as this is widely available and it is easy to create databases with this software.

SSA data entry clerks are strongly advised to make use of the database structure which has been designed by the FAO SSA development team.

The following steps should be done before the data entry starts:

- a) Review the questionnaires and codify further if needed
- b) Convert local units into standard units (sq m, kg, liters, etc.)

For the actual data entry process, it is possible to programme failsafe parameters into the database structure, making it impossible to enter data that is not consistent. This would reduce data entry errors significantly. So far this has not been done by the FAO SSA development team but is planned for 2016. In the meantime, a number of checks are necessary to validate the database including:

- a) *Take a random sample of questionnaires* and compare the data entered in the questionnaire to the data entered on the database. If errors are frequent/significant, it might be necessary to review the whole data entry process – i.e. to verify the whole database against 100 percent of certain questions in the questionnaires.
- b) *Verify the logic within the database itself.* For example, if the answer to “do you own livestock yes or no” is “yes”, then there must be an entry of some sort against at least one of the livestock types in subsequent columns.
- c) *Identify outliers and decide how to deal with them* (correct them / delete them / ignore them / keep them).

2.4.2 Data analysis

Before starting to analyze data it is necessary to be clear about the type of information required for reporting. There is a wide range of information available but not all the results are needed. The Toolbox gives guidance on analysis using PivotTable function available in Microsoft Excel (either with the MS Excel XP or MS Excel 2010 version).

The PivotTable feature is a user-friendly and easy-to-use tool, which is relevant for the kinds of analysis which is required in a SSA. For this reason it is recommended as a standard analytical tool for SSA. Other more sophisticated analyses are also possible, using statistical packages like SPSS. Such analysis would add value to the report but is not mandatory for the SSA practitioner⁴.

4 Further details on how to construct a pivot table are contained in the Toolbox.

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3

Interpretation of SSA results and making recommendations

INTERPRETATION OF SSA RESULTS AND MAKING RECOMMENDATIONS 3

3.1 Introduction

The primary task now is to review the analysis of the data and determine what interventions are appropriate. It is recommended that the findings are analyzed using the elements or parameters of seed security i.e. seed availability, seed access, varietal suitability and seed quality. Questions of resilience will be addressed through analyzing these elements and synthesizing the results.

In all cases the kind of analysis that is done will depend upon the type of SSA that is being carried out i.e. post disaster, protracted crisis or non-emergency. In the case of a **post disaster** SSA, the key analytical technique will be to compare levels of each of the SSCF parameters for particular socio-economic groups and geographical areas before and after the disaster; in the case of a **protracted crisis** the most likely technique will be to compare current levels of the parameters for groups and areas with an area of "normal / pre-crisis". Finally, in a **non-emergency** context, the key issue will be to compare levels of the parameters across different socio-economic groups or geographical areas as a "situation analysis".

Arising from the analysis will be recommendations for different kinds of actions. Examples of short and longer term interventions relevant for each element of seed security are indicated in the following section.

3.2 Seed availability

The analysis of data from different tools used in the SSA will reveal the importance of the various seed sources to farming communities. The **household questionnaire** is a key source of data in this regard. Figure 2 presents the results of analysis of household questionnaire data showing the overall proportion of seed of different crops obtained from different sources in a particular area.

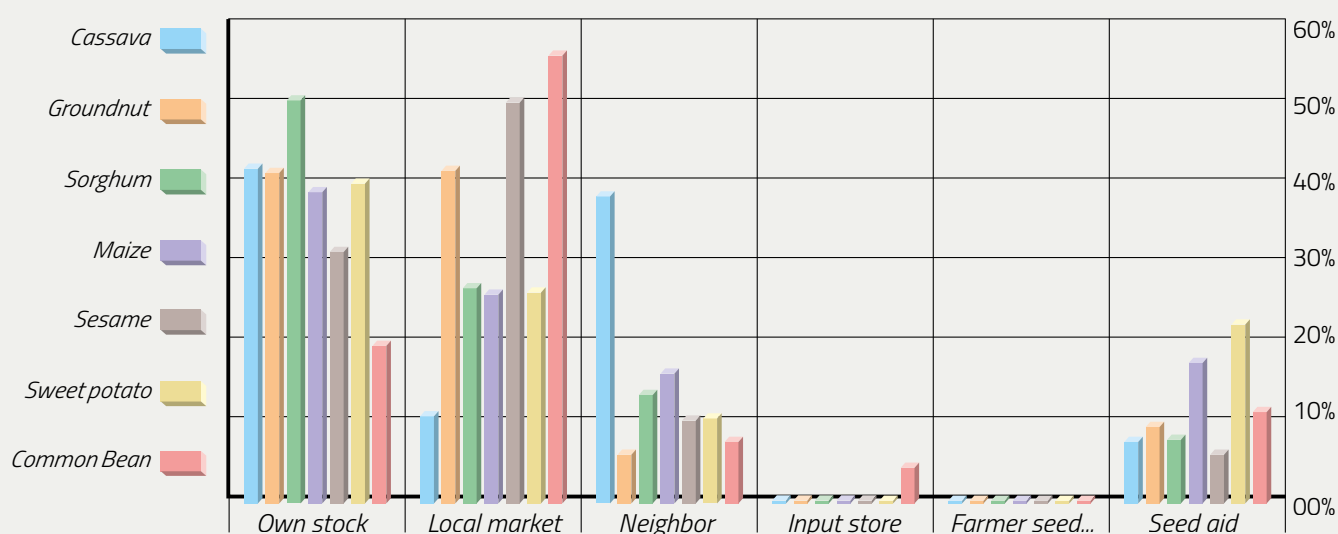


Figure 2:
Main seed sources

Source: data collected during the seed assessment

This graph illustrates the importance of own saved seed (OSS), local market seed (LoMS) and social network seed (SNS). The limited sourcing of seed from the formal sector and NGOs is also significant.

In this example, the informal sector represents almost 100 percent of the farmers' seed supply and this is common in most seed insecure areas.

A second source of information is the **Focus Group Discussions** which revealed that IDPs (Internally Displaced Persons) had limited OSS and SNS and had to rely on LoMS. At the same time the IDPs had limited assets to purchase seed, indicating a seed access problem for the IDPs.

Finally analysis of data from the Agro-input dealer questionnaire revealed the data included in the following table.

Table 1:
Traders' perception of seed availability during present and next season in % of respondents

Crop	Maize		Rice		Groundnut	
	This Season	Next Season	This Season	Next Season	This Season	Next Season
Normal	25.5	22.2	30.2	26.8	21.4	36.4
Less than Normal	58.5	46.7	57.0	59.8	78.6	63.6
More than Normal	16.0	31.1	12.8	13.4	0.0	0.0

Source: data collected during the seed assessment

Implications of the analysis for intervention recommendations

The key conclusions from piecing together the analysis from all three tools are:

- For resident populations, OSS, LoMS are the most important sources of seed followed by SNS;
- For IDPs, LoMS is an important source but access is hampered due to lack of purchasing power;
- Traders are pessimistic about availability of key seeds this season and next season, indicating a looming seed availability problem.

In these circumstances, interventions aimed at increasing seed availability for the resident population whilst simultaneously increasing seed access for the IDP population should be considered.

Focusing for the moment on seed availability, there are a number of options, both in the short term and the longer term. Some of the possible responses are indicated in Figure 3.

Problem	Unavailability of seed	
	Formal seed system	Informal seed system
Short-term response	<ul style="list-style-type: none"> ▪ Direct Seed Distribution (DSD) through UN and NGOs ▪ Seed Vouchers and Fairs with national seed companies 	<ul style="list-style-type: none"> ▪ Support local and regional traders to improve supplies of adapted seed ▪ Linking informal with formal sectors via demonstrations of new varieties or injecting small packets of improved seed into local markets
Longer-term response	<ul style="list-style-type: none"> ▪ Support seed production or strengthen supply chain components such as transport, sale outlets, and market information. 	<ul style="list-style-type: none"> ▪ Develop local and regional markets, with a focus on transport, storage, credit, and seed quality versus grain. ▪ Improved on farm (hermetic) storage. ▪ Community seed production

Figure 3:
Response options
for seed availability
problems

Source: adapted
from Sperling
(2008)

It should be noted that there are certain requirements and potential caveats for each of these options. For example, DSD requires substantial logistical support and there are cases of late seed distribution due to delays in procurement or provision of poor quality seed or inappropriate varieties. Another example is on-farm hermetic storage which only works if the seed is very dry before storage. Community seed production, seed banks and community seed enterprises can be feasible longer term responses to shortages of seed but need to be carefully designed to ensure a level of sustainability. In all cases, some thought should be given to the practicality of the response in the specific circumstance in which it will be implemented: Are partners available and competent to distribute seed? What has been the experience with attempts to strengthen seed supply chains in the area? What are the critical constraints that would need to be addressed?

In addition to these supply side responses, in some circumstances when markets are well functioning and well integrated, demand side responses which focus on increasing purchasing power of local populations might also be relevant. This is because the increased demand can stimulate increased flow of seeds into the area from other areas where seed availability is not a problem. This could be the case in situations where seed availability stress is restricted to a few relatively limited pockets. Such action should be very carefully considered as if markets are not well connected and / or if seed availability is a more geographically widespread problem that simply pumping more money into an area (e.g. via vouchers) will not solve the problem. Rather it will make things worse by causing prices to rise.

3.3 Seed access

Seed access has proven to be a key issue in SSA due to the fact that in many cases seed security is constrained by a lack of income to purchase seeds. In the case of certain types of disasters, particularly drought, the main seed problems are on the demand side. The disaster and coping with its effects diminishes income sources and assets thus reducing purchasing power.

In the following example, data from the **household questionnaire** revealed that a key reason for not planting more seed was that farmers could not afford it (see Figure 4).

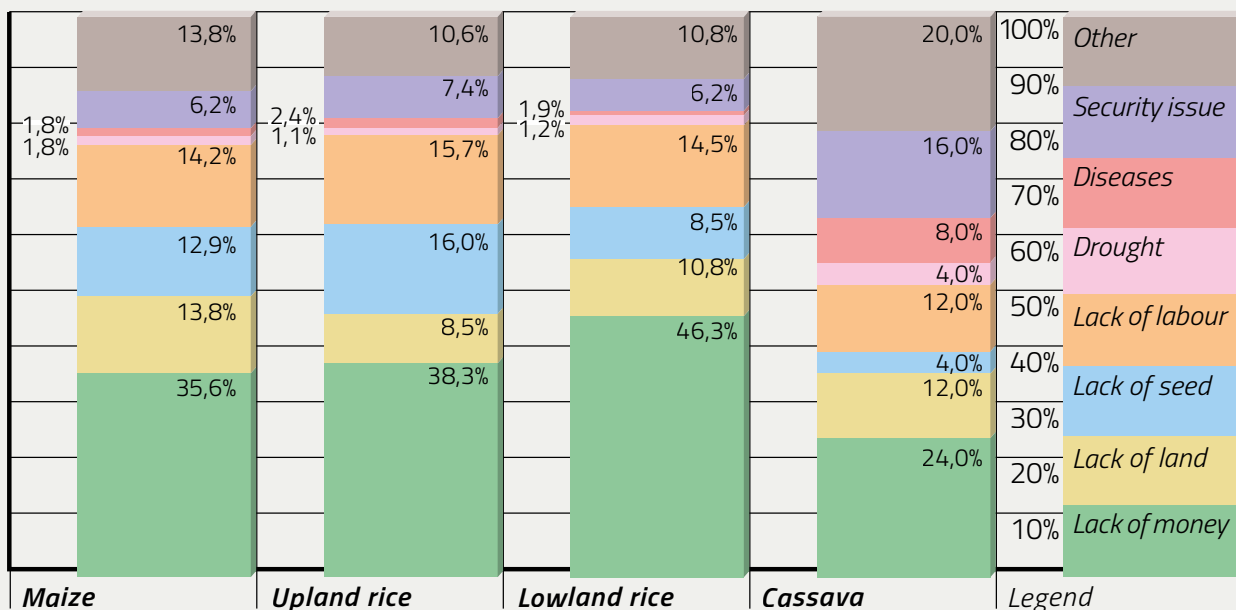


Figure 4:
Reasons for
planting less seed
(in percentage of
farmers that sowed
less seed)

Source: data collected
during the seed
assessment

Whilst seed availability problems do exist, they are much less frequently cited than lack of money – which leads to poor access to seed. In order to verify this, findings from the **Local Market Survey** and the **FGD** confirmed that prices of seed have not risen significantly recently and that there were no major issues with the availability of seed in local markets.

In order to address this kind of issue in the short term, it is important to increase the purchasing power of farmers to buy seed from local markets. This can be done by issuing seed vouchers for particular types of seed which can be redeemed either in a seed fair (informal sector) or with local seed suppliers (formal sector). Another option would be a cash for work public works programme. In the longer run, seed access can be addressed through general poverty alleviation programmes which increase incomes and thereby ability to acquire seeds.

Implementing seed access interventions when the main problem is seed availability and markets are not functioning well can have damaging consequences through raising prices of already scarce seed.

Figure 5 gives some further options to consider in cases where seed access is a major issue.

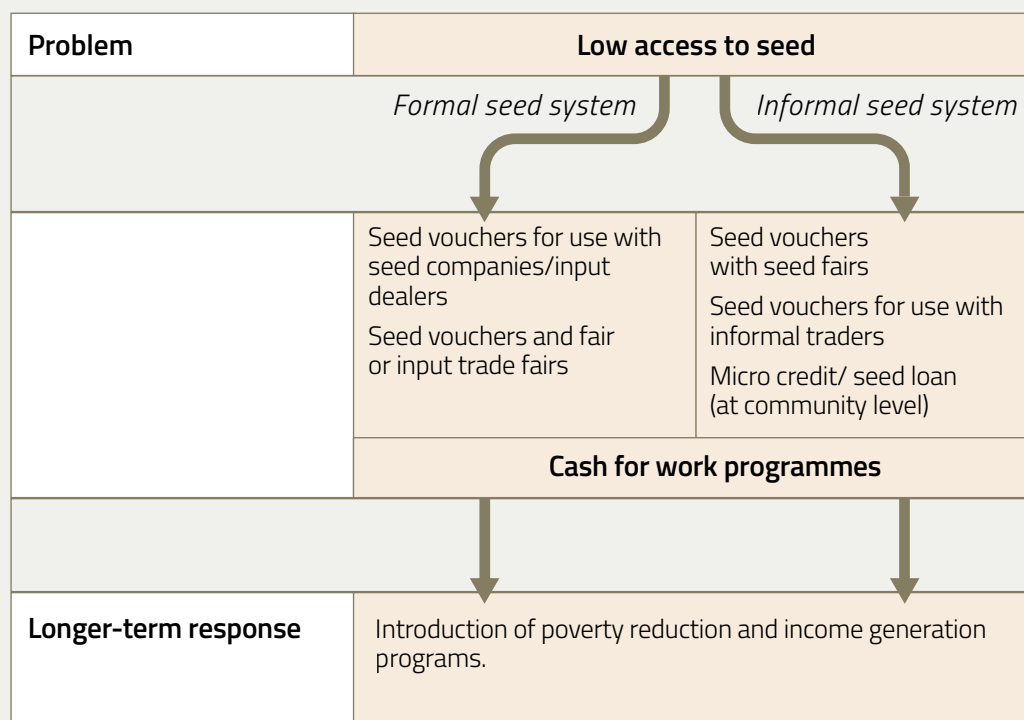


Figure 5:
Response options
for seed access
problems

Source: adapted from
Sperling (2008)

As with the interventions designed to increase seed availability, all of these options come with certain conditions and therefore may or may not be appropriate in any particular situation.

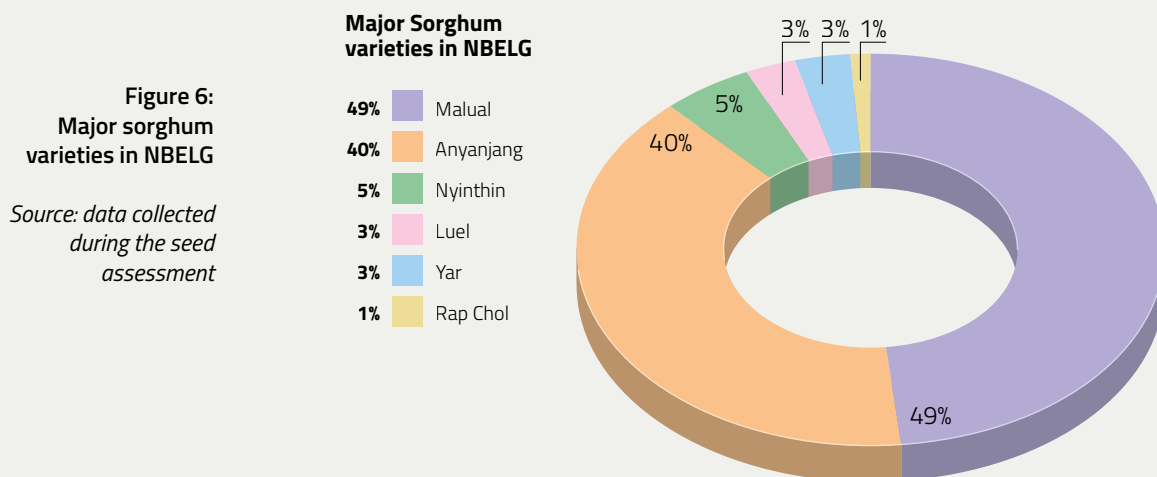
Seed Access Interventions

- **Seed Fairs:** the provision of vouchers to farmers and organizing specific seed/input fairs has proven to be an effective market based approach to improving seed security, allowing farmers to choose what they need, and bring seed producers and seed enterprises to the farmers.
- **Seed Vouchers:** here, farmers are issued vouchers which can be redeemed for seed provided by seed companies. This approach does not have the verification procedures that exist with seed fairs and it can restrict farmer seed suppliers.
- **Micro credit community level seed loans:** common in some areas but requires strong community leadership, ensuring the right variety is provided, the quality is good and payment of the loan is properly managed.
- **Cash for work:** a number of public works or asset creation schemes are possible which will increase incomes. Whilst this may increase purchasing power, it does not necessarily follow that more or sufficient seed will be purchased as the increased incomes can be spent on a variety of goods and services, including seed.

3.4 Varietal suitability

Understanding what varieties farmers are using, which ones they prefer and why, is key to identifying suitable interventions designed to increase both access and availability to seed. There is little point in introducing varieties which do not have the characteristics preferred by farmers.

In the following example, the analysis of FGDs found that over ten sorghum varieties are being grown in the state and about 3-4 varieties are grown per village. Further information from the household questionnaire revealed that among the various sorghum varieties, *Malual* and *Anyanjang* are the most popular, and are grown by 49 percent and 40 percent respectively of the households (Figure 6). *Malual* is red seeded, long maturing (6 months) and flood tolerant while *Anyanjang* is white seeded, short maturing (3 months) and preferred for food as well as bridging the hunger gap. In general, most of the local varieties cultivated in the state are considered well adapted and preferred by the farmers, as they know where and when to plant these varieties.



During a FGD with women, it was generally agreed that sufficient access to preferred seed was a significant constraint and that availability of the seed was also becoming more of a problem with time. The women attested that the varieties of sorghum and sesame received through seed aid were not well adapted to the flood zone and were therefore not used. This finding was confirmed by the household survey, which found that the improved varieties of sorghum (*wad Ahmed*), groundnut (*Serenut*, *Sodari*) and sesame provided by humanitarian organizations did not feature anywhere among the major varieties being grown by the farmers.

Implications of Varietal Suitability analysis for interventions

It is clear that the varieties preferred by farmers are not those which have been provided by seed relief agencies. Both access to and availability of preferred varieties is becoming a problem, suggesting a blend of access enhancing and availability enhancing measures. These could include:

Availability of suitable varieties

- Buy up and then distribute seed of preferred varieties (short term);
- Facilitate the development of Local Seed Enterprise for the production of adapted varieties (longer term);
- Introduce Farmer Field Schools (FFS) to promote quality seed production and participatory variety trials (longer term);
- Introduce Participatory Variety Trials of new varieties and new crops (through FFS, extension, agricultural research, NGOs, seed companies etc.) (longer term);

Access to suitable varieties

- Seed fairs bringing preferred local varieties which farmers can access with vouchers (short term).

These options are represented in Figure 7.

Problem	Lack of appropriate varieties	
	<i>Availability problem</i>	<i>Access problem</i>
Short-term response	<ul style="list-style-type: none"> ▪ Buying up of and then direct seed distribution of preferred varieties 	<ul style="list-style-type: none"> ▪ Seed fairs bringing preferred local varieties which farmers can access with vouchers.
Longer-term response	<ul style="list-style-type: none"> ▪ Facilitate the development of Local Seed Enterprise for the production of adapted varieties ▪ Farmer Field Schools to promote quality seed production and participatory variety trials ▪ Participatory Variety Trials of new varieties and new crops (through FFS, extension, ag research, NGOs, seed companies etc.) 	

Figure 7:
Response options for varietal suitability problems

Source: adapted from Sperling (2008)

3.5 Seed quality

Analysis of seed sources should include insights on farmers' perception of the quality of seed from the different sources. In any given situation, farmers may have access to seed but it may be of poor quality, leading to low germination rates.

Data gathered in the household questionnaire found that both physical and physiological quality of seed was high according to farmers (see figure 8).

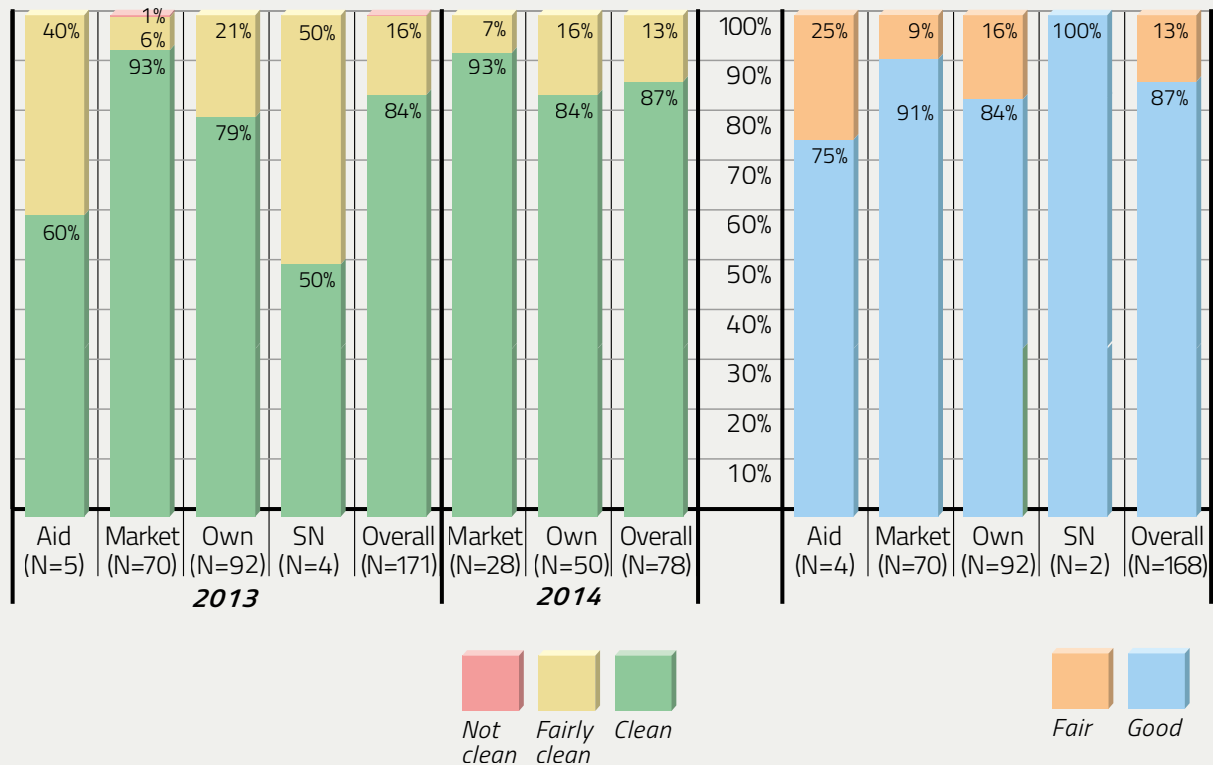


Figure 8: Physical (a) and physiological (b) quality of seed from various seed sources

On this basis, seed quality does not appear to be an important constraint to seed security. From a technical point of view, however, it would be advisable to follow up and to do sampling and testing of these sources of seed to verify the seed quality from each source.

Source: data collected during the seed assessment

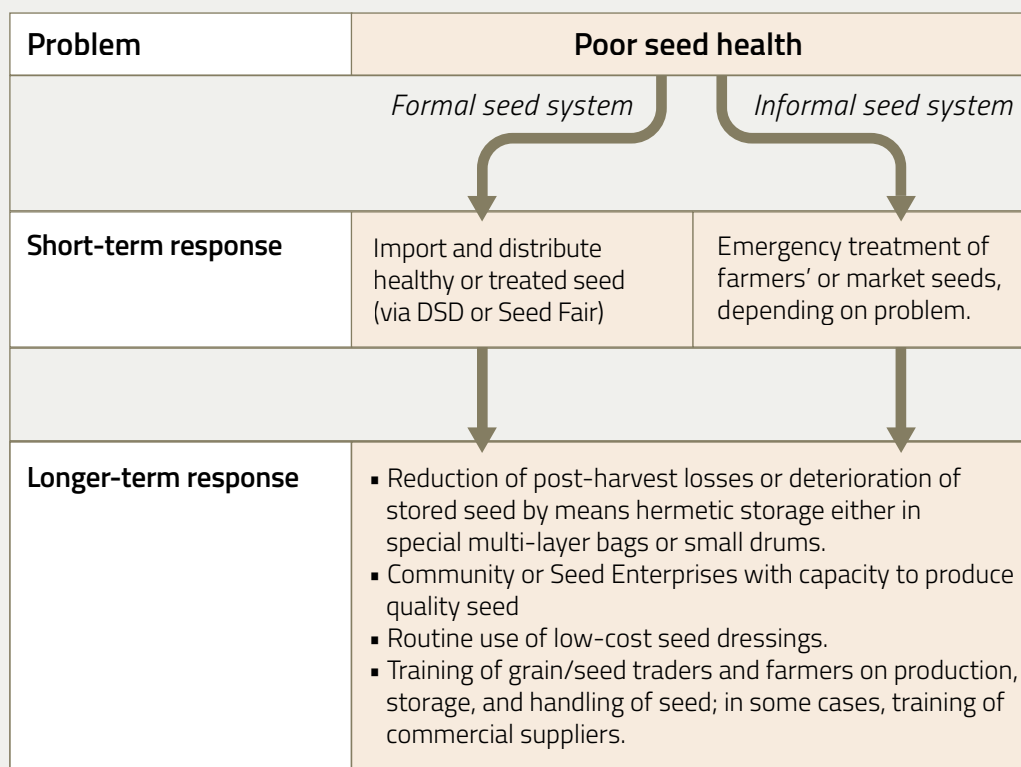


Figure 9:
Response options
for addressing seed
quality issues

Source: adapted from
Sperling (2008)

3.6 Resilience

Seed security means that farmers have adequate access to seed “at all times in both good and bad cropping seasons”. In order for this to be the case, households and individuals must be resilient to shocks and stresses faced by their seed systems. The degree of resilience is measured by the extent to which seed security is adversely affected by a particular shock or series of shocks. When faced with the same shock (such as drought) two farmers in the same village may exhibit different degrees of resilience to the shock in terms of their seed security. Thus one farmer may become seed insecure as a result of the drought (not resilient), whilst another remains seed secure (resilient). Some households may be susceptible to very small shocks, in which case we can say that they are highly prone to seed insecurity (very low resilience).

Resilience is manifested in the degree of seed security in terms of seed availability, seed access, seed quality and varietal suitability after a shock. Thus it can only be directly measured by changes in indicators for these aspects. In the SSA this can be done in different ways. Using the household questionnaire, it is possible to identify different types of household and see to what extent they are resilient to a seed security shock such as a flood or drought.

The reasons for resilience of a household can be derived from analyzing the associations between levels of seed security and various factors including: diversity of income sources, diversity of crops planted, and levels of fungible assets. Household types that are less resilient can then be targeted for different kinds of interventions which would enable them to be more resilient to the next shock. The kinds of interventions would be no different from the ones already listed under the other parameters of seed security.

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Annexes

ANNEX 1: OUTLINE OF SSA CONCEPT NOTE

It is difficult to overstate the importance of a well constructed SSA Concept note. The concept note is a critical foundation for the whole SSA process, and should clearly set out the background to the assessment, the objectives, the timeline and the overall budget. The key areas to be included in the concept note are as follows:

1. *Title:* This should be concise, and able to define the geographic or livelihood zone coverage within a given country e.g. Seed Security Assessment (SSA) in the marginal south-eastern livelihood zone of Kenya OR Seed Security Assessment (SSA) in Makueni, Tharaka-Nithi and Kitui Counties in south-eastern Kenya.
2. *Assessment period:* Indicate the month(s) and year in which the assessment will be conducted e.g. November, 2014. or Nov-Dec, 2014.
3. *Introduction and background:* A brief introduction on the contribution of agriculture to the economy of the country, particularly to its GDP and export where possible. Provide narrative statement on the proportion of the population which depends on agriculture for their livelihood; the contribution of the formal and informal seed sector; dependence of agriculture on either rain-fed or irrigation or both; the predominant farming agro-ecologies of the country, and ones that are predominant in the target zone. The recent disaster or recurrent crisis in the target zone and how it affected agricultural production in a given year or season; seed security responses or interventions used in the recent past; the assumptions or reasoning behind those interventions.

Briefly discuss the seed industry in the country and where necessary compare it with other countries within the region; also examine whether existing seed policy and regulatory framework recognize the co-existence of both the formal and informal seed sectors. Are there some notable seed policy and regulatory issues worth noting in the background? Was there any previous seed security assessment conducted in the target zone or similar agro-ecology in the country? Give brief highlight of the key findings and recommendations from this assessment; stress the importance of seed security assessment; and explain the rationale for the assessment.

4. *The Assessment Objectives and the scope:* The overriding goal of the any seed security assessment (SSA) is to understand the seed security situation of the target or affected communities based on the elements of the seed security conceptual framework (SSCF): seed availability, access, varietal suitability and quality and resilience of the seed system. The specific objectives will vary according to the situation. In this regard, it is useful to think in terms of three broad kinds of situation:
 - a. Post-disaster / emergency: Here the current seed security situation may be compared with the situation before the disaster;
 - b. Non-emergency/baseline: In this case, the SSA takes the form of a situation analysis: i.e. it focuses on current seed security without comparing to the past;
 - c. Protracted crisis: In a protracted crisis, seed security may fluctuate according to periodic worsening or improvements in the situation. Here knowledge of what is considered "normal" is useful. A sudden change in seed security within the overall context of a protracted crisis will lend itself to the same kind of approach as in a post disaster situation.

5. *Target SSA zone:* Brief description of the target zone – area, population size, farming characteristics and agro-ecological zones of interest. Why these agro-ecologies? Who are key players supporting food and seed security in this zone if known? What are they doing? A map of the zone showing the various agro ecologies and/or administrative boundaries would be useful for the reader to visualize the target area.
6. *Stakeholder analysis and responsibilities:* The Concept Note has to identify direct stakeholders who will be the key actors in the implementation of the assessment activities – training, data collection, data analysis and reporting, and those that will most likely take actions based on the recommendations of the assessment. Even within the organizations that are participating in the assessment process, departments which will play some pivotal roles need to be identified. Broadly, the following stakeholders could be directly involved or consulted; Government relevant ministries (Agriculture and Livestock; Trade, industry and commerce; Cooperative and Rural Development), donors (where there is need for additional funds); United Nation Organizations and Programmes (FAO, WFP, UNICEF, UN WOMEN) and Local and International NGOs; Community based organizations; Nation Agricultural Research System (NARS) and International Agricultural Research Centers (IARCs).
7. *Definition of outputs:* Main output of any SSA is the report. Summary of the action plan could as well be produced by the assessment team in consultation with the direct and indirect stakeholders.
8. *Activity Time Frame:* This could be summarized as in the table below.
9. *SSA Organizing Team:* Where necessary, names and contact of SSA organizing team could be included for easy reference and consultation.

ACTIVITY	OCTOBER		NOVEMBER				DECEMBER		RESPONSABILITY
	3	4	1	2	3	4	1	2	
1. Identification of partners (NGO, MoA)									FAO Kenya
2. Review of background information									FAO Kenya/REOA
3. Training of field staff (3 days)									TOT part.
4. Field Data collection									SSA Team
5. Preliminary findings workshop (1 day)									SSA Team
6. Data Mgt, Analysis and reporting									SSA Team
7. Validation Workshop (s) (1 day)									SSA Team
8. Development of Plan of Action (PoA)									Stakeholders
9. Final Report and PAO to stakeholders									SSA Team/stakeholders

NAME	ORGANIZATION/DEPARTMENT	ROLES	CONTACT
1. Daniel M.	FAO Kenya (Kitui)	Team leader	
2. Simon M	FAO Kenya (Nairobi)	Economist	
3. Wilson R.	FAO Kenya (Nairobi)	Agronomist	
4. Joseph O.	FAO REOA (Nairobi)	Data analyst/technical advisor	
5. Philippe L	FAO AGPM (Rome)	Trainer/Technical advisor	
6. Omondi. P.O.	Somali Aid (Nakuru)	Trainer/FGD facilitator	

10. *SSA Budget*: a clear budget needs to be developed. The budget required for the assessment depends on factors such as the assessment scope and coverage; transport cost; number of people involved; number of days needed to completed the field work etc. A typical budget for a SSA can be seen in Annex 2.

ANNEX 2: CONCEPT NOTE AND BUDGET FOR SSA IN KITUI, MAKUENI AND THARAKA-NITHI COUNTIES, KENYA, NOVEMBER 2014

1.0 Introduction

Agriculture is the major contributor of the Kenyan economy. It is the leading economic sector, accounting for 25 percent directly of the gross domestic product (GDP) and accounts for 65 percent of Kenya's total exports. About 75 percent of Kenyan population depends on agriculture as source of livelihood, and accounts for about 18 percent of the wage employment. Kenya's agriculture is mainly rain-fed and dependent on the bimodal rainfall in most parts of the country. It's predominantly small-scale farming mainly in the medium and high-potential areas accounting for 75 percent of the total agricultural output and 70 percent of marketed agricultural produce. A large proportion of the country, accounting for more than 80 percent, is arid and semi-arid land (ASAL) with an annual rainfall average of 400 mm. Droughts are frequent and crops fail in one out of every three seasons. With increasing population pressure in high and medium potential areas, the future of agriculture is in ASALs where large land remain land remains underutilized.

The Kenyan farmers depend on both the formal and the inform seed system. Formal seed sector is one of the most vibrant in the eastern and central Africa, with over 60 seed enterprises. However, the informal sector still accounts for over 80 percent of the total seed used in the country, with its contribution being even much higher in ASALs. The national requirement of certified seed ranged from 28,000 to 35,000 metric tons, with maize accounting for over 80 percent of the total volume of certified seed.

Achieving FAO Kenya country programming framework (CPF) outcome 2 of increasing agricultural productivity of medium and small scale producers will require a well-functioning seed system. A well-functioning seed system is one that uses the appropriate combination of formal and informal channels to efficiently meet farmers' demands for quality seeds of suitable crop varieties. While the seed industry in Kenya is better developed compared to other countries within the region, high cost of seed relative to other inputs, coupled with the inability of the formal seed system to meet the demand by farmers have been cited as bottlenecks to the seed industry (Nyoro and Ariga, 2004). In the Arid and Semi-Arid Land (ASAL), recurrent drought and crop failure have been frequently cited as source of seed insecurity. In addition, poor legislative and regulatory framework in the seed adversely affects access to improved seed and planting materials by farmers. Since the liberalization of the seed industry in 1996, private sector participation has increased, with a number of private seed companies being registered to produce seed, thus reducing the monopoly that the Kenya Seed Company has enjoyed for a long time. While it was widely expected that this would lead to improved accessibility to quality seed and hence increased efficiency, agricultural productivity has generally been low and shown declining trends.

Efforts by government and humanitarian actors to improved availability and access to quality seed of adapted crop varieties by marginal farming households have been focusing

on providing maize seed and seed of other traditional high value crops such as pigeon peas, cowpeas, beans and some other legumes in the ASAL regions. Though this is widely appreciated, very limited efforts is normally put in understanding the elements and magnitude of seed insecurity of the target population

2.0 Seed System Security Assessment

Although, a comprehensive seed system security assessment was carried out in 2011 in Eastern and Coastal Kenya, this assessment provide baseline synopsis in the face of recurrent drought. Understanding the dynamic of seed security therefore requires regular assessment for better seed and food security programming. It's against this background that FAO Kenya, with support from ECHO funded Global Food Security Capacity building through FAO Sub-regional Emergency Office for East and Central Africa (REOA) is seeking to jointly conduct a Seed Security Assessment (SSA) in the southern marginal agricultural livelihood cluster of Kenya.

The Southeastern Marginal Agriculture Livelihood cluster comprises of five counties namely; Makueni, Kitui, Tharaka-Nithi, Meru (North) and Embu (Mbeere). It covers an area of 47,348 square kilometers and has an estimated population of 3,032,460 persons. The cluster has two major livelihood zones;

- a) Marginal Mixed Farming livelihood zone representing 65 percent of the population, and
- b) Mixed Farming livelihood zone representing 26 percent of the population.

The main sources of income for the cluster include; Crop production which accounts for 40 percent of the total household income, Livestock production accounting for 35 percent and Employment at 25 percent. The target counties for the assessment are Makueni, Kitui and Tharaka-Nithi.

The Assessment Objectives

The main objective of the assessment is to examine and analyse current seed security situation and provide directive in supporting seed sector development in the Southern Marginal Agricultural Livelihood cluster,

Specifically, the assessment will:

- a) Critically and constructively review past emergency and rehabilitation seed-aid related activities in the in three counties to provide lessons learnt;
- b) Assess the current seed security situation (availability, access, quality , varietal suitability and resilience) among farmers households, including women and youth within the agro-ecological systems in the three counties;
- c) Provide a comprehensive information base (report) on which to design appropriated seed system support intervention linked to promoting agricultural growth and seed security.

2.1 Key activities

FAO Kenya office: in collaboration with other key stakeholders, carries out the following activities in order to achieve the above objectives.

- a. Arrange for all the necessary logistics necessary for conducting seed security assessment as well as coordinate with all the relevant key stakeholders;
- b. Review the food and nutrition security in the three counties in order to provide some background to the assessment;
- c. Adapt appropriate tools and methodology for data collection, entry, analysis and reporting with consideration of community participation;
- d. With support of the seed system specialist, provide training, technical assistance and coordination of the Seed Security Assessment;
- e. Provide leadership throughout the data collection, analysis and reporting period, and provide a mechanism for feedback to the community;
- f. Facilitate discussions between FAO and partners based on the results of the assessment in order to draw the main findings of the assessment, give and adopt suggested recommendation, and develop an action plan;
- g. Present the main findings, recommendations, plan of actions to FAO staff, donors, Ministry of Agriculture, livestock and Fisheries (MoALF) and partners through workshops at state level;
- h. Prepare the SSSA report highlighting the methodology used, results, conclusions and recommendation;
- i. Develop and action plan for addressing critical seed security problems identified during the assessment.

FAO REOA-Nairobi and AGPM-Rome

- Provide technical assistance to FAO Kenya for the implementation of the assessment;
- Participate in the discussions on the results and findings of the assessment;
- Review the documents produced within the assessment and especially the final SSSA report;
- Participate in the Final workshop.

National and County Government;

- Provide additional human and logistical support;
- Provide secondary data.

NGO Partners

- Support data collection, analysis and reporting;
- Provide secondary data.

2.2 Definition of outputs

- Final SSA report;
- Summary of the action plan for supporting the development of the seed sector in the three counties;

Budget

S/NO	ACTIVITY/ITEM	UNIT	DAYS	UNIT COST	TOTAL (KSH)	USD (\$)
1	Training					
1.1	Conference package	15	3	4,000	180,000	2,029
1.2	Scholastic materials	12	3	100	3,600	41
1.3	Accommodations/DSA	15	3	6,000	270,000	3,044
1.4	Transport	2	1	15,000	30,000	338
	Sub-total				483,600	5,452
					-	-
2	Administrative and support staff cost					
2.1	Special consultants ⁶ (optional)	1	10	16,000	160,000	1,804
2.2	Data clerks ⁷	3	9	5,000	135,000	1,522
2.3	Administrative cost	1	5	14,000	70,000	789
	Sub-total				365,000	4,115
					-	-
3	Field work					
3.1	Transport	2	10	15,000	300,000	4,059
3.2	Daily Subsistence Allowance	15	10	6,000	900,000	12,176
3.3	Equipment and tools	1	1	20,000	20,000	225
	Sub-total				1,460,000	16,460
					-	-
4	Preliminary findings workshop					
4.1	Conference package	15	1	5,000	75,000	846
4.2	Scholastic materials	15	1	100	1,500	17
4.3	Accommodations/ Daily Subsistence Allowance	15	1	6,000	90,000	1,015
	Sub-total				166,500	1,877
					-	-
5	SSA Validation and Action Plan Workshop(s)					
5.1	Conference package (optional)	30	1	5,000	150,000	1,691
5.2	Scholastic materials (optional)	30	1	100	3,000	34
5.3	Accommodations/Daily Subsistence Allowance	10	1	6,000	60,000	676
5.4	Transport	10	1	4,000	40,000	451
	Sub-total				253,000	2,852
					-	-
	Grand Total				2,488,100	28,051

6 A comprehensive SSA may require specialized consultants to do specific reviews such formal plant breeding

7 Can be inbuilt within the SSA field team

ANNEX 3: SEED BASICS

Introduction

A more technical understanding of seed parameters is useful background for SSA practitioners. This involves seeking answers to key questions such as: What are varieties of the crops that farmers are growing? What is meant by quality seed of adapted varieties? What are the components of National Seed systems? What is the difference between the formal and informal seed sector? What are the different sources of seed used by farmers and how is quality seed produced by farmers and seed enterprises? These are among the technical topics that will be explored in this section.

Preferred Crop Varieties

Key questions in a seed security assessment are: What are the crops and varieties that vulnerable households use and what are their essential characteristics? Are there seed quality problems associated with these crops/varieties? Are these traditional or improved varieties? What is the comparative view of farmers regarding improved and traditional varieties and how does this influence variety adoption? What are the crops and varieties that are available from the various seed sources? Are there improved crop varieties in the country that could be useful for vulnerable farmers or are these already used by the farmers? This section provides the technical background for practitioners to explore these questions.

Within crops species such as maize, rice or groundnut, there are thousands of distinct kinds of each crop, which are referred to as “varieties” or “cultivars”. Plants produced by seeds of a variety present the same characteristics, which are reproducible from one generation to another. The definition of a cultivar is a population of cultivated plants that can be clearly distinguished by any characteristic (morphological, physiological, cytological, chemical or others) and which, when reproduced (sexually or asexually), retains its distinguishing character.

“Improved” or “modern” varieties are the result of plant breeding and varietal development programmes, multi-location trials, national variety release systems and formal seed production systems. Other kinds of crop varieties are **traditional** varieties (also known as **landraces**) that are produced and conserved by farmers. They can be a local population of plants selected by farmers during many years. Sometimes traditional varieties are improved varieties that were released many years ago and are being maintained by farmers. *Normally a seed security assessment will reveal that farmers depend on traditional varieties and they often don't have access to improved varieties.* Seed of different varieties of the same crop are often difficult or impossible to distinguish just by looking at the seed once harvested. This means that the mixing of different varieties of the same crop or species can occur when the grain/seed is sold and enters the formal and informal marketing system. *However some grain marketers or local seed sellers try to keep crop varieties separate to sell as seed at planting time and this is important to determine during a seed security assessment.* Plots that are planted with a mixture of varieties may have plants of different height and mature at different times, which may be a problem in harvesting and post-harvest handling, and results in lower yields. However, it must be pointed out that traditional varieties or landraces, particularly of cross-pollinated varieties

used by subsistence farmers, are often populations of plants that are not very uniform. This heterogeneous character can be an advantage in some circumstances, such as low rainfall, low fertility, and pest and disease pressure.

For example, in Burundi, farmers prefer to plant bean seeds that are a mixture of bean varieties in order to cope with pest and disease problems or drought since each variety has different characteristics.

Characteristics that are important to farmers and need to be documented during the SSA

Preferred varieties must be adapted to the local agro-ecological conditions. The length (days) of the growth cycle is a critical characteristic in particular for rainfed crops to enable them to mature while there is sufficient moisture for grain filling. Adaptation to soil, soil fertility, diseases, pests, day length and moisture regimes are all important characteristics of a crop variety that farmers need. It is difficult to anticipate how a variety will respond to a different agro-ecological zone until it is actually grown there. Therefore, variety trials are important since they establish the recommended zones of adaptability for varieties. In drought conditions, although farmers may be interested in earlier maturing varieties, this is not always the best option. For example, bird attacks on the maturing grain of these varieties (rather than the conventional, longer duration variety) can be severe and discourage farmers from planting them. However, when early maturing varieties must be grown, there are varieties of some crops that are tolerant to bird damage which minimizes the effect of this pest, e.g. in rice and sorghum. For these varieties, it is also possible to delay the planting so that the maturity of the crops corresponds with later maturing varieties in order to diffuse bird damage over the entire crops of the area. It is also important to note that crop adaptation has a limit; it is wrong to believe that a variety can do well under all growing conditions. This should be kept in mind as we propose new varieties to farmers during emergency operations.

Farmer in Uganda have found their landraces of maize are not producing well because of the shorter rainy season and they require four months to mature. There are new maize varieties that mature in 100 days and they are interested in trying these varieties

A crop variety must have the right organoleptic properties. These properties refer to the processing, cooking, color and taste characteristics that are compatible preferences. Farmers have rejected many improved varieties because of poor taste or cooking and processing characteristics. Variety trials are often accompanied by cooking and tasting by women and men. In addition, aspects other than the edible grain may be important as the plant may be used for other purposes after harvest, such as the stalks for building material or fodder. Also, the choice of variety should take into consideration the crop architecture suited to local agronomic practices, particularly harvesting. For example, otherwise good dwarf varieties have been rejected because of the back-breaking nature of harvesting these, especially when the farmer's holding is large and there is no machine power available.

Farmers in the Oromia region of Ethiopia have adapted traditional sorghum varieties with long stems that are used for building material and animal feed but require six months to mature. When the early rains fail they look for short stature early maturing sorghum varieties to plant for the short rains.

Tolerance to pests and diseases (biotic factors) means that a plant can live with these organisms without significant loss of yield and quality. Obviously, tolerance to important diseases and pests is extremely important and a major objective of plant breeders. Tolerance and resistance can break down with time owing to mutations in the parasites or hosts. New sources of resistance and tolerance are always being sought by plant breeders. It is important to obtain precise information on disease and pest tolerance of a variety when considering the introduction of new crops and varieties.

In South Sudan groundnut is an important crop in many areas, however the rosette virus affects groundnut varieties and limits their yield. An improved rosette tolerant variety has been introduced that is very popular with farmers.

High yielding ability. This is linked to a range of plant characteristics, including plant architecture, nutrient-use efficiency, and factors mentioned above, i.e. adaptation to local conditions and pest and disease tolerance. Higher yields mean more food and income for farmers. With resource-poor farmers, it is important that high yields be achieved under low input conditions (minimal or no fertilizer and pesticides), or with the use of organic or mineral soil amendments. However, emergency operations should not be used for providing untested new crop varieties to farmers. Observing good farming practices in terms of land preparation, sowing time, weeding, soil fertility management and water management, and avoiding post-harvest loss are important contributing factors for high yields.

In the Casamance region of Senegal traditional rice varieties are often tall and late maturing. Locally bred rice varieties that are earlier maturing and have more tiller per plant have been introduced that have increased yields under low input conditions.

Variety type

A significant technical aspect of seed relates to the way a particular crop is pollinated and whether it is self-pollinated or cross-pollinated. Basically, in self-pollinated crops, the male (stamen) and female (stigma) parts of the flower are very close together in the same flower, and due to physiological factors, such as the timing of the release of the pollen in relation to the receptiveness of the stigma, the plant will be self-pollinated. The result is that varieties of these crops are often more homogenous, they are not likely to be pollinated by pollen from other plants of the same variety or even from other varieties of the same crop in the next field or hundreds of meters away. This also implies that seed production by farmers of these crops is easier and requires less isolation from other cultivars of the same species to ensure that the seed will be homogenous. Examples of self-pollinated crops are rice, wheat, beans and tomatoes.

Cross-pollinated crops are characterized by plants in which the self-pollination is prevented by either mechanical, biological or other obstructions. Sometimes there are separate male and female flowers. In other crops, the pollen is released before or after the stigma becomes receptive on that plant. In this case, wind and insects are often important for pollination. It also means that there can be considerable cross-pollination between among different fields of the same crop, even up to a distance of half a kilometer or more. Insects can even cross-pollinate crops at even greater distances. As a result, these crops have the potential to be more heterogeneous and require large isolation distances from other crops of the

same species to produce seed that is genetically homogenous. Through selection of plants for seed at harvest, farmers can maintain a degree of control over the next generation of seed. Examples of cross-pollinated crops are maize and cucumbers. Some crop species can have both types of pollination simultaneously; for example, millet and sorghum, which are mainly self-pollinated, have an out-crossing (cross-pollination) rate ranging of between 5–20 percent.

Hybrids are produced by the cross-pollination of unlike parents of the same crop. In very simple terms, parent plants are selected for certain traits and are self-pollinated for several generations to produce “inbred lines”. These inbred lines are then cross-pollinated to produce the F1 generation, which is known as a hybrid. Because the parents are genetically different, the F1 will have “hybrid vigour”, resulting in strong, vigorous plants and greater yield under good agronomic conditions. F1 plants are uniform. However, when an F1 plant is cross-pollinated with another F1 plant to produce an F2, it will not have the same characteristics as its parent plants; it will not have hybrid vigour, and in fact, it may grow very poorly and have poor low levels of vigour and yield. In addition, hybrids generally require higher levels of inputs, especially fertilizers, in order to have perform well in the field. Traditional farming practices often rely on farmers producing and saving seed for planting in the next season. Seeds produced from a hybrid seed should not be used as seed for the next season.

Open-pollinated varieties (OPVs) are varieties that have been generated from populations where all plants have had an equal chance of pollinating each other and themselves. The main characteristic of these varieties is that they maintain a high degree of stability for several generations. This means that seed of OPVs can be saved by farmers for use over the next following seasons and the characteristics of the varieties will remain stable. Seed production of OPVs mainly requires to respect isolation distances, but it does not require the use of sophisticated pollination control methodologies and is therefore much simpler than hybrid seed production. Seed of hybrid varieties is generally much more expensive than seed of OPVs.

Variety types

CHARACTERISTIC	OPEN POLLINATED	SELF-POLLINATED	HYBRIDS
Crop	Varieties or landraces of maize, sorghum, millet	Rice, groundnuts, wheat, beans, soybeans	Hybrid maize, some commercial vegetables
Production of high quality seed by farmers	Difficult: Needs isolation from pollen of other fields. Selection of best performing plants is possible but needs training on special seed production techniques (progeny test).	Easy: Minimum isolation necessary between fields. Easy to produce and to select best performing plants.	Difficult for farmers to produce since it requires isolation, inbred lines and controlled pollination.
Uniformity	Heterogeneous	Homogenous	Homogenous
Yield potential	Low	Medium	High

As information on crop varieties is gathered and seed security interventions proposed, consideration of the **variety types** needs to be included in order to assess the feasibility of the proposed action. For example, farmers can easily produce self-pollinated crop varieties but with hybrids they will have to buy the seed every year.

Seed quality attributes

An aspect of seed that is often overlooked is seed quality. Seed of low quality can have a negative effect on crop production and food security. The effectiveness of seed security interventions have sometimes been diminished by the provision of low quality seed to farmers. It is essential in seed security activities that vulnerable households receive the appropriate crop variety and good quality seed at the right time to improve their food security, rather than unknowingly contribute to food insecurity by providing poor quality seed.

There are three basic parameters for seed quality attributes:

- physical qualities of the seed;
- physiological qualities such as moisture content, germination, vigor, and varietal purity;
- seed health, which refers to the presence or absence of diseases and pests.

When seed has good physical, physiological, seed health attributes farmers have greater prospects of producing a healthy crop with improved yields. High quality seed is a major factor in obtaining a good crop stand and rapid plant development even under adverse conditions, although other factors such as rainfall, agronomic practices, soil fertility and pest control are also crucial.

Key questions in a Seed Security Assessment regarding seed quality are: Are vulnerable farmers experiencing seed quality problems with the seed they produce and save, or receive from other sources? Does the formal sector produce quality seed and what are the views of farmers regarding the quality of formal sector seed in comparison with their own saved seed or other informal sector seed? Are there opportunities to improve seed quality so farmer can increase their food security?

SEED QUALITY ATTRIBUTES – PHYSICAL

Physical qualities of the seed are characterized by having the following:

- **A minimum of damaged seed:** Damaged (broken, cracked or shriveled) seed may not germinate and is more likely to be attacked by insects or micro-organisms. It is possible to eliminate most of the damaged seed during seed processing either by the farmers or a seed company.
- **A minimal amount of weed seed or inert matter:** Good quality seed should be free of weed seeds (particularly noxious types), chaff, stones, dirt and seed of other crops. Almost all these impurities can be discarded during processing by the farmer or seed producer.
- **Near uniform seed size:** Mature medium and large seed will generally have higher germination and vigor than small and immature seed. In the conditioning (processing) of seed, undersized and light seeds are normally eliminated and this can also be done by farmers through winnowing or hand selecting of seed.

Physical quality parameters such as seed uniformity, extent of inert material content and discolored seed can be detected by visually examining seed samples. Closely examining handfuls of seed is the first step to better understanding the quality of seed provided to farmers; it gives the first but not the only opportunity to decide on seed cleaning needs.

There are many ways that farmers can improve the physical quality of the seed through winnowing, use of screens and hand selection of seed.

SEED QUALITY ATTRIBUTES – PHYSIOLOGICAL

- **High germination and vigor:** The germination percentage is an indicator of the seed's ability to emerge from the soil to produce a plant in the field under normal conditions. Seed vigor is its capacity to emerge from the soil and survive under potentially stressful field conditions. The loss of a seed's ability to germinate is the last step (not the first step) in a long process of deterioration (gradual loss of viability). Decrease in seed vigor and other physiological changes occur before loss of germination. Therefore, seed with acceptable germination can be low in vigor.

The importance of physiological quality cannot be overemphasized. Seed can only fulfil its biological role if it is viable. Therefore, physically uniform seed of an adapted variety will be useless if it is low in germination and vigor, or if it fails to germinate when planted. The difference between grain and seed is that the former may or may not germinate, while the latter must germinate. This is why germination, particularly a high percentage of it, is such an important technical specification for seed.

Legumes such as groundnuts, beans or cowpeas are prone to rapid deterioration in germination and vigor during storage. Proper drying and storage conduction can help minimize deterioration in germination.

SEED QUALITY ATTRIBUTES – SEED HEALTH

Seed health refers to the presence or absence of disease-causing organisms, such as fungi, bacteria and viruses, as well as animal pests, including nematodes and insects. Ensuring seed health is important because the diseases initially present in the seed may give rise to progressive disease development in the field and reduce the commercial value of the crop and diseased seed may introduce and spread diseases or pest into new regions. Seed health issues are particularly important for the vegetatively propagated planting materials because it is much easier for diseases to be spread through live planting material.

- Discolored or stained seed are symptoms of seed that may carry micro-organisms that have already attacked the seed or will attack it when it starts to grow. The plant may live and spread the disease to other plants.
- Seed health testing can be carried out in seed laboratories in order to assess seed sanitary quality.

The best way to avoid seed contamination by pests and diseases is to use proper seed production practices, i.e. to control pests and diseases during the seed production process. However, if a seed becomes infested with insects, then it can be fumigated. Some seed-borne diseases can be controlled or suppressed by the seed treatment during seed processing or just prior to planting. The use of seed treatment products is highly regulated at national and international levels and must be managed carefully. Special precautions need to be taken when treated seed is distributed to farmers.

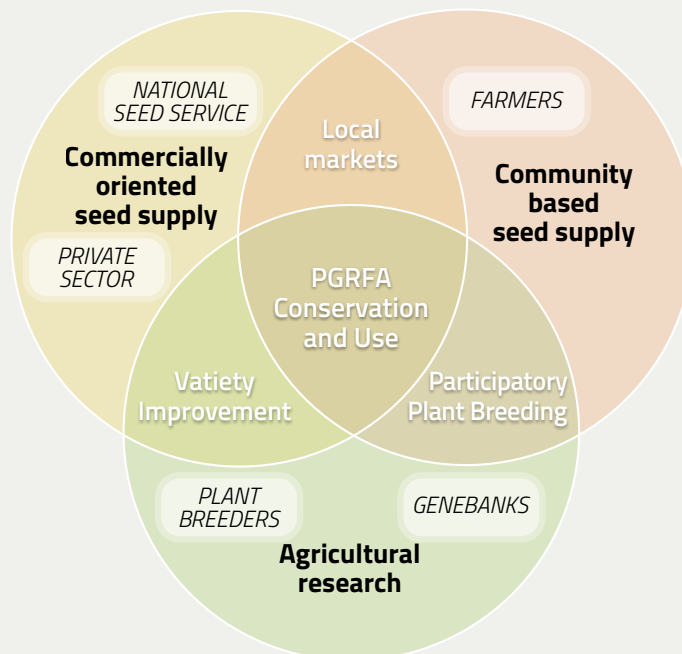
The significance of seed quality makes it an essential element of seed security. It is necessary to understand if there are seed quality issues that are negatively affecting the seed security of vulnerable farmers and how the seed quality issues can be addressed.

What is the National Seed system?⁸

A seed security assessment includes the national seed system because this is the overall national context for seed security and interventions to improve seed security of vulnerable populations. National seed systems vary greatly among countries: some countries have strong formal seed systems with well-developed agricultural research, national seed service and local seed enterprises; others have weak formal seed systems with the informal seed system providing most of the seed used by farmers. Documenting the national seed system is an essential element in conducting a seed security assessment.

Key questions related to the national seed system are: What are the different components of the national seed system, their respective roles and relative importance? What are the source of seed of both traditional and improved varieties? How can seed sources of farmer preferred crops and varieties be improved for vulnerable households?

Figure 10:
The national seed
system



8 Seed In Emergencies: A technical handbook (FAO, 2010)

The national seed system can be conceptualized as three intersecting circles representing its main components: agricultural research as the source of improved varieties, the commercially-oriented seed supply (formal seed sector) for the production of certified seed by the government and seed enterprises and the community-based seed supply (informal sector) where farmers and communities produce, save and exchange seed.

Commercially-oriented seed supply (formal seed system): in Figure 10 above, the intersection of the upper left circle and the lower circle ("**Variety Improvement**") represents the plant breeders in the private sector and/or in public research institutes or international institutions developing new crop varieties with desired characteristics, such as high yield, tolerance to pests and diseases, appropriate organoleptic (taste and cooking) characteristics for personal consumption and sale in the market. **Variety improvement** is essentially the output of agricultural research to the national seed system. After rigorous testing, the best new varieties are released through a national variety release system. The early generations of these released varieties are then multiplied by government seed services or the private sector with appropriate quality control by the **national seed service and or private seed sector** (in the upper left circle).

Later generations of the released varieties are multiplied by the seed enterprises under a quality assurance programme to become certified seed (in the formal sector seed or FSS) that meets specific quality standards. The seed is sold as certified seed to farmers through agriculture input supply stores, seed traders, government programmes, NGOs and in **local markets** (intersection of the commercial sector and farmer sector, top centre of Figure 10). Local market refers to all types of market linkages between producer and consumer/user. Therefore, it is in the local market where commercial seed and the farmer-produced seed may be present and this is local market seed (LoMS). In some countries, commercial seed is only available in input supply stores in the capital and major towns. In more remote regions, the only seed available may be from weekly markets or from small traders. In local markets there may not be a clear distinction between food grain and seed for planting.

Community-based seed supply sector (informal/farmer seed system): this refers to the upper right circle in the figure, in which farmers use traditional methods to produce, process, store and exchange seed through social networks and save their own seeds for the following planting season. For most farmers, this is their primary source of seeds, also called own saved seed (OSS). In the farmer seed system, farmers have various sources besides what they produce and include social networks, local markets, seed enterprises, government, and NGOs. Farmers value their seed, which has been passed down through generations. This system includes the selection of plants at harvest time or during storage. Selected grain to be used as seed is often stored separately from other food-grain and cleaned before planting. Seeds that farmers plant are usually from varieties that are well adapted to their agro-ecological zones and have the desired characteristics for consumption and/or sale as seed or food-grain. However, the increasing incidence of drought, flood, pest and disease attack means that farmers often seek new varieties to address these problems.

Conservation and use of Plant Genetic Resources for Food and Agriculture (PGRFA) (intersection of all three circles in the centre of the figure) refers to the commercial sector, agricultural research and the farmer, and the means by which local landraces are conserved in gene banks and by farmers in their fields, and are used for developing new crop varieties. The local landraces can be the basis for development of new varieties through crossing them with

exotic germplasm. Farm families plant a diversity of crops and often several different varieties of each crop in a wide range of agro-ecologies. Farmer seed production systems are often specific to each crop. Farmer seed systems also include the introduction of new materials that come from social networks, communities, markets, seed companies, extension workers and NGOs. Therefore, **PGRFA conservation and use** is extremely important for vulnerable farmers as well as the commercial sector. PGRFA include both the local and introduced crop diversity that are so important to a country's agriculture sector.

When farmers are involved in variety development by providing feedback on new varieties to plant breeders, this is referred to as **participatory plant breeding (PPB)** (intersection of the lower circle and upper right circle). In PPB, improved varieties developed by agricultural research are tested both in research plots and on farmers' fields at an early stage in the process of selecting new varieties.

Relationship of the formal (commercially oriented) and informal (community based) seed systems

The roles of the commercially-oriented seed supply and the community-based seed supply can vary by crop, region of the country, importance of the crop for food and for cash, as well as other factors. For example, in many countries in eastern and southern Africa, there is a commercially-oriented seed supply for important cash crops such as maize. However, for other important food crops such as sorghum, millet or beans the commercial seed sector in the same countries may not be well developed. The **commercially-oriented seed supply component** of the national seed system operates with the seed policy and national seed legislation, and phytosanitary regulations of the government.

In developing countries, the formal seed system (commercially-oriented seed supply sector) may not reach the small-scale farmers, and new, improved varieties are often not adapted to their needs owing to low input production practices and diverse agro-ecologies. In addition, these varieties are often more vulnerable to drought or environmental stresses and do not meet organoleptic requirements. Until new improved varieties of certified seeds are demonstrated in small-scale farmers' fields, it cannot be assumed that they are adapted to farmers' needs. However, improved varieties that have undergone testing by small-scale farmers can prove to be a welcome addition to their diverse crops and varieties.

CHARACTERISTIC	FORMAL SECTOR SEED CERTIFIED OR TRUTH IN LABEL SEED	INFORMAL SECTOR SEED OR FARMERS SEED SECTOR
Origins of crop variety	Public research institutes or private breeding, National or Foreign.	Traditional Landraces. Varieties from formal seed sector multiplied with no genealogy or varietal purity control (attention to multiplication of F1 hybrids)
Source of Seed	Input dealers/seed sellers often not in local markets. Emergency interventions with direct distribution of seed.	Farmers, Social networks, local markets
Seed Quality	Seed lot has passed a Quality control system. However it depends on the reliability of the system and/or the storage conditions	Variable, depends on seed production and saving practices
Cost of Seed	High cost	Low cost, barter or gift

In the context of a seed security assessment it is important to analyze both the formal and informal seed sectors in order to understand their current status and their roles in providing seed for vulnerable farmers in the affected area. The impact of the crisis on the seed systems and the availability of seed for farmers need to be understood. For example when there is a crisis farmer/community-based seed systems can be impacted and vulnerable farmers turn to other sources of seed such as social networks, local markets, NGOs, seed traders and the government to replace their seed stocks. It is the changing seed supply situation and the means of the vulnerable households to obtain the seed that must be examined in a seed security assessment in order to determine the best strategy to address the seed insecurity in a way that will strengthen and not weaken the seed system.

ANNEX 4: LINKING DISASTER TYPE TO SPECIFIC SEED SECURITY PROBLEMS: INSIGHTS FROM AFRICA

DISASTER OR OTHER STRESS	FEATURES WITH THE POTENTIAL TO UNDERMINE SEED SECURITY	SEED SECURITY CONSTRAINTS MOST OFTEN UNCOVERED	INSIGHTS FROM FIELD EXPERIENCE
Drought	<ul style="list-style-type: none"> Harvest may be lower than usual but only in rare cases will there be a total failure. Seed sharing may decrease due to seed scarcity. There may be asset losses due to reduced harvest 	Access problem: some depletion of farmer assets.	Droughts are by far the most common trigger justifying DSD, particularly in southern Africa. However, evidence from the field shows that even with sharp declines in harvests, enough seed for planting is usually available from both home production and markets. This is typical of drought-prone areas where small-seeded crops such as sorghum or pearl millet predominate.
Plant disease	<ul style="list-style-type: none"> Harvest may be reduced or a total failure. Local crops and varieties may not be adapted to the disease. Local seed production channels may not be able to immediately provide adapted varieties. Seed sharing may decrease due to seed scarcity. There may be asset losses due to low or no harvest. 	Varietal suitability problem: Varieties no longer adapted to local conditions.	<p>The challenge with plant disease is to identify something that will grow under changed production conditions (in contrast to drought, where production conditions are stable). Also, finding enough resistant material may demand widespread seed multiplication efforts.</p> <p>Example: parts of eastern and central Africa have been confronting crises and related seed-quality problems since the late 1990s with waves of CMD in cassava and a build-up of root rots in bean crops.</p>
Plant pest	<ul style="list-style-type: none"> There may be total crop failure, even across crops. Seed sharing may decrease due to seed scarcity. There may be asset losses due to low or no harvest 	Varietal suitability: Variety no longer adapted to local conditions	<p>Seed security issues will vary by type of pest and extent of pest damage. Locust damage, which is not crop-specific, may be extreme, affecting various crops, and even trees, bushes, and grass (possibly affecting livestock forage supplies). Locust, however, do not have lingering effects. They strike, destroy, and then disappear.</p> <p>Example: West Africa, for instance, has had waves of locusts: Northern Mali, attacked in 2004, resumed relatively normal crop production by 2005 (although it suffered droughts in between).</p>
Flood	<ul style="list-style-type: none"> Local seed production channels may not be functioning. Social relations generally remain the same but could change if families end up in camps for internally displaced persons (IDPs). Markets, roads, and other infrastructure could be significantly disturbed. There may be significant losses of assets (seed, livestock, and houses). 	<p>Availability problem likely; also, the required conditions for planting (arable fields) may not be in place.</p> <p>Prime problem might be extensive asset loss.</p>	<p>2000, moving seed from one agro-ecological zone to another. That response puts the focus on 'access' constraints.</p> <p>Depending on the source of the flood water, soil issues (i.e. leaching, erosion) may need to be addressed before planting.</p>

DISASTER OR OTHER STRESS	FEATURES WITH THE POTENTIAL TO UNDERMINE SEED SECURITY	SEEDSECURITY CONSTRAINTS MOST OFTEN UNCOVERED	INSIGHTS FROM FIELD EXPERIENCE
War (quick onset, short and intense, staggered over zones)	<ul style="list-style-type: none"> ▪ Harvest are lower than usual, but only rarely a total failure. ▪ Perhaps no forced population displacement, although massive fleeing by some portions of the population. ▪ Seed sharing may decrease due to ruptured social relations and seed scarcity. ▪ Local seed production channels may (or may not) be functioning. ▪ Security might be compromised, restricting agricultural work or use of public resources such as markets. ▪ Assets losses due to small or no harvest (as when fields are abandoned). 	<p>Depends on nature of war:</p> <p>Could be problems of availability and access, or neither.</p> <p>Issues of protection could be key. Does one provide inputs to households if this might put them in danger?</p>	<p>Seed security problems encountered greatly depend on the specifics of conflict (onset, duration, extent, intensity).</p> <p>Example: before war and genocide in Rwanda in the 1990s, many farmers had come to rely on formal sector channels for clean potato seed and new varieties. These arrangements broke down early in the conflict as government services retrenched and development projects pulled out. In contrast, local markets, the main source of beans, continued to diffuse bean seed during some of the worst events. So while potato production virtually collapsed, relying as it did on the formal sector, bean seed channels, which were based on local farmers' systems, continued on course for the most part.</p> <p>In the case of potatoes, there was a seed availability problem. For bean seed, the constraint was solely access.</p> <p>Note also the ruptures in social networks of 'seed sharing' were not a key factor. This is because the giving of seed was not part of Rwandan farm culture even before the crisis.</p>
War (Chronic conflict)	<ul style="list-style-type: none"> ▪ Asset loss is likely to be severe. 	<p>Depends on nature of war:</p> <p>Could be problems of availability and access, or neither.</p> <p>Quality, particularly variety quality, could be a problem should population move to new agro-ecological zones.</p> <p>Issues of protection could be key. Does one provide inputs to households if this might put them in danger?</p>	<p>It is difficult to generalize about longer-term conflict.</p> <p>A 'war' is rarely homogeneous, with conditions often in flux.</p> <p>Example: Darfur in 2008 is a good example. There are areas that move into and out of use over time, and different issues must be addressed in different places.</p>

Sources: Sperling (2008)



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