Building capacity for seed security assessments

Household seed security concepts and indicators

DISCUSSION PAPER

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Introduction

The Seed Security Conceptual Framework (SSCF) was inspired by the USAID Food Security Conceptual Framework. When it first appeared in 1998, it provided an improved basis for assessing and analysing seed security and developing appropriate actions to be taken. The original SSCF was comprised of three components: seed availability, seed access and seed quality. The purpose of this document is to describe a revised SSCF which grew out of initial discussions in an expert gathering in Addis Ababa in December 2013[1], and was further developed in the context of an ECHO funded project entitled *Building capacity for better food and nutrition security programming in emergency and rehabilitation contexts through improved seed system assessment, enhanced integration of nutrition and strengthened accountability to affected populations.*

Definitions

Definition of household 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 substitution "household" with "men and women" as follows:

- 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.

Explanation and disaggregation of the definitions

Each of these definitions contains five elements which are critical to ensuring seed security:

- seed availability (seed supply at the right time and place);
- seed access (means to acquire);
- seed quality (germination, physical purity, free from pests and diseases);
- varietal suitability (adapted crop varieties farmers prefer and need);
- stability of seed system in the context of shocks and stresses (resilience).

These elements are in fact derived from the food security conceptual framework which has five elements or pillars:

- food availability;
- food access;
- food quality;
- food preferences;
- stability of food security in the context of shocks and stresses.

[1] FAO Expert Consultation on Seed System Security, 12-13 December 2013.

There is a direct relationship from these five pillars to seed security as shown in the following table:

Food security	Seed security
Food availability	Seed availability
Food access	Seed access
Food quality	Seed quality
Food preferences	Varietal suitability
Stability of food security in the context of shocks and stresses (resilience).	Stability of seed security in the context of shocks and stresses (resilience)

As with food insecurity, there are a number of different types of seed insecurity: lack of availability; lack of access; poor seed quality; lack of access to preferred and adapted varieties; lack of stability in seed security (low resilience to seed shocks and stresses). Seed insecurity exists when any of these aspects are present even if all other aspects are not. Knowing which particular aspect(s) of seed insecurity is / are present is critical for designing appropriate interventions.

Measuring household seed insecurity

A key difference between the definition of food security and seed security is that the food security definition lends itself more easily to quantification. Food insecurity is commonly measured by internationally recognized parameters, making it fairly straightforward to distinguish a food secure from a food insecure household. One commonly used indicator of food security is daily kilocalorie intake. A per capita kcal intake of less than 2100 per day is generally seen as being an indicator of food insecurity.

In contrast, there is no internationally recognized measurable indicator of seed insecurity. In the definition of seed insecurity given above, how does one distinguish between a seed insecure and a seed secure household? The key word in the definition is "sufficient". But what does sufficient actually mean? Previous attempts at quantification have included:

- a household is seed secure when seed is of sufficient quantity and quality to produce enough kilocalories to feed the family until the next harvest;
- a household is seed secure when it is able to plant the same area with good quality seed of preferred varieties at locally practiced seeding rates as it usually does.

Such definitions are fraught with difficulties. The first assumes that households are autarchic – i.e. completely self-sufficient from own production with no need to trade. The second assumes that "usual" or "normal" is enough. But this may not be the case, especially in a situation of chronic crisis, where "usual" is seed insecurity and associated gradual asset depletion leading to eventual destitution. Despite these caveats, for practical purposes the second definition may be used in most situations where seed insecurity is not a chronic problem. In those cases where it is, a further normative element may be introduced into the definition as follows:

- a household is seed secure when it is able to plant the desired area with good quality seed of preferred and adapted varieties using locally practiced seeding rates and without resorting to negative coping strategies[2].

[2] An example of a negative coping strategy would be repeated sale of productive assets to acquire seed at high cost. Whilst this could protect seed security in the short run, in the longer run it reduces the ability of the household to generate income required to access needed seed.

The importance of household seed insecurity

Whilst it is difficult to define, what is clear is that "sufficient" varies according to circumstances. Of particular relevance here is the livelihood portfolio of the household. A livelihood is comprised of all those ways and means by which the household accesses the food and income which enables it to survive. Some households depend a great deal on crops for access to food and income year on year, whereas others depend on crops far less. As such, for the first household seed will be much more important than it is for the second. It is possible, that a household which does not depend upon seed very much to meet food and income needs, may nonetheless be seed insecure if is unable to access sufficient quantities of good quality and preferred seed to meet household needs all other things being constant. It is unlikely however that such a household would be the subject of serious study due to the fact that crop production and therefore seed per se was a small aspect of livelihood, and therefore the impact of seed insecurity was relatively minor and in all probability is substituted for by other livelihood strategies.

The question then arises, is it possible to set a threshold of some kind whereby access to good quality seed of preferred crop varieties becomes an important / significant part of the overall livelihood strategy and as such seed (in) security becomes an important consideration for assessment and decisions on interventions? Any attempt to set a threshold will be difficult because there will always be exceptions to a general rule. Notwithstanding this caveat, for practical purposes some kind of threshold would seem to be important. Therefore on this basis the following rule of thumb thresholds are proposed:

Self-reported importance of seed in livelihood[3]	Relevance of seed security to food security
Greater than 75%	Extremely relevant
50 – 75%	Highly relevant
25 – 50%	Somewhat relevant
Below 25%	Not very relevant

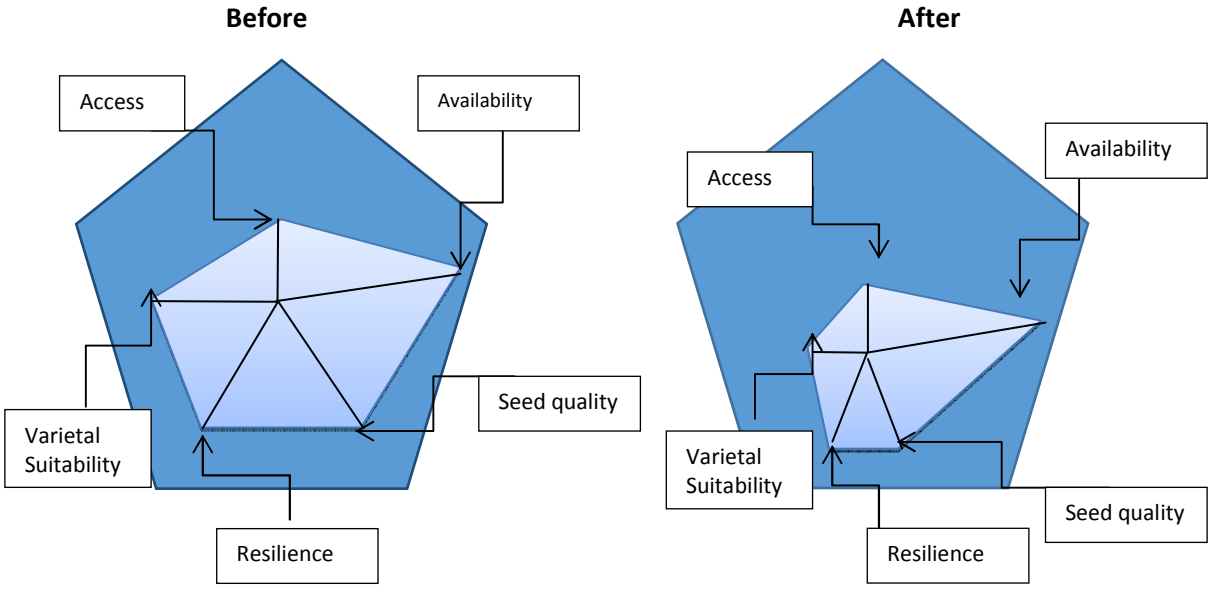
These thresholds can be estimated in a particular case by proper structuring of questions in a household questionnaire.

<u>The seed security pentagon</u>

The seed security pentagon is a way of conceptualizing and visualizing seed security at the household level. The distance from the centre of the pentagon to each of the five points represents one of the elements of seed security. Changes in the size and shape of the pentagon indicate changes in the extent of seed security / insecurity (see figure 1).

[3] In practice, this could be established by asking a question such as "On a scale of 1 to 10 how important is crop production for the food security of your household?"

Figure 1: Seed security pentagon before and after a severe localized drought



In the diagram, the dark blue pentagons both before and after a drought represent a theoretical maximum for each of the elements of seed security. These pentagons are regular in shape – i.e. each side has the same length. The light pentagon on the left represents the level of seed security of a particular household / group of households before a drought. Focusing on the left hand side of the diagram, when comparing the light blue with the dark blue pentagon, two things are immediately apparent: first, the overall area of the light blue pentagon is smaller than the dark blue one. This signifies that even before a drought the level of seed security is sub-optimal. Secondly, the sides of the light blue pentagon are not of equal length. If they were of equal length then all elements of seed security would be equal – i.e. the farmer would be equally seed (in)secure across the five elements. In this case we can see that there is seed insecurity in terms of availability is least pronounced, whereas in relation to seed access it is most pronounced. Turning to the right hand side of the diagram, we see the impact of the drought on overall seed (in)security, as well as the effect in terms of particular elements. Comparing the total area of the two light blue pentagons, we see that the one on the right is significantly smaller, showing that the drought has had a significant negative impact on overall seed security. In addition, it is clear that whilst all elements have been negatively affected, seed availability is still, relatively, less affected than the other elements. On the other hand, seed access and varietal suitability appear to have been severely reduced. The patterns shown in the diagram would be consistent with a severe but fairly localized drought in an area with reasonably good market access. In such a case, the shock could wipe out crops and reduce income sources in a relatively small area, whilst not having such an impact on the overall availability of seed in the market place. In such situations, interventions designed to increase seed access and varietal suitability would be preferred over those designed to increase availability of seed.

In order to construct such pentagons in practice, it is important to understand the meaning of the different parameters of household seed security and how these may be measured at field level[4].

[4] A detailed illustration/explanation of how to construct seed security pentagons from field data is outside the scope of this conceptual paper. It will be addressed in a subsequent paper which focuses on the subject.

Pillars of household seed security

Availability of seed

For the purposes of analysing seed security at the household and intra-household level, seed availability refers to the farmer's supply of seed 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, the formal seed sector and from seed aid suppliers 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.

Examples

- There is a complex emergency of civil conflict over a wide area and drought that has disrupted usual farm-saved seed supply and operation of local markets so that seed is not available within a reasonable distance to vulnerable populations. This could be a problem of seed availability for crops with a high seed rate such as direct seeded rice and groundnut.

- A vulnerable household has limited own-saved seed for planting due to a flood and their social networks have also lost their seed but there is enough seed of preferred varieties and crops available in the local markets. There is not a problem of seed availability.

Indicators for seed availability at household and intra-household level would include:

- quantity of own saved seed stored at the household;
- quantity of seed known to exist within social networks;
- quantity of grain of preferred varieties and crops available in local markets at planting time which farmers could use as seed;
- quantity of seed available with seed companies and local seed stockists at planting time;
- quantity of seed available through seed aid organisations at planting time;
- prices of seed in local markets, seed companies and local seed stockists;
- proximity of seed sources in relation to the household – e.g. distance to local markets, local seed stockists.

Access to seed

Access to seed is defined as the ability to acquire seed through exchange, loan, barter or use of power in social networks. Thus 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 labour, 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 through the market place in exchange for cash, in local markets or in seed distributors (formal sector).

Examples

- 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 access has been compensated for by social access).

- 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 physical, social and economic access.

- 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.

- 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.

- 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 smaller farmers in these same communities report poor harvest and they predict a challenge to acquire rice seed for the next season. These smaller 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 then an access problem.

Indicators for seed access at household level would include:

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

Varietal suitability

This aspect of seed security refers to the ability of farmers to access seed of crop varieties which have the characteristics that they prefer. There are a range of desirable characteristics which may differ between men and women within the household. The most commonly cited desirable characteristics include: appearance, taste, aroma, storability, ability to produce fodder, high income potential, high production potential, disease and pest resistance in the field.

Households require seed of crop varieties that they know, have a preference for and are confident to plant. In some cases farmers can identify the seed of the varieties they use. This is also why farmers need to trust the seed seller since varieties cannot always be identified by looking at the seed. Also farmers are sometimes hesitant to plant seed that they are given since it is a big risk if the variety is wrong or the seed quality is poor. However, it may also be the case that the varieties farmers are using are no longer adapted to shorter growing seasons or to pest or disease. This would mean they need access to new varieties they do not currently have

Examples

- 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 appreciate are in short supply - they cannot plant them in the same quantity as in the past and as per their desire. This is a varietal suitability problem.

- 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. This is a varietal suitability problem.

Indicators for varietal preference / suitability would include:

- level of farmer satisfaction with the crop and varieties they are currently growing or desire to grow;
- specifically desired characteristics which are/ are not present in the varieties which they are currently growing;
- number and types of problems related to current varieties (duration, pest, disease, yield);
- farmer access to accurate and useful information about varieties they are being provided.

Seed quality

Seed quality is a technical parameter that includes a number of seed attributes such as germination, physical purity, seed health, and – for some crops – varietal purity. Though it is a quantitative parameter the perception of the farmer depends on the crop and what they consider normal or acceptable. Some of these seed attributes are apparent when you examine the seed and others are not. Seed quality attributes are an essential parameter of seed security because of their potentially 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.

Germination: Germination is the ability of the seed to produce a normal seedling under favourable conditions. 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 is adversely affected by seed stored under the conditions of high temperature and humidity that result in the rapid deterioration of legumes and vegetable seed but normally rice, wheat, millet, sorghum and maize are less affected. Maintaining low seed moisture content is essential for maintaining high seed germination.

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 alive 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 or insects that will later attack the plant or be transmitted to other plants. Therefore it is important that seed is free of pests and diseases. Seed health may not be determined by looking at the seed and requires seed health testing or growing the seed to the seeding 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.

Examples

- 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% and reducing the germination and vigour 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).

- 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 seeds 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.

- 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 improved the overall physical purity of the seed that may increase germination and vigour of the seed. In this way, potential seed quality problems (varietal and physical purity) can be reduced.

- Small 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.

Seed quality indicators[5]

- Proportion of diseased seeds from different seed channels (on-farm; local market; social network)
- Rate of germination of seeds from different seed channels: provided by farmers; local market; social network
- Mean % physical purity of seeds from different seed channels: provided by farmers; local market; social network

[5] Note: All of the following indicators can be measured by asking for perceptions of farmers /traders .and/or by physical inspection / testing.

- Mean % varietal purity (when a pure variety has specific advantages) of seeds from different seed channels: provided by farmers; local market; social network

Resilience of the seed system

Resilience is the degree to which the household's seed system can resist, adapt to and recover from shocks and stresses which threaten the integrity of household seed security. A resilient seed system is one in which the farmer has adequate access to sufficient quantities of adapted and preferred seed "at all times in both good and bad cropping seasons" (see definition of seed security above. Thus 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).

<u>Indicators</u>

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 indictors 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 diversity (risk spreading);
- different abilities to switch between seed source channels – linked to: amounts of stored seed, degree of social access, proximity to local markets;
- 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 recognised as a bona fide source of seed or not in the existing policy frameworks).