

SEED SYSTEM SECURITY ASSESSMENT
KASAI ORIENTAL
DEMOCRATIC REPUBLIC OF CONGO

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CORE RESEARCH TEAM

Catholic Relief Services

Louise Sperling
Jean Nyemba
Jean-Paul Cigulube
Salvatore Nkurunziza

CARITAS

Degaul Koleela
Omer Llunga
Crispin Kasongo
Jean-Pierre Tshiana

Government of the DRC+

DPS: Division Provinciale de la Sante/
Provincial Department of Health
ITE: Inspection Territoriale de l'Environnement/
Territorial Inspection of Environment

Mpoyi Mbaya
Benoit Kazadi Kalenga
Mpoyi Kayembe

INERA

Joachim Kaboko
Robert Mukendi

REFED

Marcel Muteba
Christine Nyamabo
Lex Mwanza Nkash

SENASEM

Dieu-Beni Ngandu

Other

Independent Consultant
Reseau Burundi 2000 Plus

Christian Man
Longin Nzeyimana

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The insights of many people shaped this work for the field assessment itself: men and women farmers, government ministry personnel, crop and livelihood specialists, local seed producers, agro-dealers, traders, agro-enterprise specialists, humanitarian relief personnel, and others. Thanks to all for helping to sharpen the results.

Finally, we do aim for this assessment to lead to practical action in the short and medium-term. The positive opportunities for seed system, marketing and livelihood support in Kasai Oriental need to be seized upon soon and with vigor.

Acronymns

APSKO	Association of Seed Producers in Kasai Oriental/(Association des Producteurs de Semence du Kasai Oriental)
CBSP	Community-based seed production
COPROSEM	Cooperative of Seed Producers of the Kasai
CRS	Catholic Relief Services
DFAP	Development Food Aid Program
DRC/RDC	Democratic Republic of Congo/ République Démocratique du Congo
DSD	Direct Seed Distribution
FC	Congolese Franc (currency unit) *
FOs/OPs	Farmer Organizations/ Organisations paysannes
HH	Household
HNI	Human Network International
IDP	Internally Displaced Persons
INERA	Institut National pour l'Étude de la Recherche Agronomique National Institute for Agronomic Study and Research
FAO	Food and Agriculture Organization (also UN-FAO)
g	grams
Kg	Kilos
LM	Linear meter (ML metre linéaire) (unit for cassava planting material)
MT	Metric Tons
OPV	Open Pollinated Variety
NCBA-CLUSA	
NGO	Non-governmental organization
PICS	Purdue Improved Crop Storage
REFED	Réseaux Femmes et Développement
SENASEM	Le Service Nationale des Semences: National Seed Service
SSSA	Seed System Security Assessment
USAID/FFP	United States Agency for International Development/ Office of Food for Peace

* \$US 1 equaled about 1410 FC at the time of assessment.

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Comments and updates are welcome by the SSSA team. Please contact the assessment coordinators at louise.sperling@crs.org, james.guarshie@crs.org; jean.nyemba@crs.org

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EXECUTIVE SUMMARY

This report presents the results of a Seed System Security Assessment (SSSA) in the province of Kasai-Oriental within the Democratic Republic of the Congo. The assessment took place in May 2017 and was focused in two sites, Miabi and Tshilundu.

The SSSA was conducted in Kasai Oriental for three main reasons:

1. The region has become the focus of a new Development and Food Aid Program (DFAP) awarded by the US Agency for International Development / Office of Food for Peace. The SSSA is to serve as a baseline for a range of agricultural programming activities by key DFAP partners including Catholic Relief Services (CRS), Government of DRC, Caritas, Réseaux Femmes et Développement (REFED), Human Network International (HNI), Tufts University, NCBA-CLUSA.
2. Seed systems have been seen as a critical entry point for increasing agricultural productivity. CRS' central and eastern Africa programs and its partners have long been interested in seed systems and have been involved in a range of programs supporting: processes of seed selection and varietal development, seed multiplication and delivery, and improved storage methods. CRS firmly believes that empowering businesses and local communities to create and sustain functional seed systems can directly lead to varied goals, increasing food security and household income; and strengthening household nutrition and farming system resilience. Key is focusing on both creating supply and stimulating demand.
3. The work also took place to build assessment capacity. Seed security assessment tools are linked to food security assessments, but are also quite distinct. For example, an assessment of a production shortfall, which often leads to food gaps, in most cases does not lead to a seed shortfall. The SSSA in Kasai-Oriental was designed to give honed technical insight and to train professionals in fast-evolving seed security assessment (SSSA) methods and tools. (for specifics on methodology, including precise tools SeedSystem.org).

This report presents findings across the Kasai Oriental sites.

Select SSSA results are reported below in two sections: a) Acute seed security findings, and b) Chronic seed security findings and opportunities. Recommendations then follow.

Acute Seed Security Findings

Diverse indicators suggest the seed security of Kasai Oriental farmers in the short-term is stable. (note that the analyses compared 'like seasons'. B with B and A with A.)

From the farmer point of view, 2017 B and 2017/8 A

1. For the 2017 B season (March to June), farmers sowed more than normal in (+9.7%) in terms of overall quantities planted. Crop yields were rated to be generally good or average in 72% of cases.

2. Farmers relied on local channels to access 99%+ of their seed during the 2017 B season. Local markets were the crucial core for ensuring seed security, supplying 54% of total seed sown especially for crops such as maize and legumes. 'Friends and kin' as a source were important especially for the vegetatively-propagated crops (cassava and sweet potato) , which has key implications for how these cuttings might move more widely and quickly.
3. For the 2017B season, seed from formal seed sources, such as agro-dealers, government/NGO aid, or even seed from community-based groups, was virtually non-existent. (Farmers in Kasai Oriental seem to have limited options for sourcing seed.)
4. Farmer projections for the 2017/8 main season show an unusual increase in the amounts to be sown across crops, overall +43%. (so, jumping from +9.7 % to + 43%. one season to the next) . While this upward trend might seem positive, the reasons for this strategy suggest a more nuanced picture (point# 7) (e.g. need to sow higher rates to combat low levels of soils fertility).
5. The overall upward trend in sowing rates should not obscure that there may be still vulnerable populations within the SSSA sample. Farmers were/will be planting less in 18% and 4% of crop cases respectively the for 2017 B and 2017/8 A seasons. (This is a relatively low % as experience from elsewhere shows that farmers routinely change sowing rate and crops profiles and often from season to season. So some up and down movement can be expected.)
6. The rationale for using less seed (a general proxy for decreasing land area) is key. During the two seasons reviewed, farmers gave three main reasons for sowing less: Lack of money to buy seed, ill health and land constraints. Important is that virtually no farmers (2.3% for season B and 0% for season A) indicated they were planting less due to unavailability of seed or cuttings. This means that giving free seed- when farmers are planting less—would not have addressed their constraints.
7. Understanding farmers' rationale for expanding seed use (a general proxy for expanding land area) is also central for planning how to spur production. Households did or will plant more mainly because: they had a good harvest prior and seed was more readily available; they were giving more priority to agriculture or, and especially as they got more access to land. All of these are positive reasons. However, a large group of farmers planting more seed because they hoped to compensate for poor sowing conditions and particularly low soil fertility (recorded under 'other'). In Kasai, 'sowing more seed' is a sign of mixed trends—negative as well as positive.

So overall, from the farmer viewpoint, there seems to be no acute stress- simply restricted seed sources and ongoing problems with ill health, land access and especially low soil fertility—all shaping seed use.

On the supply side, 2017/8 A

Given farmers' dependence on the local markets for large proportions of their stock, important questions for seed security in the 2017/8 season revolve around markets. Can they supply enough seed and acceptable seed? Subsequently, can farmers then afford the seed on offer?

7. Seed availability. Several sources of information show that seed availability will not be a problem in the zones of assessment for the 2017/8 season.
- Seed flow mapping demonstrates that there are multiple sources of seed/grain for all the major crops from the south, east and western adjacent areas (see precise seed flow maps). All normal supply routes remained open at the time of the SSSA. That said, traders expressed some concern about future supplies continuing from the west, Kasai Central, should the unrest continue.
 - Farmers assessed that 2017 B had been an average or good season in 72% of cases (across crops). These production gains translate as more seed available for the upcoming season.
 - The very large traders in Mbuji Mayi assessed that seed stocks for maize, the key crop, would be at normal or above normal quantities. (Sample sizes for other crops were too small, one or two traders- but no critical constraints were signalled. none)
8. Seed quality. Will the quality on offer be acceptable? While the SSSA team did not conduct objective seed quality assessments, the team did gather farmer and trader qualitative insights. There was no evidence that the current quality of seed and other planting material, across crops, was different from the norm, or was particularly 'bad'. The opposite, the quality was deemed quite good.
- From the farmer point of view, the quality of seed sown 2017 B was generally good (78% of cases) or average (14% of cases), with seed specifically sourced from the market assessed as 'good' and 'average' in 73% and 14% of cases, respectively. Hence, there was no real difference in farmers' assessment of seed quality from all sources versus seed specifically sourced from the local markets). The two crops where there were some seed quality issues, maize and cowpea, are those with high storage-linked losses
 - The SSSA team visited two market centers and reviewed stocks of a range of crops that are used for seed, especially maize and legumes (common bean, cowpea, green gram, Bambara). Stocks were generally well-sorted, by variety, and free of any inert material (stones, sand, sticks, debris). Grains did not show significant visible damage (e.g. bruchid damage or breaking).
9. Seed price/access issues. While money is often the constraint in seed use for smallholder farmers, this constraint was not marked in this Kasai Oriental assessment. Average expenses for seed purchase seem unusually modest: \$ 3 and \$7 for the two seasons respectively, for the two major crops, maize and cowpea, and \$ 15 and \$21 respectively (season A and B) for those farmers who also plant groundnut. The SSSA team sensed these affordable for the large majority of farmers. Further, large traders indicated that maize prices were decreasing, down 13% comparing from 2017B from previous.

In sum, for the analysis of market seed, quantities seem to be available across a range of crops (that can be sourced from multiple sites), needed cash outlays for farmers are modest, the price of the key maize crop decreased this season, and the quality on offer was acceptable to farmers.

Community summary

How did communities themselves assess the potential of their members to achieve seed security (that is, having seed in stock or being able to access it elsewhere?) For Miabi, the community itself suggested it is 100% seed secure. For Bakua Lukanda, the community assessment was largely 100% seed secure with a single issue being raised around maize. Clearly, the communities themselves did not see the upcoming season as being a highly stressed one.

Overall, in the short-term, for season B 2017 and upcoming season A 2017/18. The seed security situation is stable: farmers are sourcing from their normal sources, they are increasing sowing rates, acceptable seed is available from the markets and at 'affordable costs'. That said, 'normal' in Kasai Oriental shows signs of extreme and constant stress: farmers are routinely buying large quantities of seed from the locale markets season after season, and they have elevated sowing rates to compensate for what they describe as low fertility soils.

The summary of chronic stress trends appears below.

Chronic Seed Security Findings

The review of medium-term trends in seed security in Kasai Oriental showed very little dynamism or innovation of any sort. In contrast, key bottlenecks were identified.

1. While the communities in the SSSA sample seem to grow a range of crops, closer scrutiny raises critical issues. There is little crop special specialization: nearly all are used for both food and income. Also transformation levels overall are very low, mainly only resulting in different types of flour and local alcohol.
2. Seed system channels have remained static over the least five years for all crops. There has been virtually no outside innovation. (As indicated above, 99% or more of seed is still sourced from local channels- from home stocks, neighbors/friends, and local markets. Even seed aid does not exist as an innovation source).
3. New variety access within the sample even has been unusually low, even though the area (Mbuji Mayi as the referent point) is about 95 km from a major research station in Ngandajika. Overall, only 4-12% of the SSSA sample had accessed a new variety in the last 5 years, with a range given as two-thirds of the new varieties came from local friends or the local market-- so could not be confirmed as modern varieties. New varieties were largely accessed for the crops of maize, cowpea and cassava. The need for ongoing and innovative variety delivery channels seems pressing.
4. There is virtually no decentralized seed multiplication in the zone: no way farmers can get quality seed or quality cuttings. Farmers in the sample did not access any seed from the Agri-multipliers operating in the zone (at small scale), and agri-multipliers were even transporting some of their quality seed out of the zone to Kinshasa and elsewhere.

5. Similar to #10, there are few agro-enterprise opportunities in the area, although there is some milling of flour and production of palm oil soap.
6. Do farmers in this Kasai Oriental region use non-seed inputs? The short answer is a strong 'no'. For mineral fertilizer, only 2% used 2017 B season with the same 2% projected for 2017/8A. Generally farmers indicated either that it was unavailable or just too expensive. For compost/manure, 25% used some organic input- but this was mostly kitchen residue. Main reasons for non-use were that it was not available (especially for manure) or that they do not know how to use this organic material.
7. The lack of use of storage chemicals (<2% of sample) was perhaps the most surprising gap as losses in storage are alarmingly high, 25-95% of what is stored [losses especially in maize and the legumes (groundnut, cowpea, bambara and soybean)].
8. Seed aid, that is free distribution of seed as part of emergency response and development initiatives, has been virtually non-existent. About 5% of households have received seed aid an average of one time with the last five years. (Unlike many stressed areas in Africa, even the aid response has not been functional.)

In sum, overall there seems to be very little agricultural (no?) innovation in Kasai Oriental. There are negligible ways for farmers to access new varieties or quality seed, virtually no agro-enterprise and little non-seed input use. In contrast, the agricultural and seed stresses are pressing (alarming), especially the soil fertility concerns and storage losses.

The main issue is where to start: on what interventions? and how to design them to serve all farmers in this remote and chronically stressed region.

Kasai Oriental might serve as a 'poster child' on how to jumpstart smallholder agriculture in a truly chronically stressed agriculture region.

Recommendations

The opportunity for the SSSA team to conduct assessments in two sites of the Kasai Oriental provided the field teams a useful perspective on seed security in this eastern Congolese region.

Overall, the SSSA did not find constraints that warranted an ‘emergency response’. The problems are chronic, deeply ensconced ones. Hence, the recommendations center on actions to alleviate chronic stress and to seize upon developmental opportunities.

The recommendations below are practical and doable one; implementation of such actions can lead to positive changes within the four-year timeframe of the DFAP project.

Below, find a set of recommendations that are applicable across Kasai Oriental sites. These are loosely clustered into six themes.

I. New varieties: making these more accessible: Delivery outlets and approaches

Modern varieties seem to exist for Kasai Oriental that have been confirmed to be adaptable and acceptable to farmers in the specific zones of action (see Table 3.1) . This recommendation focuses on how to get these new varieties out to farmers. Farmers need regular access to outlets that can provide them (through sale) with the new varieties they desire.

1. Sale Outlets. Current formal sector outlets are non-existent in the two SSSA region sites. In addition, only two agro-vets shops were found in larger town center of Mbuji Mayi (a town of 3 million people) and, in terms of seed, focused on packets of horticultural crops (so no legumes, no maize). Sale points need to be opened up in rural communities.
 - Sale points could consist of specialized stores vending only agricultural inputs and related tools.
 - A more realistic approach might be to sell seed in the already existing general stores and boutiques that serve the rural population with such basic goods as sugar and oil. Rural shop owners would need to be trained in seed-specific management and seed-related information as well as in general input marketing and business skills.
2. Awareness-raising and confirmation plots. Variety testing trials and demonstration plots might be installed directly adjacent to where sales are taking place. Church partners as well as local market merchants might also be encouraged to establish awareness-raising and confirmation plots (These plots could additionally confirm that are the varieties truly adapted and that farmers and traders find them acceptable.)
3. Small packs Packaging should be arranged in farmer- affordable sizes of 250g, 500 g and 1 kg sachets (especially for the legumes). Farmer-focused, small packs sales

might be tested in the range of venues where farmers routinely buy seed and other goods. Small pack seed is certified and sale models should be geared to giving a large number of farmer customers access to these high quality products.

4. Traders: new varieties of certified seed. Given that local markets (and their traders) are important for farmers' seed supply, more attention should be given to engaging these open seed/grain markets to supply the kinds of varieties farmers need. Seed/grain traders could be powerful partners in helping to *move new modern varieties* widely, within and among farming communities. Such traders, selling certified seed (and especially women sellers) for the legumes) would need to learn about new variety identification, attributes and management.

If done smartly, the above suggested broadening of seed sale venues and seed sale formats should stimulate the creation of a broader customer base, focusing demand toward direct producers (small farmers) and away from reliance on large institutional buyers (such as NGOs). As the above also builds on the varied local market channels that all farmers use on a regular basis, transaction costs for farmers should be minimized.

II. New varieties/quality seed: making these more available

Seed production, and especially the decentralized seed production that can reach smallholders, needs to become a more strategic and effective force in serving farmers. The formal seed sector will never be able to handle a) the range of crops farmers need, nor b) the range of varieties. At this point, the single decentralized seed multiplication model found in the Kasai sites, the formal APSKO-supported agri-multipliers, is having negligible impact. (Agri-multipliers were the source only 0.4% of the seed farmers in the zone sowed, with only a single farmer in the sample having received a new variety through an agri—multiplier).

Given a four-year time frame, it is recommended that any decentralized seed production work focus on strengthening existing organizations and not on the creating of new multiplication groups.

5. Capacity of existing agri-multipliers. The capacity of the few existing agri-multipliers needs to be strengthened. There seem to be four or five in the SSSA zones assessed and they are tied to APSKO (Association of Seed Producers in Kasai Oriental). Multipliers might be encouraged to produce a wide variety of crops : OPV and the 60-day short cycle maize, cowpea, groundnut maybe soybean, (*depending on market-demand assessments*). Such individuals might best develop an analysis of the cost-effectiveness of their operations as well as an explicit delivery strategy. Seed producers should be encouraged to produce only if a) viable markets are identified and b) Individuals' own agro-enterprise and marketing skills have been enhanced.
6. Capacity of Farmers' Organizations already multiplying new varieties. Select farmer organization (organisations paysannes- OPs) links might be specifically catalyzed to tie such decentralized variety producers with a) continuing and new sources of germplasm (from INERA and elsewhere) and b) buyers, including localized shops.

Moving to broader recommendations to make high quality seed available:

7. Traders and seed quality. Given that local markets are *the first most important source for seed*, the quality of seed in open markets might explicitly be improved. Hence, traders (as above) might be engaged actively in *safeguarding and improving the quality of seed they put on offer*. This could involve actions such as: linking traders to credible sources of good quality seed; working with them on techniques of seed bulking; advising and supporting traders in better storage options....
8. Farmers own seed selection and conditioning. Given that farmer-produced and stored seed is *the second most important source of planting material*, farmers' own field selection, post-harvest activity and grain/seed storage processes should be fine-tuned. This will involve widespread technical advice and support activity. Better management of home-saved seed makes sense as a key strategic investment—helping the majority of farmers improve seed quality at the primal source. (*Note that the issue of better storage is dealt with in more detail point #III below*).

In sum, seed production recommendations suggest building on existing decentralized production and delivery efforts, not creating new structures. In addition, a multi-thrust approach for supported seed quality is recommended that can affect seed quality at scale: Beyond certified seed production by specialists---- efforts should address how best to improve the quality of seed available in local markets and in farmers' home stocks. Activities should be programmed explicitly to work with traders and farming households on seed selection and maintenance.

III. Storage: reducing grain and seed storage losses

9. Storage management. Storage losses on-farm need to be combatted in multiple ways and the need is urgent as current storage losses range between 25 and 95 %, particularly with crops such as maize and cowpea. Different storage options should be systematically tested: perhaps, metal silo containers made by local blacksmiths or hermetic bagging techniques promoted by organizations such as Purdue ('PICs) or GrainPro, or use of local containers (plastic bottles/clay pots). INERA has likely done work on local storage methods (e.g ash, dung, urine) and this body of research might also be reviewed. Storage methods on which INERA has done research. Key is that a) farmer demand for any technique be understood – and raised, if necessary, and b) that a supply chain to manufacture and sustain any solution be put in place quickly. (Note that for PICs bags, there is an existing manufacturer in Kigali Rwanda).

IV. Insect and Pest Problems: select focus on products

10. Insect/pest control. Several plant pests and diseases were identified as effecting particularly acute damage: striga and Alectra vogelii (maize and cowpea). In the short term, chemical products might be put on offer for sale, in approved shops that can handle such carefully-regulated inputs.

V. Soil Fertility Enhancement: first steps

While soil fertility issues *per se* were not an initial focus of this SSSA, their direct influence on how farmers choose crops/varieties and how farmer adjust sowing densities to combat low fertility means that a first set of ameliorating actions seems important to include—even in a seed system security assessment. Obviously, a comprehensive soil fertility management program is warranted (to be led by specialists).

11. Improved fallows and legume rotations. The efficacy of rotations with a range of legumes is already well known (and INERA particularly suggested the sequence of cassava, cowpea and maize for food crops). Also, the possibilities of fallows with varied agro-forestry such as *Mucuna*, might be tested. Key, of course, is farmer acceptance of the agronomic technique as well as its technical effectiveness.
12. Nitrogen fixing trees. Preparing for longer-term horizons (beyond the 4-year project), diagnostic trials with 'best bet' nitrogen-fixing trees, might be piloted now as added as an explicit work stream. Soil fertility improvement and management (including adding of biomass) demands that interventions think long from the start.

VI. Farmer-centered Information Systems : raising awareness and demand: range of improved techniques

Finally, as a last set of recommendations, we focus on information systems. Kasai Oriental farmers currently receive little information about improved techniques for sustainable and profitable agricultural production. The SSSA teams noted a lack of familiarity not just with new varieties but with even basic 'good practice' agricultural techniques, e.g. crop rotation and use manure, improved storage possibilities. There is an urgent need to stimulate a) a learning and experimentation environment, especially in rural areas; b) an environment that provides a wealth of technical information; and c) information channels that foster feedback mechanisms- quickly and directly.

Several recommendations appear below related to information innovation follow. The focus here is on enabling the small farmer to draw in much needed innovations, to make more informed choices among multiple agricultural options—and to feedback to those helping to generate research and supply side advances.

13. Community experiential learning. Face-to-face on-farm experimentation models need to be catalyzed within communities; experimental community fields or farmer field schools are but two models. Important is that women and youth (and particularly those returning from the mines) be included in these interactive learning processes.
14. Agricultural-linked technical information and dissemination. Agricultural-linked technical information also has to be passed through a range of media. Some farmers (and traders) do have access to mobile phones (and concrete SMS messages could be key in passing concrete variety and seed-linked information). The effectiveness of existing grassroots communication mechanisms, through schools and faith-based organizations might also be explored to share information on good practice and available innovations. Even more classic information methods, like development of 'new variety posters and illustrations' would be an important addition.

15. Global strategy for communication in communities (cascading strategy). Overall, the gap in relation to agricultural information within communities is so vast and deep, that the prime recommendation here might be to develop (from near scratch) a global strategy for two-way communication that embraces actors at various levels and allows dynamic interactions (and corrections in course). The term 'cascading strategy' has been suggested for this process.

In sum, overall, this SSSA has 15 precise recommendations that are practical and doable in the four-year time frame of the DFAP project. While all can be moved forward in the short term, all can potentially lead to long-term, sustainable impacts in this chronically-stressed Kasai Oriental region. The operative framework is 'short term' but not 'short-sighted'. There is an urgent need for systemic problem solving right now that lead to durable solutions and measurable jumps in agricultural productivity and resilience in the Kasai Oriental region.

I. INTRODUCTION

Rationale for Seed System Security Assessment (SSSA)

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Aims and Structure of Report:

The report presents the results of the SSSA in Kasai Oriental in May 2017. It presents the findings on seed security within two communities nearby the regional center of Mbuji-Mayi, Miabi and Tshilundu. The sites seem sufficiently similar, that they have been treated as one unit of analysis.

In terms of report structure, Chapter II introduces the SSSA methodology and reviews the actual methods used in the May 2017 assessment, including the parameters describing site choice. Chapter III provides a brief background to eastern Congo's formal and especially informal seed sector, and has a special section on how local seed markets function.

Chapter IV presents the main field findings, divided into specific sections on seed security issues in the near term (2017-8), and on chronic stresses and emerging opportunities over the medium to longer-term. The 'near term' analyses include data from both main seasons, the '*Season B*', spanning the period March to June and '*Season A*' from September to December/January.

Chapter V presents the recommendations across sites, followed by references.

The Appendix posts the action plan.

This is not an academic report: the fieldwork has been effected in a relatively short time to allow for planning of the upcoming agricultural season, starting with sowing in September 2018. Having said this, the assessment has aimed for considerable rigor: including use of multiple methods, triangulation of results (with quantitative and qualitative data), and fieldwork encompassing important sample sizes.

II. BACKGROUND TO SEED SYSTEM SECURITY ASSESSMENT (SSSA)

This chapter presents the necessary background to interpret this SSSA. It introduces the concept of seed security and the different types of seed aid approaches that might be matched to diverse seed security problems (and opportunities) encountered on the ground.¹ Methods used in the May 2017 assessment are then presented.

The Concept of Seed Security

Farm families are seed secure when they have access to seed (and other planting material) of adequate quantity, acceptable quality, and in time for planting. Seed security is best framed within the broader context of food and livelihood security. Helping farmers to obtain the planting materials they need enables them to produce for their own consumption and sale.

Achieving seed security is quite different from attaining food security, despite their obvious links. One can have enough seed to sow a plot but lack sufficient food to eat, for example during the ‘hungry season’ prior to harvest. Conversely, a household can have adequate food but lack access to appropriate seed for planting. Despite these important differences between food security and seed security, determinations of seed security are normally based, implicitly or explicitly, on food security assessments. This results from a lack of appreciation and understanding of seed security issues.

The Dimensions of Seed Security: a Framework

The concept of seed security embodies several fundamental aspects. Differentiating among these is crucial for promoting those features that foster seed security as well as for anticipating the ways in which such security might be threatened. Table 2.1 outlines the fundamental elements of seed security: seed has to be available, farmers need to have the means to access it, and the seed quality must be sufficient to promote good production.

Table 2.1: Seed security framework, basic elements

Parameter	Seed Security
<i>Availability</i>	Sufficient quantity of seed of adapted crops is within reasonable proximity and in time for critical sowing periods.
<i>Access</i>	People have adequate income or other resources to purchase or barter for appropriate seeds.
<i>Quality</i>	Seed is of acceptable quality: <ul style="list-style-type: none"> • ‘healthy’ (physical, physiological and sanitary quality) • adapted and farmer-acceptable varieties

Source: Remington *et al.* 2002.

¹ This section draws on Sperling *et al.*, 2008.

Availability is defined narrowly as whether a sufficient quantity of seed of target crops is present within reasonable proximity (spatial availability) and in time for critical sowing periods (temporal availability). It is essentially a geographically based parameter, and so is independent of the socioeconomic status of farmers.

Seed **access** is a parameter specific to farmers or communities. It largely depends upon the assets of the farmer or household in question: whether they have the cash (financial capital) or social networks (social capital) to purchase or barter for seed.

Seed **quality** includes two broad aspects: seed quality *per se*, and variety quality. Seed quality consists of physical, physiological and sanitary attributes (such as germination rate and the absence or presence of disease, stones, sand, broken seed or weeds). *Variety quality* consists of genetic attributes, such as plant type, duration of growth cycle, seed color and shape, and palatability.

In situations of stress, it is rare to have constraints in all three seed security features at the same time. The challenge is to identify the real problem and then to target actions that alleviate well-defined problem.

Acute and Chronic Seed Insecurity

Analysis of seed security requires consideration of the duration of the stress: whether it is 'acute' or 'chronic' (recognizing that the divisions are not absolute).

Acute seed insecurity is brought on by distinct, short-lived events that often affect a broad range of the population. It may be spurred by failure to plant, loss of a harvest, or high pest infestation of seed in storage. While in normal times households may have various degrees of seed security, all may be affected by an acute event, such as a flood.

Chronic seed insecurity is independent of an acute stress or disaster, although it may be exacerbated by it. It may be found among groups who have been marginalized in different ways: economically (for example, due to poor, inadequate land or insufficient labor); ecologically (for example, in areas of repeated drought and degraded land); or politically (in insecure areas, or on land with uncertain tenure arrangements). Chronically seed insecure populations may have ongoing difficulties in acquiring off-farm seed due to lack of funds; or they may routinely use low-quality seed and unwanted varieties. The result is households with built-in vulnerabilities.

Acute and chronic seed insecurity often exist together in stressed contexts. Indeed, in cases where short-term emergencies recur – in drought-prone areas, for example – acute problems are nearly always superimposed on chronic problems rooted in poverty.

More Refined Analyses Leading to More Targeted Responses

Table 2.2 gives examples of how identification of a specific seed security constraint should lead to a targeted response, as we are aiming for in this Kasai-Oriental assessment. So, for example, if 'seed availability' is assessed as the problem in the short term, seed-based interventions, such as seed importation (for acute shocks) may be appropriate. (Seed availability problems rarely persist over the long term.) In contrast, a diagnosis of a problem of 'seed access' might wisely trigger a holistic analysis of livelihood strategies. In the acute phase, providing farmers with cash or vouchers to get their desired seed might be effective.

However, an identification of access problems on a chronic basis should lead practitioners to look well beyond seed and seed security constraints. The inability to access certain necessary goods on a repeated basis is usually equated with problems of basic poverty. Initiatives to help farmers generate income and strengthen their livelihoods would be essential. Seed quality problems, whether they relate to concerns with the varieties or with seed health *per se*, are rarely short-term. Responses usually require significant development programs, linked to plant breeding or seed quality initiatives, depending on the specific constraint identified.

Table 2.2: Types of seed security problems and broadly appropriate responses

Parameter	Acute	Chronic
Unavailability of seed	Direct distribution of seed	(Happens rarely or never)
Farmers lack access to available seed	Vouchers and cash (sometimes with seed fairs)	Income generation activity Agro-enterprise development
Poor seed quality <ul style="list-style-type: none"> ▪ poor varieties (variety quality) 	<u>Limited</u> introductions of new varieties (already tested in site)	Introduce new varieties/with technical support Variety selection / plant breeding Participatory variety selection
Poor seed quality <ul style="list-style-type: none"> • diseased/damaged seed (seed quality <i>per se</i>)	Seed fairs with quality controls	Programs to improve seed quality in: <ul style="list-style-type: none"> - seed companies - on farm (CBSP) -local markets

Seed System Security Assessment

A SSSA reviews the functioning of the seed systems farmers use both formal and informal. It asks whether seed of adequate quality is available and whether farmers can access it. The SSSA also promotes strategic thinking about the relief, recovery or development vision needed. For instance, during a period of stress, should efforts aim to restore the seed system to its former state, or should they aim to strengthen it? Should efforts focus on crops for food, income or both? Should interventions be linked to crops tied with the most vulnerable (e.g., women)? Sperling 2008 gives a description of the SSSA method. Precise tools and reports of many and diverse SSSAs can be found at SeedSystem.org.

Methods Used

The themes and methods used in the Kasai-Oriental SSSA are sketched out in Table 2.3. They include a range of qualitative and quantitative methods and draw on multiple stakeholder insights. Mapping tools were also used to trace seed availability and seed flows within and among regions. Of special note is that the sample sizes were relatively big for a rapid assessment: 177 individual farmer interviews, 14 trader interviews, visits to the only agro-input dealers in the region, and multiple focus group discussions and key informant interviews.

Table 2.3: Investigative methods used in the SSSA Kasai-Oriental, May 2017

Type of Investigation	Commentary
Background information collection	Project reports, regional literature
Database utilization	agricultural production figures/districts vulnerability data
Key informant interviews	government /project personnel INERA, SENASEM seed producers/multipliers
Focus group discussions (FGD)	Separate community and women-
Community-based	agricultural and variety use and trends
Women's groups	seed source strategies, by crop community seed security assessment women's crop/seed constraints/opportunities
Farmer interview s (N=177)	seed source patterns/input use access to new varieties/ seed aid
Agro-input dealers (N=2)	market constraints + opportunities
Seed/grain market traders (N=14 traders)	crops and varieties supplies on market pricing patterns/ sourcing areas seed quality management procedures

Household sample

Part of the methodology used in the SSSA did involve conducting quantitative interviews at the household level. Households were chosen without bias by fanning out in diverse directions from a central location point. Every 3rd or 4th household was chosen (depending on population density).

Of the 177 HH interviewed, almost all were residents (i.e. very few internally displaced) and over 85% were nominally headed by males. Areas cultivated were relatively small, over 80% HH cultivating 1 ha or less.. Table 2.4 summarizes household sample characteristics.

Table 2.4: SSSA Kasai Oriental, household (HH) sample characteristics (N =177)

Feature	Description	% Sample		
Type of HH	Adult-headed	97.2		
	Grandparent-headed	2.2		
	Child-headed	0.6		
Resident status	Resident	95.4		
	IDPs	4.6		
Gender of HH head*	Male	85.9		
	Female	14.1		
Area cultivated (ha)	< 0.5	28.4		
	0.5-1.0	51.7		
	>1.0- 2.0	13.1		
	>2.0	6.8		
Household size	avg	Std dev	min	max
	8.7	4.2	2	32
Age of HH Head	43.9	3.7	8	85

Site Choice

Sites were chosen mainly to link the assessment to practical action, and hence followed the zones of DFAP priority. Both areas are now highly agricultural although many families had key workers in the diamond mining industry until fairly recently (the diamond business started to sharply decline about 2006 onwards) (see Box 1). Principal crops are quite restricted: cassava, maize, cowpea, some peanuts. Figure 2.1a+b suggests the degree of intercropping and key severe problems of poor soils and erosion.



Fig 2.1a. Individual household plot: Miabi



Fig 2.1b. Road cut/erosion- Miabi

Figure 2.2 indicates the general location of the two sites, Miabi and Tshilundu. They are respectively 30 and 60 km from the major regional city of Mbuji-Mayi.

Figure 2.2. Geographic location sites in Kasai Oriental for SSSA May 2017



A summary of the basic site parameters appears as Table 2.5 below. These were elicited from a launch meeting of local/regional experts. Given that the SSSA team sketched basic characteristics as unusually similar, the report and analyses have clustered the two sites as one. Again, it is key also to remember that in both of these ‘agricultural’ sites, industrial diamond mining was a driving income source, until very recently.

Table 2.5: Select descriptive parameters of sites chosen for SSSA

Site	MIABI	TSILILUNDU
Agro-ecology	Between 700-800 m altitude; Grassy savanna	Between 700-800 m altitude; Grassy savanna
Irrigated /rainfed	Rainfed: Plateau and valley bottoms, no mechanical irrigation	Rainfed: Plateau and valley bottoms, no mechanical irrigation
Principal Crops	Cassava, maize, cowpea, groundnuts, bananas, oil palm	Cassava, maize, cowpea, groundnuts, bananas, oil palm
Emerging crops	Pineapple, taro, avocado, plantain	Pineapple, Taro
Infrastructure -roads - telephone	Roads in poor condition, dirt / tarmac, existence of telephone networks;	Roads in poor condition, dirt / tarmac, existence of telephone networks;
Security risks	stable	stable
Environmental risks	Erosion, drought	Erosion, drought
Internally-Displaced Persons	no	no (or very few)
Other salient characteristics	Some farmers reintegrating into agriculture as prime activity after years in mining.	Some farmers reintegrating into agriculture as prime activity after years in mining.

Box 1: Transition from life as an industrial diamond miner to life as a subsistence farmer

Many industrial diamond miners are transitioning back into agriculture. Simply, diamond deposits are 'used up', that is harder and harder to find at the shallower depths. Those who tend to stay in mining are mostly the young as income just isn't stable. In contrast, food for a family is easier to find when one farms.

Those re-entering farming often make the transition via goat and chicken raising. The activity can give quick cash returns and the initial investment need is fairly modest.

Seasonal Overview

The area of Kasai-Oriental has two major seasons. 'Season B' runs from March to June and 'Season A' from Sept to Dec/Jan. In between, farmers who have access to the valley bottoms (marshes) sometimes practice a Season C in June and July. Table 2.6 gives an idea of the crops grown in these three seasons, and the staggered dates of their sowings and harvests.

Table 2.6: Crop Calendar in DFAP sites for Kasai-Oriental, Seasons A and B

Crop		jan	feb	mar	apr	ma	jun	jul	aug	sep.	oct	nov	dec.
1 Maize	Sowing Harvest	X X	X			X	X		X	X			X
2 Cowpea	Sowing Harvest	X X	X			X	X			X	X		X
3 Groundnut	Sowing Harvest	X X	X			X	X		X	X			X X
4 Soybean	Sowing Harvest	X X	X			X	X		X	X			X
5 Cassava	Sowing Harvest	X X	X X	X	X	X	X	X	X	X	X	X	X
6 Bambara	Sowing Harvest	X	X			X	X			X			X

Table 2.7: Crop Calendar in DFAP sites for Kasai Oriental, Season C

Culture		jan	feb	mar	apr	ma	jun	jul	aug	sep.	oct	nov	dec.
1 Maize	Sowing Harvest						X	X	X		X	X	X
2 Taro	Sowing Harvest	X	X	X	X		X	X	X	X	X	X	X
3 Cowpea	Sowing Harvest								X	X			X X
4 Amaranth	Sowing Harvest						X X	X X	X X				
5 Sweet potato	Sowing Harvest						X	X			X	X	
6 Okra	Sowing Harvest	X X	X		X	X	X X	X		X	X	X	X

Of specific note were the patterns of crop performance around the period of the seed system security assessment. Communities assessed their harvest of key crops for the ‘current season’, 2017B, as well as for the two preceding ones, Season 2017A and Season 2016B. As Table 2.8 shows, only cassava has had a consistently regular performance (three XXX’s for good). For the majority of crops and across the three seasons, harvests have been generally poor (a single X). Perhaps it is not surprising that there are farmers who try to survive by growing cassava alone, as a single crop (Box 2).

Table 2.8: Community assessments of crop performance over three past seasons:

Main Crops	Current season : March-June 2017 (B)	Season before: Aug. 16-Dec 17 (A)	Season before March-June 2016 (B)
Miabi			
Cassava	XXX	XXX	XXX
Cowpea	---	XXX	---
Maize	X	XX	XXX
Groundnut	X	XX	XXX
Bakua Lukanda			
Cassava	XXX	XX	XX
Cowpea	X	X	X
Maize	X	X	X
Rice	X	X	X

X= poor ; XX= average XXX= good

Box 2: Can you survive sowing only cassava: households in Miabi and Tshilundu

In both sites of the Kasai-Oriental SSSA, some farming families grow only cassava. Can you survive on this single crop---- Apparently YES According to farmers:

- Cassava gives a lot of production. Some is consumed, some is sold (e.g. to pay school fees). Moreover, the harvest is staggered so a family can have money flowing in all year round. It is truly a ‘culture economique’.
- Cassava also gives quite nutritious leaves—again which can be eaten over many months.
- There is no real harvest loss in manioc associated with climate stress
- With manioc, there is also guaranteed seed security: either you have the stems or the neighbor gives them to you for free.

Taking a closer look, however, manioc may be the sole crop, but it is often not the sole economic activity.

This region of Kasai-Oriental is indeed a hard one in which to have a reliable crop yields. Weather variations are only one major issue. Declining/low soil fertility looms equally large. As a result, there are farmers who cultivate near uniquely cassava—and manage to survive (see Box 3). Farmers are also increasingly having to use specific strategies to a) respond to weather variations and to b) combat unusually low fertility conditions. Increasingly sowing densities--- planting lots and lots of seed in the hopes that something will germinate and yield, is one indicator of chronic seed security stress (Box 3).

**Box 3: How farmers in Kasai-Oriental are dealing with climate variations
(little rain, deluges of rain...)**

Farmers in this region of Kasai clearly recognizes changing climate. Among the signals they cite:

- Higher heat
- Crops becoming drier more quickly
- Drought in in the middle of the rainy season
- Late onset of the beginning of the rains
- The marsh areas (marais, bas fond) drying up
- River levels gong down
- Sometimes very heavy rains in a short period, which causes them to stop sowing immediately

So how do farmers say they are responding?

- Sowing much larger areas (as if anticipating some crop failure)
- Seeking out early-maturing varieties like the cowpea named 'diamond' that has a duration of two months
- Respecting more the 'time to sow'. At first rains, they head to the fields
- Maintain the crops to a greater degree—weeding, mulching
- Changing crops when the rain comes later-- moving away from legumes and towards manioc which can resist more extreme conditions.

III. SEED SYSTEMS IN KASAI ORIENTAL: OVERVIEW

Smallholder farmers can use multiple channels for procuring their seed. These channels generally fall within formal and informal seed systems (with the latter also sometimes labeled as the local, traditional or farmer seed systems).

The formal seed system involves a chain of activities leading to certified seed of named varieties. The chain usually starts with plant breeding, and promotes materials towards formal variety release. Formal regulations aim to maintain varietal identity and purity, as well as to guarantee physical, physiological and sanitary quality. Seed marketing takes place through officially recognized seed outlets, either commercially or by way of national agricultural research systems (Louwaars, 1994). Formal sector seed is also frequently distributed by seed relief agencies.

The informal system embraces most of the ways farmers themselves produce, disseminate and procure seed: directly from their own harvest; through gifts and barter among friends, neighbors and relatives; and through local grain markets or traders. Farmers' seed is generally selected from the harvests or grain stocks, rather than produced separately and local technical knowledge, standards guide informal seed system performance. Recent detailed analyses show that upwards of 90% of seed farmers sow comes from informal channels, although up-to date with although this varies by crop and region (McGuire and Sperling 2016). Results of this Kasai Oriental SSSA show that over 99% of seed these eastern Congolese farmers sow comes from local channels. (There has been virtually no impact from the formal plant breeding or seed sectors).

Finally, as a parallel channel, the development of a 'relief seed system', has become of distinct importance on the supply side in many parts of Africa (Bramel and Remington, 2004). Unusually, Kasai Oriental, so far, has been relatively removed from this 'seed relief' trend, with only limited distributions having taken place since the early 2000s (source: experts at Launch meeting, May 15 2017). Within the sample of the Kasai Oriental, only 5% of households have received seed aid with the last five years and with an average of a single delivery.

Figure 3.1 shows schematically the formal and informal seed systems (and their component channels) and how they may interact. Adapted from Almekinders and Louwaars (1999), the figure additionally highlights the importance of the local seed market and seed relief channels. Note that community meetings in both Miabi and Tshilundu stressed the importance particularly of local markets as a source of seed, in fact, as important overall as farmers own home-saved stocks. No agro-dealers (or other certified seed sources) were mentioned by communities as sources during the assessment. Such shops are not just far from the community but near non-existent in the region all together.

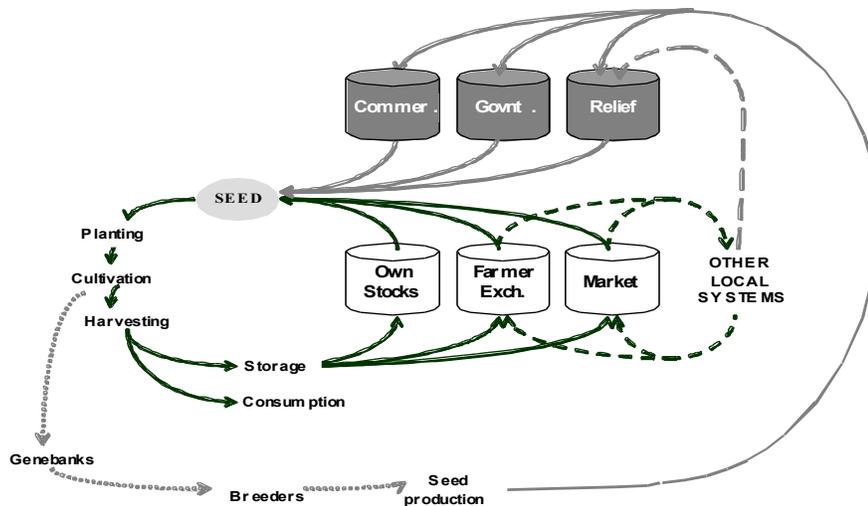


Figure 3.1: Channels through which Farmers Procure Seed. Own seed stocks, exchange with other farmers, and purchase through local grain markets constitute ‘informal’ channels, while commercial seed companies, government or research outlets, relief supplies constitute formal channels. Adapted from Almekinders and Louwaars (1999).

The next sections make a few points on varieties and formal seed system structures (or lack thereof) serving the Kasai Oriental zones. The formal breeding and formal seed sector are quickly reviewed and then focus shifts to informal seed systems, and particularly, the local seed/grain markets—as these prove to be the core for seed system stability in the zones assessed.

Formal Seed Systems in Kasai Oriental: variety development and seed multiplication

There are few formal breeding or seed sector programs in the Kasai Oriental. Brief information is presented below on a) variety development + b) organized seed multiplication to give an overview of the context.

Variety development

Variety development across Congo is spearheaded by the Institut National pour l'Étude et la Recherche Agronomique (INERA), (the National Institute for Agronomic Study and Research). While INERA headquarters in are based in Kinshasa, regional stations take the lead in more site-specific research initiatives, including plant breeding and variety testing. The only research station currently linked to the Kasai Oriental is in the south, in Ngandajika, about 90 km away from Mbuji Mayi.

INERA/Ngandajika has released a range of varieties that researchers suggest are adapted to the Kasai-Oriental zones monitored during the SSSA (Table 3.1).

Table 3.1: Crops and varieties being promoted by INERA for the Kasai Oriental region

Crop	Variety
Maize	Mudishi 1 Mudishi 3 Mus-1
Cowpea	Diamant Yamakshi Mu.. Langa
Groundnut	IL24 (Bubandi) A 65
Manioc- white	Mbankana Ngandajika Dbanj Sansi Mvuasi
Manioc- yellow	Kindisa (biofortified)
Manioc- in pre diffusion	Ngandajika 2010 038 Ngka 2012/149 Ngka 2011/274

source: INERA Ngandijika 2017

New variety multiplication (formal seed initiatives)

At present, the National Seed Service, SENASEM, has limited operations in Kasai Oriental. Its main function is to offer seed quality control service and advice on regulations more generally. Seed multiplication itself seems to now be contracted out to the private sector. Production statistics for SENSAM-linked seed during the 2015 and 2016 seasons are posted in Tables 3.2 and 3.3. About 60-75% of the seed multiplied is maize (across several varieties, both seasons). Cowpea is the second most important crop multiplied.

Table 3.2: Official seed production figures for Kasai Oriental, 2015 (SENSEM)

#	Seed Type	Quantity (kg)	%
1	Groundnut JI 24	400	0.62
2	Bean-Kenya D6	500	0.78
3	Maize Salongo 2	4390	6.86
4	Maize Mus-1	29555	46.17
5	Maize Mudishi 3	11963	18.69
6	Cowpea Diamond	9672.5	15.11
7	Cowpea H 36	841	1.31
8	Rice IRAT 112	1950	3.05
9	Rice Nerica 4	4340	6.78
10	Rice K7	250	0.39
11	Soybean Afya	150	0.23
Total		64011.5	99.99

Table 3.3: Official seed production figures for Kasai Oriental, 2015 (SENASEM)

#	Seed type	Quantity (kg)	%
1	Maize Mus- 1	67863	55.62
2	Cowpea Diamond	39214	32.14
3	Maize Salongo II	3850	3.15
4	Cowpea H36	1050	0.86
5	Maize Mudishi 3	8330	6.82
6	Maize Mudishi 1	250	0.20
7	Peanut J1 24	1450	1.18
Total		122007	99.97

While such seed has been recorded as produced in Kasai Oriental, it is not clear how much stays in the region. Agro-multipliers (see below) recounted that some of their production is shipped of to Kinshasa.

Agri-multipliers

During the SSSA, SENSAM identified five Agri-multipliers who are officially certified and working in the Kasai Oriental zone. Such agri-multipliers have clear contracts with SENSAM having met multiple screening requirements: good land, advanced agronomy training.... They are also linked to a clear set of non-governmental organizations, most of whom had formerly had contracts and received technical support from Belgian aid (Cooperation Technique Belge- CTB). The multipliers sometimes sell to cooperatives such as COPROSEM but do not seem to have an expansive marketing strategy. They also do not establish variety trials or demonstration plots and, as such, rarely engaged directly with smallholder farmer end-buyers.

Farmers in the SSSA sample did not access any seed from the Agri-multipliers operating in the zone for the 2017B season.

Note that the SSSA team itself did not find any community-based seed production groups in the assessment zones. However, in a public feedback session one implementer (Save the Children with the UN-FAO) indicated they were multiplying 30 ha of cassava- to be used as planting material. This start is important---- and at a very modest scale.

New variety delivery systems (virtually no agro-dealers!)

The results of the Kasai Oriental SSSA showed 4-12% of farmers accessing some new varieties within the last 5 years (Chapter IV: section 'New Varieties and Figure 4.4 and Table 4.14'. A range is given as two-thirds of the new varieties came from local friends or the local market-- so could not be confirmed as modern. New varieties were largely accessed for the crops of maize, cowpea and cassava.

The teams found that agro-dealer stores were virtually non-existent in the SSSA sites. None (0) were found serving the communities of Miabi and Tshilundu.

Two agro-vets were found in Mubji-Mayi, a town of 3,000,000 and they were selling primarily veterinary linked products (especially chicks) with a smattering of horticultural seed.

The need for ongoing and innovative variety delivery channels seems pressing.

	<p>Box 4: Agro-vet stores?</p> <ul style="list-style-type: none"> • Two in all of Mbuji Mayi, town of c. 3,000,000 people) • ONLY horticultural seed- (tomatoes, peppers cabbage) no legumes <hr/> <ul style="list-style-type: none"> • No Agro-vets in Miabi or Tshilundu
--	--

In brief, both modern varieties and high quality seed are scarce in Kasai Oriental. Decentralized seed producers as well as more formal agro-input shops area also barely operating.

Informal Seed Systems in area of Kasai Oriental

Cassava, maize, cowpea, and groundnuts, constitute some of the crops that are important in the informal seed sector in the Kasai Oriental region. In fact, except for small amounts of horticultural seed (e.g. cabbage, onions, tomatoes) the informal sector supplies all of the seed in Kasai Oriental (over 99% of total seed sown). Note that the informal sector includes all the ways farmers themselves produce and disseminate seed: through own stocks, via barter/gifts and through local markets.

Local markets, in particular, serve as the backbone of seed provision for farmers in this region. In fact, on a routine basis, local markets are considered as the most important source of seed for all key crops, except for cassava, whereby cuttings are more likely obtained through neighbors. Supporting and strategically strengthening such markets would be key for promoting seed security across a range of smallholder farmer sites. Much of this next section on Informal seed systems focuses on how local seed/grain markets in Kasai Oriental.

Seed/grain markets

‘Seed/grain markets’ refer to a diverse set of actors and institutions, from open-market traders to permanent village shops to long-distance truckers, who buy and sell crops for consumption and, potentially, for seed (Sperling and McGuire, 2010). To be clear, much that is sold in local markets is used for grain (for consumption, flour, brewing). However, there is a special subset of this grain which can potentially also be used for seed and which is actually sown. This is referred to as ‘potential seed’.

Distinguishing seed from grain

Both farmers (buyers) and traders (sellers) use a range of strategies to access ‘good’ seed from the markets. For the buyer, he/she wants to maximize the possibility that the product bought will actually grow on farm. For the seller, he/she wants to tap into a lucrative seed market, one that may offer higher prices than for routine sales of food grain alone. There are a number of different practices that traders may use to distinguish seed from grain, in terms of how they source, manage, or present their wares.

Table 3.4 gives a sense of the frequency of each management practice traders use to distinguish seed from grain among the sample of traders interviewed for the SSSA. There are at least seven different practices which over half of the traders interviewed use to encourage better seed-related products. For example, nearly all traders sought specific varieties of their key crops, keep freshly harvest grains apart, and sorted out inert material like stones and dust.

Know also that traders report clear signals from buyers that such farmers are looking to find seed (not grain) from the local markets. Key among these: Farmers may: seek varieties that are not mixed; ask for a specific variety by name, look for batches that are free from waste (stones, dust) and where the grains are undamaged (full, not broken). Farmers may ask traders how the grains were stored-- or they may say explicitly: ‘I am buying for seed’.

Box 6 describes some of the processes used in managing potential seed by traders.

Table 3.4: Trader practices in managing potential seed, Kasai Oriental sample SSSA May 2017

<u>Potential Seed Practice</u>	<u>% of traders answering yes</u>
<i>Get grain from specific regions</i>	89
<i>Seek out specific varieties</i>	89
<i>Buy from specific growers</i>	0
<i>Keep varieties pure</i>	55
<i>Keep freshly harvested stocks apart</i>	100
<i>Grade stocks</i>	67
	0
<i>Do germination tests</i>	
<i>Have special storage conditions</i>	55
<i>Sort out waste (stones dust)</i>	100
<i>Sort out bad grains/ seed</i>	100
<i>Sell seed & grain separately</i>	67

Box 5: Managing 'potential' seed

Local open markets serve as an important source for farmers' seed and in the Kasai Orientale SSSA proved to be the most important source for three of the four main crops: cowpea, groundnut and maize. While these are, local markets are commonly referred to as 'grain' markets', farmers and traders regularly exercise considerable agency in managing and selecting among grain supplies to ensure that some can be used for planting material. These grain supplies that include adapted varieties and seed screened for select quality features can be termed 'potential seed' (Sperling and McGuire 2010)

Traders don't sell just anything	Farmers don't plant just anything
<p>Traders in Miabi aim to sell a high quality product and clearly recognize that some of their stocks will be used as seed: prices rise markedly around planting time for 'potential seed' and traders aim to capture this increase. Hence, a meka (about 1.5 kgs) of groundnut potential seed might go for 4500 () while that suitable only for consumption sells at 3500.</p> <p>Traders in Miabi employ numerous practices to support the quality of their seed. Among the most common:</p> <ul style="list-style-type: none"> • Seed is sought from specific regions known provide sowing materials adapted to the local area. • Traders seek out specific varieties • Varieties are kept separate • Recent harvests are kept separate from older ones. • Broken, damaged, immature grains are tossed out. • Extraneous debris- sand, pebbles, sticks—is tossed out. 	<p>In scouting out potential seed from markets, farmers look for unmixed stocks and may seek out specific varieties even asking by name. They further screen for visible quality traits: are the grains mature? are they not damaged by pests? Farmers may also buy potential seed within a larger grain batch and make the refinements for 'seed' at home, sorting out the non-seed trash (the twigs, pebbles, sand, broken grains.)</p> <p>Perhaps most important is that farmers may actually indicate they are buying for seed (that is, not grain) and trust the trader's advice on the varied possibilities that are best for sowing.</p> <p>The trader buyer relationship is an important one. If the trader provides poor sowing material, the word can spread among potential buyers quite quickly</p>

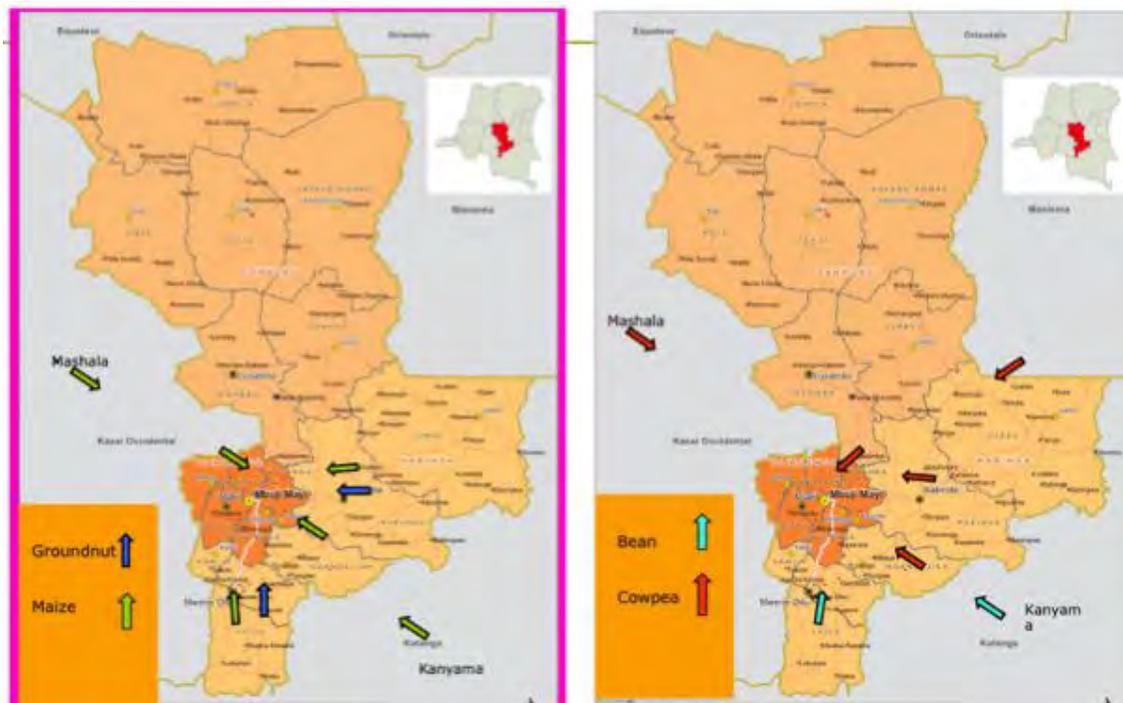
Seed flow mapping: regional mapping for Kasai Oriental territories

Flows of 'potential seed' are closely connected to those of grain movements. Generally, 'potential seed' moves from areas with similar adaptation zones and sometimes with higher productivity. Transport infrastructure is also crucial in shaping flows between regions. For example, in reference to Mbuji Mayi, the area sources potential from at least three directions east west and south. The north is not an option as the roads are not functional.

Figure 3.2 and 3.3 diagrammatically shows sources of 'potential seed' for Kasai Oriental for 4 contrasting crops – groundnut, maize, cowpea and common bean as described by the large traders who source such seed. As these flows demonstrate, there are multiple sources of seed/grain for all the major crops. This means that a poor harvest in Miabi or Tshilundu would not necessarily lead to the unavailability of potential seed in the immediate local markets, as surrounding regions also serve as main sources.

During the time of the SSSA, all routes remained open, but key informants suggested that supplies from the west, Mashala, could be constrained if instability in that area escalates.

Figure 3.2. 3.3 Sources of potential seed for Kasai Oriental, by crop



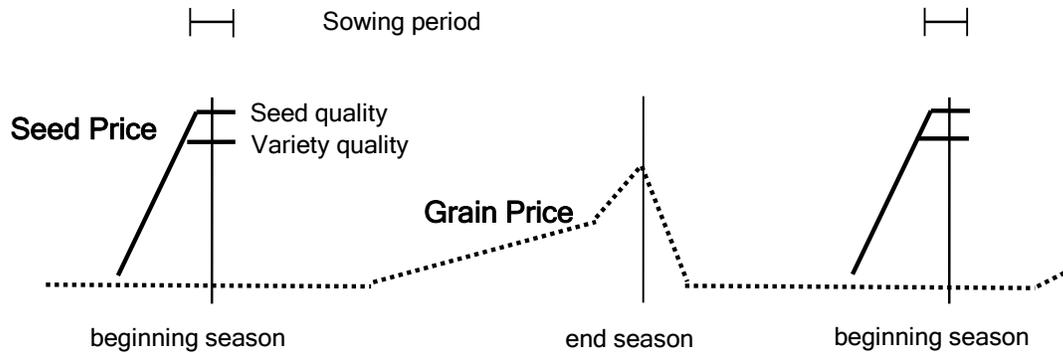
Potential seed and price

As a final facet of analyzing local seed/ grain markets, issue of price of seed and grain is considered, and how prices might fluctuate according to seasonal patterns.

During non-sowing periods, grain and potential seed remain relatively undistinguished in terms of price. However, during sowing periods, extending some four to eight weeks prior to planting, two trends can be observed. First, prices spike for the most sought-after varieties for sowing, that is, for the varieties that are most adapted, productive or which give the highest income return (i.e. those which could be used as potential seed). Second, around planting time, traders may distinguish among batches of the same variety which are 'well sorted and stocked' from batches 'less well sorted and stocked', adding a price premium. In Miabi, summarized that during sowing period, there was generally a 10-15% difference in the price of batches used for grain and seed. So for instance, cowpea for grain would sell at 2200fc/meke while that for seed would rise to 2500 fc/meke.

Seed-related prices, unlike grain prices, do not rise during the hunger gap periods (and immediately pre-harvest) so the patterns of price rise and fall are quite distinct for seed and grain. Figure 3.4 conceptually suggests these price trends.

Figure 3.4 Trends in crop and seed prices in local seed/grain markets through the season, showing seed price peaks at sowing time and grain price peaks before harvest. Seed price differential takes into account variety quality (for the most sought-after varieties), plus, sometimes, additional seed quality features (i.e. a price premium for well-sorted stocks).



Hence, overall, there are multiple signals to show that potential seed offers a real market: in trader and farmer sale/purchase behavior, trader seed sourcing patterns, and even in price. Strengthening the quality of seed on offer in local markets might represent an important opportunity for improving the seed the majority of farmers use.

Salient points: Formal + informal seed systems in Kasai Oriental

Plant Breeding

1. The only INERA (Institut National pour l'Étude et la Recherche Agronomique) research station currently serving the Kasai area is in Ngandajika about 90 m from Mbuji Mayi. A set of varieties have been released by INERA that are potentially suitable for the Miabi and Tshilundu zones, including varieties of maize, cowpea, groundnut, and cassava (white and yellow).
2. Farmer access to new varieties has been low: within SSSA sample only 4-12% of farmers accessing some new varieties within the last 5 years. A range is given as two-thirds of the new varieties came from local friends or the local market and could not be confirmed as 'modern'.

New Variety Multiplication/ Formal Seed Sector

3. SENASEM, the formal sector seed service, works within the Kasai Oriental zone mainly to oversee seed quality and regularly issues. It does not directly multiply seed as this capacity has been transferred to private sector seed multipliers. A total of 64 and 122 MT of SENASEM-linked seed was produced in Kasai Oriental in 2015 and 2016 respectively. Of that amount 60-75% was of diverse maize varieties with the second most important crop produced being cowpea. While produced locally, some of that seed tonnage was moved to customers in Kinshasha and elsewhere.
4. SENASEM works through agri-multipliers of whom 5 were listed in the Miabi and Tshilundu zones. These Agri-multipliers who are officially certified, have clear contracts with SENSAM and have met multiple screening requirements: good land, advanced agronomy training. The multipliers often sell to cooperatives such as COPROSEM but do not seem have their own

direct clear marketing strategy. They also do not establish variety trials or demonstration plots and, as such, rarely engaged directly with smallholder farmer end-buyers.

5. Farmers in the SSSA sample did not access any seed from the Agri-multipliers in the 2017B season.
6. The SSSA work identified no decentralized seed producers in the Kasai Oriental sites aside from the agri-multipliers. There were no examples found of community based seed production).

Variety input and delivery systems

7. The main delivery channel for the new varieties has been local markets and friends.
8. Agro-dealer stores were virtually non-existent in the SSSA sites. None (0) were found serving the communities of Miabi and Tshilundu. Two agro-vets were found in Mubji-Mayi, a town of 3,000,000 and they were selling primarily veterinary linked products (especially chicks) with a smattering of horticultural seed.

In brief, venues for producing and selling new varieties , and high quality seed are non-existent (for all extent and purposes) in the zones of assessment.

Informal Seed Sector

9. The informal system is the key one across crops in northern Katanga and supplies over 99% of the total seed sown, with notable exceptions being horticultural crops (cabbage, onions, tomatoes).
10. Local markets, in particular, serve as the backbone of seed provision. For example, resident farmers accessed (or will access) 53 % and 60 % of their seed from the local market for the main seasons 2017B and 2017/8 A, respectively.
11. Traders strategically manage their stocks of 'potential seed', that is, grain which can usefully be planted. Within the SSSA sample, the majority of traders regularly used seven distinct practices to manage seed so as to arrive at a better product e.g. keeping varieties separate, sourcing from specific regions and producers, and sorting out of inert debris- stones, dust, sticks, as well as damaged or immature grains.
12. Trader seed flows were relatively unobstructed during the time of assessment. Seed sold in Mbuji Mayi (beans, cowpea, maize and groundnut) comes from multiple production zones in the east, west and south. Concerns were expressed that south from the west, Kasai Central could become significantly constrained if instability in that area escalates. Supplies potentially available from other zones, however, were seen as being sufficient to fill in any shortfalls.

Given that the informal sector is an important force, opportunities for strengthening and professionalizing it further should be pursued. This might include explicit actions collaborating with seed/grain traders to: to introduce new varieties, raise seed quality and promote even more specialized seed trade.

IV. FIELD FINDINGS: ACROSS SITES

The fieldwork for the SSSA took place in May 2017, slightly before harvest for the 2017 'B' season. It unfolded in the province of Kasai-Oriental within the Democratic Republic of the Congo and was focused in two sites, Miabi and Tshilundu. The assessment was triggered to serve as one agricultural baseline in a newly-funded USAID/DFAP project. It also aimed to get an in-depth understanding of the seed system structures and processes in the region so as to strengthen farmers' seed security over the coming three to eight seasons (i.e. the length of the funded project).

The assessment considered two major themes. It analyzed the short-term, acute seed security situation, focusing on 2017 'B' season (March to June 2017) and the principal upcoming 'A' season 2017/8 (Sept to December 17/January 18). Seed procurement strategies, quantities sown and crop profiles were all examined.² As the second thrust, the SSSA considered medium-term trends, including possible chronic seed security problems and emerging opportunities. Issues explored included: crop diversification, agricultural product transformation, access to modern varieties, use of other inputs and seed aid received.

This section presents field findings on seed security across both assessment sites together as they seemed sufficiently similar to be considered as one unit of analysis (see Table 2.5). 'Acute' seed security findings, for seasons A and B 2017/8 are reported first, followed by analysis of the medium-term trends.

Acute Seed Security Findings: 2017 season B, and 2017-8 season A

Issues of seed security were scrutinized for the short term: how and where did farmers obtain seed for 'B' season, March to June 2017? Did they sow 'normal' quantities of planting material? What do they assess as their seed prospects for the principal A season, Sept to Dec/Jan 2017-8? (Note that seed system stability and resilience are best assessed by looking at several seasons in a row.)

Farmers' seed sources and quantities planted, season B, 2017

Table 4.1 and Figure 4.1 show the sources and quantities of seed actually planted by farmers for the season B 2017. Information is given in both table and graph form so as to make visible the relative use of sources and the scale of seed use from each. Several features are of note.

Overall, over 99+ of the seed farmers sowed came from local channels, including from farmers' own stocks, the local market, or through social networks of neighbours, friends and relatives.

A closer look reveals that farmers' local markets were somewhat more important than own stocks as a source of seed (53% and 32% of total seed sown respectively) and suggests the degree to which farmers may have to buy seed, routinely, season after season. (In fact, this routine reliance on local markets for seed is the highest ever recorded in an SSSA- see McGuire and Sperling 2016 for other cases). Local markets as a key seed source were important for all major crops but cassava. Cassava, the exception, is very rarely sold but is rather saved in farmers' home stocks (fields) or gifted through social networks of family, friends and neighbors. The high degree of cassava stems

² The seed security focus is on the three crops farmers each consider 'most important' so there may be some under-reporting of secondary crops, which are also key for nutrition and income.

and cuttings obtained through social networks is remarkable, almost 45% the cassava planting material used.

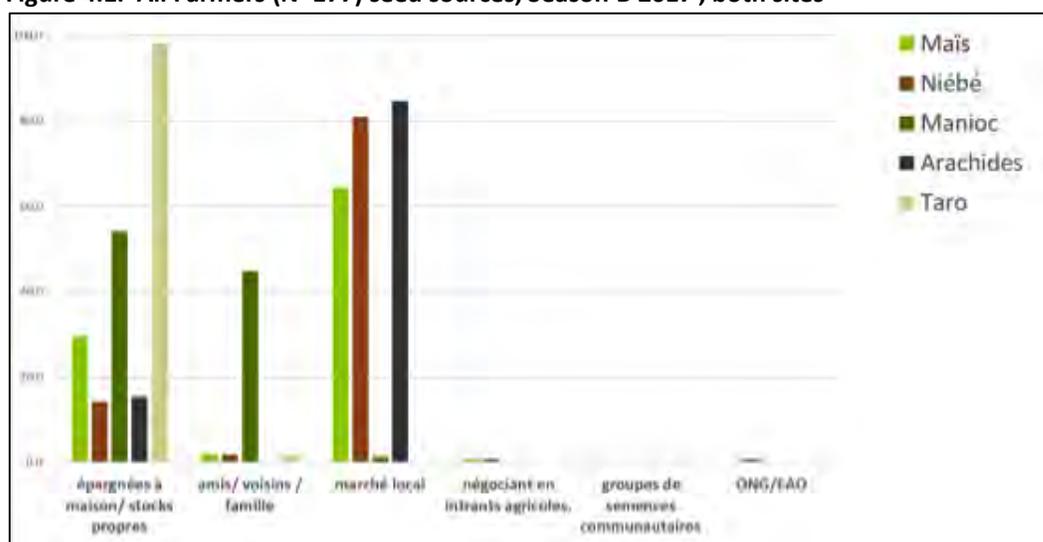
More formal seed sources, such as agro-dealers, government/NGO aid, or even seed from community-based groups, were virtually non-existent. Farmers in Kasai Oriental seem to have limited options for sourcing seed.

Table 4.1: Seed (kg) planted and sources all farmers used, season B 2017 both sites

Crop	kg total planted	% de total							
		Own stocks	neighbors/ family	Local market	Agro-dealers	CBSP	Gov't	NGO/ FAO	Contract farmers
maize	1271.3	29.6	2.0	64.4	0.6	0.0	0.0	0.0	0.0
Cassava	585.6	54.2	44.8	1.3	0.0	0.0	0.0	0.0	0.0
Sweet Potato	1.4	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Groundnut	352.5	15.5	0.0	84.5	0.0	0.0	0.0	0.0	0.0
Cowpea	599.3	14.4	1.7	80.9	0.8	0.0	0.0	0.8	0.0
Amaranthe	0.4	75.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
Taro	204.0	98.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Bambara	47.0	4.3	2.1	86.2	0.0	0.0	0.0	0.0	0.0
Soybean	8.0	12.5	0.0	87.5	0.0	0.0	0.0	0.0	0.0
Banana plantain	8.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Mustard	47.0	4.3	2.1	86.2	0.0	0.0	0.0	0.0	0.0
Watermelon	8.0	12.5	0.0	87.5	0.0	0.0	0.0	0.0	0.0
TOTAL - All	3124.3	33.2	9.7	53.4	0.4	0.3	0.0	0.1	0.0

* CBSP= community-based seed group

Figure 4.1. All Farmers (N=177) seed sources, Season B 2017 , both sites



Are farmers unusually seed-stressed, season B 2017?

To understand better any possible vulnerability, the SSSA team asked farmers to compare the 2017 B quantities of seed sowed, by crop, with what they would normally sow at the same time each year. Basically, the question was this: Were the 2017B patterns 'normal' or 'different' (sowing more or less) from what you usually do?

For all major crops, farmers reported that they had increased quantities sown, with an overall increase of 9.7% (Table 4.2). Sowing increases ranged from 7-14%. While this might seem as a positive trend, as farmers are giving more priority to agriculture, sow rates are also strongly influenced farmers perception that soils are poor: many farmers believe that higher sowing densities are need to encourage at least minimal harvests.

Table 4.2: All farmers - Amounts for season B 2017 - more, less, or same? *

Crop	# HHs	% of HH			% change for those sowing
		MORE	SAME	LESS	mean %
Maize	158	13.3	64.6	22.2	14.30
Cassava/Manioc	144	15.3	71.5	13.2	7.03
Groundnut	33	9.1	81.8	9.1	8.75
Cowpea	115	14.8	60.0	23.5	9.25
Bambara	11	18.2	63.6	18.2	0.00
Soybean	5	0.0	100.0	0.0	0.00
Watermelon	11	18.2	63.6	18.2	0.00
TOTAL - All	483	13.5	65.8	18.0	9.7

* Means are only calculated for crops with 5 entries or more

Sowing amounts portray only of the picture. For the major crops (those with larger sample sizes), farmers' judged yield and harvests as 'good' or average, for 72% of cases, especially for cassava and groundnut.

Table 4.3: Farmers' assessment of yield, by crop, 2017B season

Crop	How was the yield (%)		
	good	average	poor
Maize	34.1	29.1	36.8
Cassava	68.4	21.5	10.1
Groundnut	54.3	20.0	25.7
Cowpea	40.5	21.4	38.1
TOTAL	48	24	28

So, in brief, the 2017 B season seems to have been a fairly normal or even slightly positive one in terms of sowing quantities and yields. This does not obscure the fact that farmers describe ongoing

stresses, which are now considered 'normal'. *Inter alia*, these include 'changing season' (climate variability, low soil fertility, and select plant diseases (striga, *Alectra vogelii*), and high storage pests, etc.; see Chapter II: 'Seasonal overview', and this chapter, 'storage section').

Farmers' seed sources to be planted, 2017/8, Season A: are there changes in sources? Are farmers' seed stressed?

Farmers in Kasai Oriental region were asked the same questions on actual seed sources and quantities to be planted for the next major season, season A, Sept to Dec 2017/Jan 2018. While 'planned seed sources' are not 'hard' (directly-measured) data, they are a good indicator of whether farmers expect seed stress or other related troubles. The results for the upcoming season, below show a strong, continuing, and intensified reliance on local markets for seed (Table 4.4).

Table 4.4: All farmers - Seed planned by source, Season A 2017/8

Crop	kg total planted	Source		
		Own stocks/saved	Friends/family /neighbors	Local market
Maize	1848.1	36.2	1.5	62.3
Cassava	579.5	80.8	18.1	1.2
Sweet Potato	100.0	0.0	50.0	50.0
Groundnut	747.8	11.2	0.0	88.8
Cowpea	1033.6	29.8	1.6	68.1
Amaranth	0.6	0.0	0.0	100.0
Taro	5.0	100.0	0.0	0.0
Bambara	56.3	32.7	0.0	67.3
Soybean	23.5	12.8	0.0	87.2
Mustard	0.5	0.0	100.0	0.0
Total All	4394.7	35.4	4.5	60.0

Perhaps even more remarkable is that farmers' project greatly increasing overall quantities to sown-- increases of over 40% (Table 4.5) Again, this could be a positive sign of aiming to increase production... or it could be a sign of stress, an issue we examine in the next section.

Table 4.5: All farmers- Amounts for Season A 2017-8 more, less, or same?

CROP	% Households			% change for those who sow*
	More	Same	Less	Average %
Maize	36.6	58.5	3.7	42.94
Cassava/Manioc	37.3	58.7	4.0	32.02
Groundnut	42.3	53.8	1.9	46.14
Cowpea	39.4	55.1	5.5	54.77
Bambara/vouanzou	9.1	81.8	9.1	3.79
Soybean	40.0	40.0	0.0	
total - All	37.8	57.3	4.1	43.05

* Means are only calculated for crops with 5 entries or more

Focusing on potential problems areas and spurring production

The relatively normal picture for Kasai Oriental farmers in seasons A and B of 2017- 8 should not obscure the fact that there are still vulnerable populations : farmers stated in 18.0% and 4.1 % of crop cases that they were planting less of particular crops in the two seasons examined (Tables 4.2 and 4.5.). These are unusually small numbers as farmers everywhere routinely adjust sowing quantities as they change agricultural strategies.

Still, to understand more clearly the nature of any stress, farmers were asked to explain why they were planting less of a given crop. Diverse reasons were given [with the two seasons being reported side by side. Lack of money to buy seed, ill health and land constraints were the three major reasons cited. There were also many cases (reported in the category ‘other’) where farmers were planting less seed of a given crop as they were opening new land or testing a parcel-- as plot use is very fluid in this region. (People are coming back to farming and putting less emphasis on mining). Perhaps key here is that almost no farmers (2.3% for season B and 0% for season A) indicated they were planting less due to unavailability of seed or cuttings (Table 4.6). This means that giving free seed--when farmers are planting less—would not have addressed their problems at all.

Table 4.6: Reasons (% of responses) all farmers cited for planting LESS of a given crop in Season B 2017 and Season A 2017/8

Reason	Season B (N=49)	Season A (N20)
SEED- RELATED (or indirectly linked)		
<i>Seed availability</i>		
No seed available in market	0.0%	0.0%
No seed/cuttings available from neighbors	2.3%	0.0%
<i>Seed access</i>		
No money to buy seed/poor finances or seed too high	19.5%	30.0%
<i>Seed quality</i>		
Seed available is not good quality or the variety is not liked	4.6%	0.0%
sub-total: Seed-related	26.4%	30.0%
NON-SEED FACTORS OF PRODUCTION (Limits)		
No/insufficient labor	4.6%	5.0%
Illness/health problems	24.1%	5.0%
No/insufficient land/ land not appropriate/fertile	11.5%	10.0%
Lack of tools/tractor/ other machinery to farm	1.1%	5.0%
Plant pests/diseases make production not possible	3.4%	0.0%
Animals/predator make production not possible	0.0%	0.0%
Lack of other inputs: controlled water supply/irrigation or fertilizer	0.0%	0.0%
Poor weather/rainfall	8.0%	0.0%
Insecurity	1.1%	0.0%
sub-total: Factors of production-related	56.3%	25.0%
OTHER PRIORITIES/STRATEGIES		
Markets for crop or crop products not well-developed	6.9%	0.0%
Other priorities than agriculture (e.g. have shop)	0.0%	5.0%
Other	9.2%	30.0%
Changing crop priorities or agricultural practices	0.0%	0.0%
TOTAL	98.9%	90.0%

Box 6 further explores some of the unusual reasons why farmers in Kasai Oriental planted/will plant less during the two seasons monitored in the SSSA.

Box 6: Why some farmers planted less in 2017 B insights from Kasai Oriental, non-seed related

- ‘I am trying out a new parcel and want to test how it produces. Better not to use too much seed this time
- I have some great quality seeds- so I can plant less and still expect very good production

Hence, farmers’ planting less of a given crop might not be a sign of stress at all. ‘It depends’ and key is understanding the reasons why for a given strategy.

Is money an issue shaping seed security: seed expenditures

In reviewing seed security constraints 2017B and 2017/8, the issue of money constraints is raised in a good number of cases (20-30% of cases per season for those sowing less). Farmers say they planting less of a given crop because they don’t have the resources to buy or get additional seed.

Table 4.7 looks at this more closely. It presents calculations of money needed for the three major crops, according to actual average amounts planted. Average expenses seem unusually modest: \$ 3 and \$7 for the two seasons respectively, for the two major crops, maize and cowpea, and \$ 15 and \$21 respectively (season A and B) for those also plant groundnut. The SSSA team sensed these affordable for the large majority of farmers (and this conclusion is supported by the absolutely low number of people planting less, and then the subset decreasing planting due money concerns.

Table 4.7: Farmers’ Average spending for seed, 3 main crops, Season B 2017, Season A 2017/8

Three main crops	#	Local market	Agro-input	
Season B	sowing		shops	
Maize	159	4313.9	0.0	
Cowpea	115	373.2	0.0	
Groundnuts	33	13543.2	0.0	
Total (of 3)		21233.2	0.0	\$15 – 3 crops \$3 for 2 major
Three main crops	#	Local market	Agro-input	
Season A	sowing		shops	
Maize	164	5850.2	0.0	
Cowpea	127	4435.3	0.0	
Groundnuts	52	19146.6	0.0	
Total (of 3)		29432.0		\$ 21- 3 crops \$7 for 2 major

Spurring production

To complete this analysis of the rationale for farmers’ planting decisions, this section looks at what seem like positive reasons for changes in sowing strategy, focusing those who planted more in 2017 B and planning for 2017-18A (Table 4.8). Households planted more mainly because: they had a good harvest prior and seed was more readily available; they were giving more priority to agriculture or, and especially as they got more access to land. All of these are positive reasons. However, a large

group of farmers planting more seed because they hoped to compensate for poor sowing conditions and particularly low soil fertility (recorded under ‘other’). In Kasai, ‘sowing more seed’ is a sign of mixed trends—negative as well as positive (see also Box 7).

Table 4.8: Reasons (% of responses) all farmers cited for planting MORE of a given crop in Season B 2017 and Season A 2017/8

Reason	Season B (N=65)	Season A (N=185)
SEED RELATED		
<i>Seed availability</i>		
More seed available due to good harvest	12.3%	1.6%
More seed available due to free seed	1.5%	0%
<i>Seed access</i>		
More money to buy seed or seed price low	1.5%	2.7%
Got credit to buy seed	0%	0%
<i>Seed quality</i>		
Have especially good seed or good variety	0%	0%
sub-total: Seed-related	15.4%	4.3%
NON-SEED FACTORS OF PRODUCTION (opportunities)		
Good/increased labor	4.6%	7.0%
Feeling strong/healthy	1.5%	2.2%
Have more land/more fertile land	35.4%	45.4%
Have tools/tractor, other machinery to help farm	0%	0%
Have access to irrigation, fertilizer or other inputs (i.e. stakes	0%	0%
Good weather/rainfall	1.5%	0%
Good security (peace has arrived)	3.1%	0%
sub-total: factors of production-related	46.2%	54.6%
OTHER PRIORITIES/STRATEGIES		
Well-developed /new markets for crop or crop products	1.5%	2.2%
Have decided to give more priority to agriculture	10.8%	15.1%
Change in profile of crops	1.5%	0.5%
Other	23.1%	22.7%
TOTAL	98.5%	97.5%

Box 7 further explores some of the unusual (non-seed) reasons why farmers in Kasai Oriental planted/will plant more during the two seasons monitored in the SSSA.

Box 7: Why some farmers planted more in 2017 B, insights from Kasai Oriental- non-seed related.

- “ I have a big family (n=32 extended members) and can easily access the labor”.
- “The soil is so infertile that I have to plant more seeds to get the same results”
- “I can have got access to a new parcel. —so, more land more seeds”

Note that the second reason, soil infertility was cited in many cases. Farmers describe a strong relationship among sowing density, quality of seed and especially fertility of the soil. The soil type and fertility seems to strong shape crop and seed choice—and this is an area for further study as soil enhancement and crop/seed choices may be expanded.

Can the markets deliver seed 2017-8?

In all of this, the key question concerning seed security in Kasai Oriental becomes “Can the markets deliver”? Will seed be put on offer, with the quality that farmers want and at prices that make purchase accessible for smallholder farmers? Simply, the lion’s share of seed is sourced from local markets.

Market seed availability

As has been shown in these field findings, formal sector seed is insignificant in supplying Kasai-Oriental farmers with planting material. Rather, farmers get large amounts of their seed from local markets: they carefully seek out ‘potential seed’ from the grain supplies, by looking for specific varieties and seed batches which are clean and well-stored. Further, as shown in Table 4.4, farmers in the assessment zones intend to increase significantly the quantities of seed planted for the upcoming 2017/8 main season. The issue is whether supplies of local market seed can meet this demand.

Several sources of information (which triangulate varied data) show that seed availability will likely not a problem in the zones of assessment for the 2017/8 planting season.

First, seed flow maps (figures 3.2 and 3.3- page 20) demonstrate that there are multiple sources of seed/grain for all the major crops. This means a poor harvest in Miabi/Tshilundu would not necessarily lead to the unavailability of potential seed in the immediate local markets, as surrounding regions are the main sources--- from multiple directions and supply sources.

Further, farmers themselves said that 2017 B season had been an average or good season in 72% of cases (across crops). For the upcoming season, 2018 A, they sense they will be able to source at least a third of the seed from home stocks— and the funds for sourcing the quantities of seed they need from local markets seems unusually modest (table 4.10 above).

The SSSA team also interviewed a number of very large traders in Mbuji Mayi who somewhat control the seed supply (or ‘potential seed’ supply). Where there were multiple responses (maize and common bean, large traders deems supplies available as ‘normal’ or ‘more than normal’). and for maize prices, at least, seem to reflect availability for this central crop (Table 4.10).

Table 4.9: Larger traders’ in Mbuji Mayi Assessment of Changes in Seed Quantities, Compared to Normal, May 2017

	Less	Normal	More
Maize (n = 5)	X	X	XXX
Groundnut (n = 1)	X		
Common Bean (n = 2)		XX	
Cowpea (n = 1)	X		

Market seed access/price

As with many seed security issues identified so far, one of the major constraints revolves around market price and farmers’ purchasing power. In terms of actual expenses for farmers (Table 4.7), the layout in cash seems modest and traders interviewed suggested that prices for the key crop,

maize were actually decreasing. (The other sample sizes for other crops not big enough to make conclusions.)

Table 4.10: Traders' Assessment of Changes in Seed Prices, Compared to Normal

	Current season (avg price per kilo)	Last season (avg. price per kilo)	% Change
Maize (n = 6)	560	647	-13%
Groundnut (n =1)	1,500	1,500	0%
Common Bean (n = 2)	2,667	1,250	113%
Cowpea (n = 1)	567	667	-15%

Market seed quality

Finally, the potential seed was assessed as available in all sites for 2017/8, but was the quality on offer acceptable? The SSSA team did not effect objective seed quality assessments, but rather drew on systematic farmer and trader insights, and on visual inspections in select markets. Hence the quality assessments are qualitative ones.

From the farmer point of view, overall seed sown 2017 B was generally good (78% of cases) or average (14% of cases), with seed specifically sourced from the market assessed as 'good' and 'average' in 73% and 14% of cases, respectively. (Hence, there was no real difference in seed quality form all sources versus seed specifically sourced from the local markets) The two crops where there were some seed quality issues, maize and cowpea, are those with high storage-linked issues. As to traders, they recognize the market for 'potential seed', and exerted multiple actions 2017B to improve the quality of the product they put on offer (Chapter III- section on seed/grain markets).

Visually, the SSSA team visited two market centers and reviewed stocks of a range of crops that are used for seed, especially maize and legumes (common bean, cowpea, greengram, Bambara). Stocks were generally well-sorted, by variety, and free of any inert material (stones, sand, sticks, debris). Grains did not show any visible damage (e.g. bruchid damage or breaking)

Table 4.11 Farmers' assessment of the quality of seed they sowed season 2017 B

Crop	N total	Seed Quality			N			%		
		Good	Average	Poor	Good	Average	Poor	Good	Average	Poor
Maize	183	132	31	20	72.1%	16.9%	10.9%			
Cassava	160	129	24	7	80.6%	15.0%	4.4%			
Sweet potato	1	1	0	0	100.0%	0.0%	0.0%			
Groundnut	35	33	1	1	94.3%	2.9%	2.9%			
Cowpea	126	97	16	13	77.0%	12.7%	10.3%			
Banana	2	2	0	0	100.0%	0.0%	0.0%			
Velvet Beans	2	2	0	0	100.0%	0.0%	0.0%			
Lima bean	12	8	3	1	66.7%	25.0%	8.3%			
Sunflower	5	5	0	0	100.0%	0.0%	0.0%			
Tomato	1	1	0	0	100.0%	0.0%	0.0%			
Onion	1	1	0	0	100.0%	0.0%	0.0%			
TOTAL-all crops	528	411	75	42	77.8%	14.2%	8.0%			

Overall, for quality, there was no evidence that the current quality of seed and other planting material, across crops, was different from the norm, or was particularly 'bad'. There was also no evidence that the quality of seed sourced from the market was different from seed sourced elsewhere (i.e. home stocks or neighbors). That does not mean that the quality of market seed, in particular cannot be improved as so much of the seed farmers sow comes from this source. Efforts to improve quality further, varieties on offer and the seed quality per se (e.g. health and germination rates) could certainly be explored by working more closely and more systematically with a range of traders (Box 8).

Box 8: Working with market traders to improve seed on offer in Kasai Oriental

Given that local markets, and traders are the backbone of farmer seed supply (40-60% of seed for select major crops) much more attention might be given to ensuring that these markets can supply the kinds of seed farmers need. One major challenge is how to leverage traders' efforts to gradually improve the quality of seed on offer in normal market channels.

- Seed/grain traders could be potentially powerful partners in helping to move *new modern varieties* widely within and among stressed farming communities. Methods should be tested for directly linking formal sector seed supply with informal trader seed/grain sellers. Sale of small packets of seed; and more systematic sale of modern varieties in bulk are options that approaches that have had marked success in other countries in East and Central Africa.
- Seed/grain traders could also be partners in improving the seed quality *per se*. Procedures for (*inter alia*) segregating among varieties and reducing percentage of sub-standard grains could give farmer clients a better return for their purchase. Initial quality-related interventions have had promising results in West Hararghe, Ethiopia. Since 2002, those supplying CARE's relief seed program have been required: to have a license; separate out varieties, have a warehouse; and maintain specific seed stores (which are clean and insect free). CARE also trains traders in seed quality issues, and withdraws contracts from those who deliver substandard material. Such awareness-raising, capacity building and monetary incentives (such as CARE's) might be possible measures for encouraging gradual seed/grain quality improvements in other places.
- Traders could also be key sources for disseminating variety and seed information (e.g. which varieties are available and from where, cost, quality, performance). Traders move even in remote communities and equipping them with up-to-date seed-related information would raise awareness quickly among clients, but also among other important trader suppliers.

(Adapted from Sperling and McGuire 2010)

In sum, for the analysis of market seed, quantities seem to be available across a range of crops (that can be sourced from multiple sites), needed cash outlays for farmers are modest, with the price of the key maize crop decreased this season, and the quality on offer was acceptable to farmers.

Community assessment of seed security

As a final cross-check to the above multi-source data, the communities themselves were asked to assess the seed security of their members. Seed Security was defined as either having the seed already in hand, or being able to access the seed with some certainty (through purchase, barter, gift, or other means). Community meetings at all sites involved upwards of 30 people, men and women, and the discussions were intense and interactive.

Table 4.12 presents the communities' own assessment of those within their village who they deem seed secure for major crops for the upcoming 2017-8 A season.

For Miabi, the community itself suggested it is 100% seed secure. For Bakua Lukanda, the community assessment was largely seed secure with a single issue being raised around maize. Clearly, the communities did not see the upcoming season as being a highly stressed one.

Table 4.12: Community self assessment of those having seed security 2017/8 A season

CROP	% HH having seed security
<u>Miabi</u>	%
Maize	100
Cassava	100
Cowpea	100
Groundnut	100
<u>Bakua Lukanda</u>	
Maize	50
Cassava	100
Cowpea	100
Taro	100

Summary: Acute Seed Security Findings

Diverse indicators suggest the seed security of Kasai Oriental farmers in the short-term is stable. (note that the analyses compared 'like seasons'. B with B and A with A.)

From the farmer point of view, 2017 B and 2017/8 A

1. For the 2017 B season (March to June), farmers sowed more than normal in (+9.7%) in terms of overall quantities planted. Crop yields were rated to be generally good or average in 72% of cases.

2. Farmers relied on local channels to access 99% of their seed during the 2017 B season. Local markets were the crucial core for ensuring seed security, supplying 54% of total seed sown especially for crops such as maize and legumes. 'Friends and kin' as a source were important especially for the vegetatively-propagated crops (cassava and sweet potato), which has key implications for how these cuttings might move more widely and quickly.
3. For the 2017B season, seed from formal seed sources, such as agro-dealers, government/NGO aid, or even seed from community-based groups was virtually non-existent. (Farmers in Kasai Oriental seem to have limited options for sourcing seed.)
4. Farmer projections for the 2017/8 main season show an unusual increase in the amounts to be sown across crops, overall +43%. (so jumping from +9.7% to +43%. one season to the next). While this upward trend might seem positive, the reasons for this strategy suggest a more nuanced picture (point# 7) (e.g. need to sow higher rates to combat low levels of soils fertility).
5. The overall upward trend in sowing rates should not obscure that there may be still vulnerable populations within the SSSA sample. Farmers were/will be planting less in 18% and 4% of crop cases respectively for the 2017 B and 2017/8 A seasons. (This is a relatively low % as experience from elsewhere shows that farmers routinely change sowing rate and crops profiles and often from season to season. So some up and down movement can be expected.)
6. The rationale for using less seed (a general proxy for decreasing land area) is key. During the two seasons reviewed, farmers gave three main reasons for sowing less: Lack of money to buy seed, ill health and land constraints. Important is that virtually no farmers (2.3% for season B and 0% for season A) indicated they were planting less due to unavailability of seed or cuttings. This means that giving free seed- when farmers are planting less—would not have addressed their constraints.
7. Understanding farmers' rationale for expanding seed use (a general proxy for expanding land area) is also central for planning how to spur production. Households did or will plant more mainly because: they had a good harvest prior and seed was more readily available; they were giving more priority to agriculture or, and especially as they got more access to land. All of these are positive reasons. However, a large group of farmers planting more seed because they hoped to compensate for poor sowing conditions and particularly low soil fertility (recorded under 'other'). In Kasai, 'sowing more seed' is a sign of mixed trends—negative as well as positive.

So overall, from the farmer viewpoint, there seems to be no acute stress- simply restricted seed sources and ongoing problems with ill health, land access and especially low soil fertility—all shaping seed use.

On the supply side, 2017/8 A

Given farmers' dependence on the local markets for large proportions of their stock, important questions for seed security in the 2017/8 season revolve around markets. Can they supply enough seed and acceptable seed? Subsequently, can farmers then afford the seed on offer?

8. Seed availability. Several sources of information show that seed availability will not be a problem in the zones of assessment for the 2017/8 season.

- Seed flow mapping demonstrates that there are multiple sources of seed/grain for all the major crops from the south, east and western adjacent areas (see precise seed flow maps). All normal supply routes remained open at the time of the SSSA. That said, traders expressed some concern about future supplies continuing from the west, Kasai Central, should the unrest continue.
 - Farmers assessed that 2017 that 2017 B had been an average or good season in 72% of cases (across crops). These production gains translate as more seed available for the upcoming season.
 - The very large traders in Mbuji Mayi assessed that seed stocks for maize, the key crop, would be at normal or above normal quantities. (Sample sizes for other crops were too small, one or two traders- but no critical constraints were signalled. none)
9. Seed quality. Will the quality on offer be acceptable? While the SSSA team did not conduct objective seed quality assessments, the team did gather farmer and trader qualitative insights. There was no evidence that the current quality of seed and other planting material, across crops, was different from the norm, or was particularly 'bad'. The opposite, the quality was deemed quite good.
- From the farmer point of view, the quality of seed sown 2017 B was generally good (78% of cases) or average (14% of cases), with seed specifically sourced from the market assessed as 'good' and 'average' in 73% and 14% of cases, respectively. Hence, there was no real difference in farmers' assessment of seed quality from all sources versus seed specifically sourced from the local markets) The two crops where there were some seed quality issues, maize and cowpea, are those with high storage-linked losses
 - The SSSA team visited two market centers and reviewed stocks of a range of crops that are used for seed, especially maize and legumes (common bean, cowpea, greengram, Bambara). Stocks were generally well-sorted, by variety, and free of any inert material (stones, sand, sticks, debris). Grains did not show significant visible damage (e.g. bruchid damage or breaking).
10. Seed price/access issues. While money is often the constraint in seed use for smallholder farmers, this constraint was not marked in this Kasai Oriental assessment. Average expenses for seed purchase seem unusually modest: \$ 3 and \$7 for the two seasons respectively, for the two major crops, maize and cowpea, and \$ 15 and \$21 respectively (season A and B) for those farmers who also plant groundnut. The SSSA team sensed these affordable for the large majority of farmers. Further, large traders indicated that maize prices were decreasing, down 13% comparing from 2017B from previous.

In sum, for the analysis of market seed, quantities seem to be available across a range of crops (that can be sourced from multiple sites), needed cash outlays for farmers are modest, the price of the key maize crop decreased this season, and the quality on offer was acceptable to farmers.

Community summary

How did communities themselves assess the potential of their members to achieve seed security (that is, having seed in stock or being able to access it elsewhere?) For Miabi, the community itself suggested it is 100% seed secure. For Bakua Lukanda, the community assessment was largely 100% seed secure with a single issue being raised around maize. Clearly, the communities themselves did not see the upcoming season as being a highly stressed one.

Overall, in the short-term, for season B 2017 and upcoming season ! 2017/18. The seed security situation is stable: farmers are sourcing from their normal sources, they are increasing sowing rates, acceptable seed is available from the markets and at 'affordable costs'. That said, 'normal' in Kasai Oriental shows signs of extreme and constant stress: farmers are routinely buying large quantities of seed from the locale markets season after season, and they have elevated sowing rates to compensate for what they describe as low fertility soils.

We look more closely at these possible chronic stress issues in the next section.

CHRONIC SEED SYSTEM CONCERNS + OPPORTUNITIES

This analysis now moves to examining more systemic trends in Kasai Oriental agricultural and seed security. Community-level assessments were done in all sites and involved a range of methods: community meetings, special focus groups with women, key informant interviews with government leaders, business men, NGOs staff and others), and market analyses. The varied methods allowed for cross-verification and opened possibilities to assess medium-term trends. The following topics are highlighted below: crop diversification and processing, dynamism in use of seed sources, access to new varieties and use of select inputs: inorganic and organic fertilizers and seed storage chemicals.

Crop diversification and (few) value added products

Communities in Miabi and Tshilundu provided overviews of major crops sown in their area, and rated their respective importance for food consumption, income, and possible transformation from raw agricultural goods into value-added products geared to increasing revenue margins (Table 4.13, sample results from Miabi below) While the community overall seems to grow a range of crops, closer scrutiny raises a number of issues. There is little crop specialization: nearly all are used for both food and income. Also transformation levels overall are very low, mainly only resulting in different types of flour and local alcohol.

Table 4.13: Miabi: crop diversity but little transformation (or specialization)

Crop	Importance for food	Importance for income	Transformation?
Maize	+++	+++	local alcohol, flour
Bambara	++	+	-----
Cowpea	+++	+++	-----
Cassava	+++	+++	local alcohol/ flour
Groundnut	+++	+++	Gnut milk
Soybean	+	+++	flour
Sweet potato	++	++	-----
Amaranth	+++	+++ - +++	-----

X indicates relative levels of importance, with more X's being relatively more important

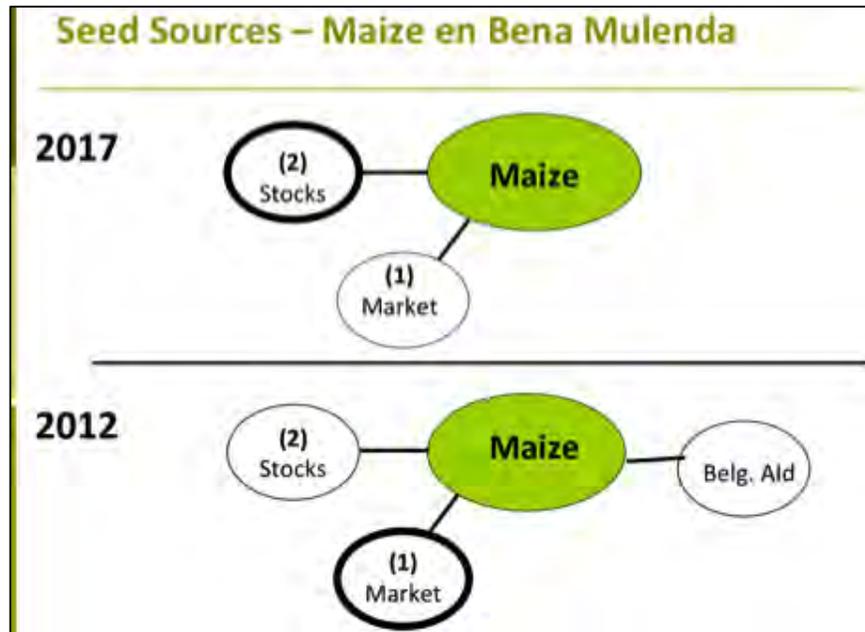
The SSSA team noted exceptions to these diversification trends. For instance, some of the poorest farmers rely on basically one crop- cassava (Box 2, page 11).

Seed system sourcing-- dynamic trends

Community mapping of seed sources trace general trends in seed source strategy. Groups mapped seed sources for a particular crop and compared current sources with those used five years previous. The analyses (Figures 4.2, 4.3) show that there has been no dynamism in sources— and no real choice at any period. The absence of any more business-oriented sources is notable.

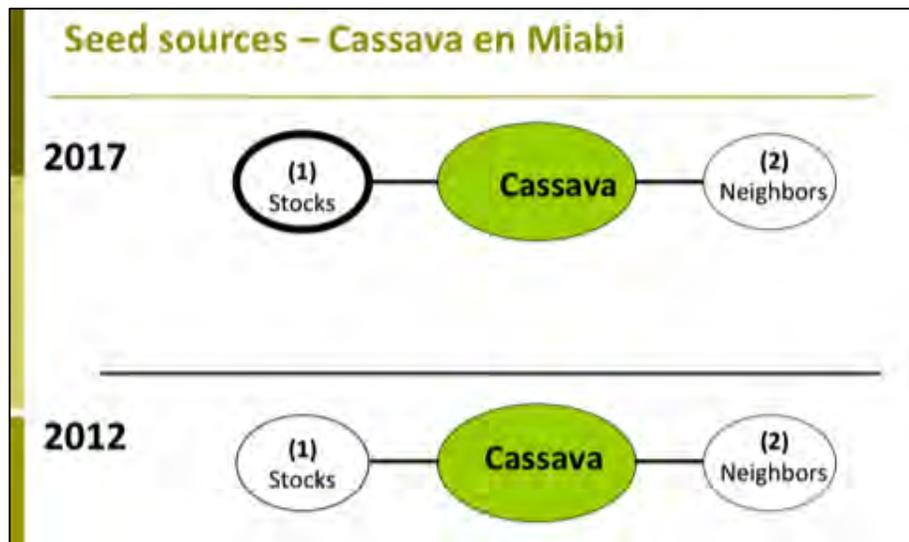
The first example is drawn from Bena Mulenda and focuses on maize seed. The only difference in sources from five years ago, is that there is no longer Belgium seed assistance in the area.

Figure 4.2 Maize seed sources in Bena Mulenda



A second example comes from Miabi and focuses on cassava planting material. There has been absolutely no change in five years—not in sources or in the importance of sources: own stocks, neighbors and nothing more.

Figure 4.3 Cassava planting material sources in Miabi

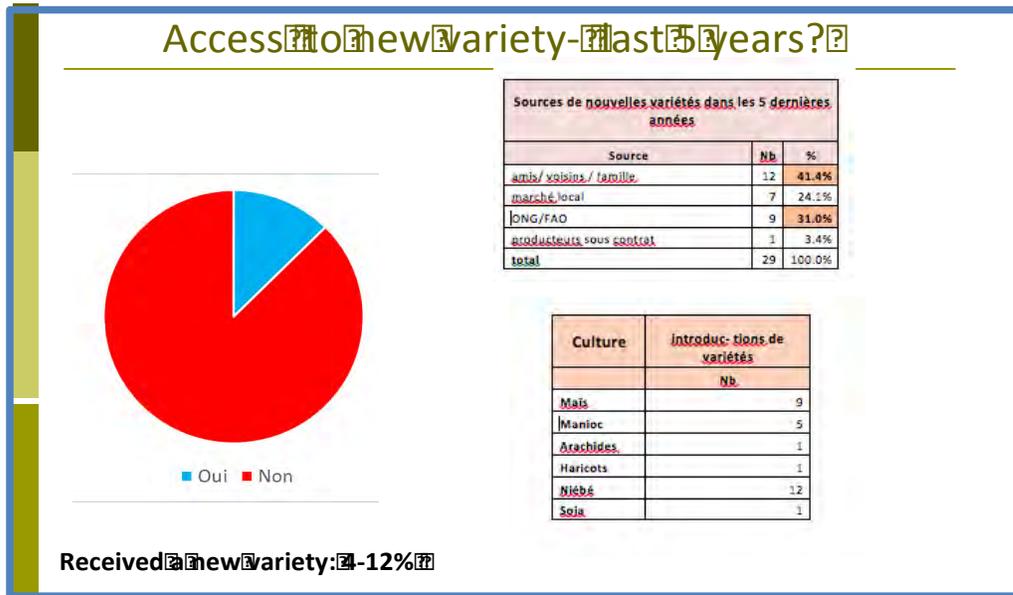


In fact, when questioning was opened in all three communities where community group interviews took place, farmers could not list any crop where there had been major changes in seed sourcing in the five-year period.

New varieties

Continuing to search for innovation, the issue of new varieties has been examined. Within the context of assessing seed security, it is especially important to consider new variety access as varieties can be an economical way to increase production quickly. Figure 4.4 and Table 4.14 show the extent of variety introductions ‘during the last five years’ within the sites sampled. Only 4-12% had accessed a new variety in the last 5 years, with a range given as two-thirds of the new varieties came from local friends or the local market-- so could not be confirmed as modern. New varieties were largely accessed for the crops of maize, cowpea and cassava. The need for ongoing and innovative variety delivery channels seems pressing (Box 8).

Figure 4.4. Farmers’ sources of new varieties, 2012-2017 (‘last five years’).
Table 4.14 new variety types, by crop.



Box 9: A number of varieties released but not in farmers' hands

Varieties have been released for all major crops in Miabi and Tshilundu: maize, cassava and cowpea.

However, follow-up of farmers' access to these varieties shows very modest results. Only 12% in the full sample had had access to new varieties in the previous five years and most of these were obtained through family or friends or from the local market-- suggesting they not were necessarily modern varieties (but simply new to the region). SSSA calculations estimate that 4% of farmers have recently accessed a modern variety (see table 4.13).

In contrast, Miabi farmers are eager for new varieties and even asked for several by name--- Mus, Mudishi (maize) ---having heard them advertised on the community radio.



Input use: Fertilizer + Manure/Compost + Storage Chemicals

Select input use was also considered during the Kasai Oriental assessment as a complement to the seed security analysis. This included attention to farmers' use of a) inorganic fertilizer, b) manure and compost, and c) seed storage chemicals. Do farmers in this Kasai Oriental region use non-seed inputs? The short answer is a strong 'no'. 'No' across farmers of all types.

For mineral fertilizer, 2% used 2017 B season with the same 2% projected for 2017/8A. Generally farmers indicated either that it was unavailable or just too expensive.

For compost/manure, 25% used some organic input- but mostly kitchen residue (95+% of those saying 'yes') . Main reasons for non-use were that it was not available (especially for manure) or that they do not how to use this organic material.

The lack of storage chemical was perhaps the most surprising as losses in storage are alarmingly high, 25=95% of what is stored (figure 4.6) . (Note that the soybean 95% loss depicted in Figure 4.6, was a single case.)

Figure 4.5: Use of select inputs by farmers within the SSSA sample, 2017 B

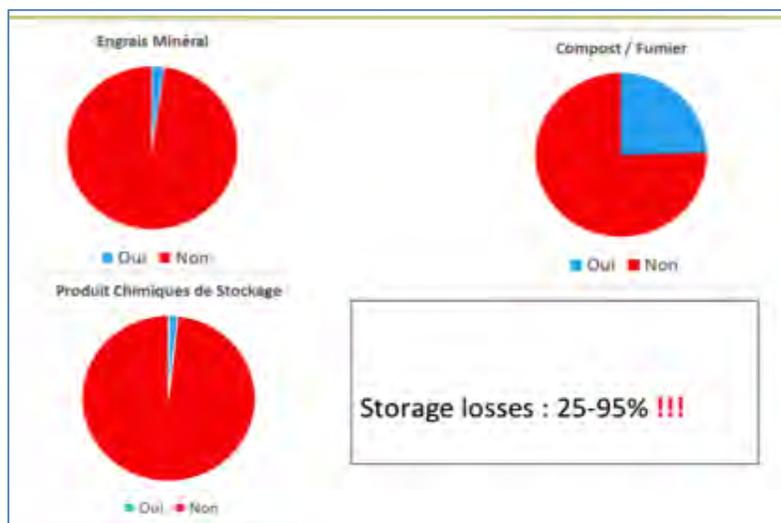
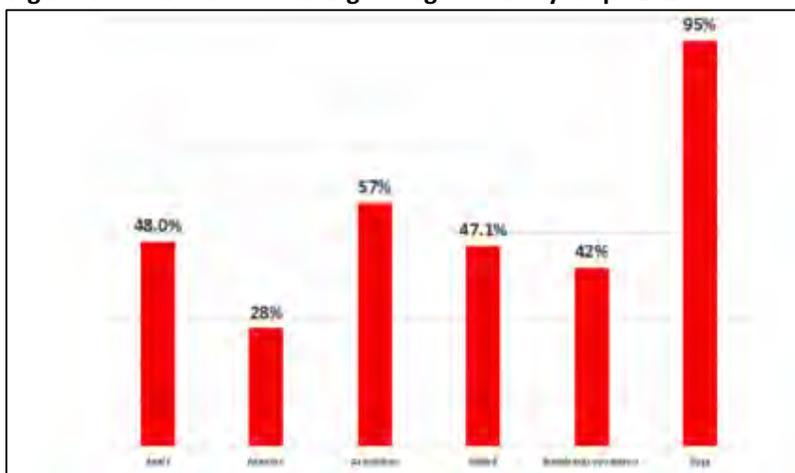


Figure 4.6. Farmers estimating storage losses by crop 2016



Clearly, technical strategies for combatting these storage losses would seem to be a number #1 action priority

Seed aid

Seed aid, that is free distribution of seed as part of emergency response and development initiatives, has been virtually non-existent in the sites monitored. Only about 5% of households have received seed aid with the last five years and with an average of a single delivery. (Unlike many stressed areas in Africa, even the aid response has not been functional in these Kasai Oriental zones)

Summary: Chronic Seed Security Findings

The review of medium-term trends in seed security in Kasai Oriental showed very little dynamism or innovation of any sort. In contrast, key bottlenecks were identified.

1. While the communities in the SSSA sample seem to grow a range of crops, closer scrutiny raises critical issues. There is little crop special specialization: nearly all are used for both food and income. Also transformation levels overall are very low, mainly only resulting in different types of flour and local alcohol.
2. Seed system channels have remained static over the last five years for all crops. There has been virtually no outside innovation. (As indicated above, 99%+ of seed is still sourced from local channels- from home stocks, neighbors/friends, and local markets. Even seed aid does not exist as an innovation source)
3. New variety access within the sample even has been unusually low, even though the area (Mbuji Mayi as the referent point) is about 95 km from a major research station in Ngandajika. Overall, only 4-12% of the SSSA sample had accessed a new variety in the last 5 years, with a range given as two-thirds of the new varieties came from local friends or the local market-- so could not be confirmed as modern varieties. New varieties were largely accessed for the crops

of maize, cowpea and cassava. The need for ongoing and innovative variety delivery channels seems pressing.

4. There is virtually no decentralized seed multiplication in the zone: no way farmers can get quality seed or quality cuttings. Farmers in the sample did not access any seed from the Agri-multipliers operating in the zone (at small scale), and agri-multipliers were even transporting some of their quality seed out of the zone to Kinshasha and elsewhere.
5. Similar to #10, there are few agro-enterprise opportunities in the area, although there is some milling of flour and production of palm oil soap.
6. Do farmers in this Kasai Oriental region use non-seed inputs? The short answer is a strong 'no'. For mineral fertilizer, only 2% used 2017 B season with the same 2% projected for 2017/8A. Generally farmers indicated either that it was unavailable or just too expensive. For compost/manure, 25% used some organic input- but this was mostly kitchen residue. Main reasons for non-use were that it was not available (especially for manure) or that they do not know how to use this organic material.
7. The lack of use of storage chemical (<2% of sample) was perhaps the most surprising gap as losses in storage are alarmingly high, 25-95% of what is stored [losses especially in maize and the legumes (groundnut, cowpea, bambara and soybean)].
8. Seed aid, that is free distribution of seed as part of emergency response and development initiatives, has been virtually non-existent. About 5% of households have received seed aid an average of one time with the last five years. (Unlike many stressed areas in Africa, even the aid response has not been functional.)

In sum, overall there seems to be very little agricultural (no?) innovation in Kasai Oriental. There are negligible ways for farmers to access new varieties or quality seed, virtually no agro-enterprise and little non-seed input use. In contrast, the agricultural and seed stresses are pressing (alarming), especially the soil fertility concerns and storage losses.

The main issue is where to start: on what interventions? and how to design them to serve all farmers in this remote and chronically stressed region.

Kasai Oriental might serve as a 'poster child' on how to jumpstart smallholder agriculture in a truly chronically stressed agriculture region.

V. OVERALL RECOMMENDATIONS

The opportunity for the SSSA team to conduct assessments in two sites of the Kasai Oriental provided the field teams a useful perspective on seed security in this eastern Congolese region.

Overall, the SSSA did not find constraints that warranted an ‘emergency response’. The problems are chronic, deeply ensconced ones. Hence, the recommendations center on actions to alleviate chronic stress and to seize upon developmental opportunities.

Recommendations

The opportunity for the SSSA team to conduct assessments in two sites of the Kasai Oriental provided the field teams a useful perspective on seed security in this eastern Congolese region.

Overall, the SSSA did not find constraints that warranted an ‘emergency response’. The problems are chronic, deeply ensconced ones. Hence, the recommendations center on actions to alleviate chronic stress and to seize upon developmental opportunities.

The recommendations below are practical and doable one; implementation of such actions can lead to positive changes within the four-year timeframe of the DFAP project.

Below, find a set of recommendations that are applicable across Kasai Oriental sites. These are loosely clustered into six themes.

I. New varieties: making these more accessible: Delivery outlets and approaches

Modern varieties seem to exist for Kasai Oriental that have been confirmed to be adaptable and acceptable to farmers in the specific zones of action (see Chapter. III, Table 3.1). This recommendation focuses on how to get these new varieties out to farmers. Farmers need regular access to outlets that can provide them (through sale) with the new varieties they desire.

1. Sale Outlets. Current formal sector outlets are non-existent in the two SSSA region sites. In addition, only two agro-vets shops were found in larger town center of Mbuji Mayi (a town of 3 million people) and, in terms of seed, focused on packets of horticultural crops (so no legumes, no maize). Sale points need to be opened up in rural communities.
 - Sale points could consist of specialized stores vending only agricultural inputs and related tools.
 - A more realistic approach might be to sell seed in the already existing general stores and boutiques that serve the rural population with such basic goods as sugar and oil. Rural shop owners would need to be trained in seed-specific management and seed-related information as well as in general input marketing and business skills.

2. Awareness-raising and confirmation plots. Variety testing trials and demonstration plots might be installed directly adjacent to where sales are taking place. Church partners as well as local market merchants might also be encouraged to establish awareness-raising and confirmation plots (These plots could additionally confirm that the varieties are truly adapted and that farmers and traders find them acceptable.)
3. Small packs Packaging should be arranged in farmer- affordable sizes of 250g, 500 g and 1 kg sachets (especially for the legumes). Farmer-focused, small packs sales might be tested in the range of venues where farmers routinely buy seed and other goods. Small pack seed is certified and sale models should be geared to giving a large number of farmer customers access to these high quality products.
4. Traders: new varieties of certified seed. Given that local markets (and their traders) are important for farmers' seed supply, more attention should be given to engaging these open seed/grain markets to supply the kinds of varieties farmers need. Seed/grain traders could be powerful partners in helping to *move new modern varieties* widely, within and among farming communities. Such traders, selling certified seed (and especially women sellers) for the legumes) would need to learn about new variety identification, attributes and management.

If done smartly, the above suggested broadening of seed sale venues and seed sale formats should stimulate the creation of a broader customer base, focusing demand toward direct producers (small farmers) and away from reliance on large institutional buyers (such as NGOs). As the above also builds on the varied local market channels that all farmers use on a regular basis, transaction costs for farmers should be minimized.

II. New varieties/quality seed: making these more available

Seed production, and especially the decentralized seed production that can reach smallholders, needs to become a more strategic and effective force in serving farmers. The formal seed sector will never be able to handle a) the range of crops farmers need, nor b) the range of varieties. At this point, the single decentralized seed multiplication model found in the Kasai sites, the formal APSKO-supported agri-multipliers, is having negligible impact. (Agri-multipliers were the source only 0.4% of the seed farmers in the zone sowed, with only a single farmer in the sample having received a new variety through an agri—multiplier).

Given a four-year time frame, it is recommended that any decentralized seed production work focus on strengthening existing organizations and not on the creating of new multiplication groups.

5. Capacity of existing agri-multipliers. The capacity of the few existing agri-multipliers needs to be strengthened. There seem to be four or five in the SSSA zones assessed and they are tied to APSKO (Association of Seed Producers in Kasai Oriental). Multipliers might be encouraged to produce a wide variety of crops: OPV and the 60-day short cycle maize, cowpea, groundnut maybe soybean, (*depending on market-demand assessments*). Such individuals might best develop an analysis of the cost-effectiveness of their operations as well as an explicit delivery strategy. Seed producers should be encouraged to produce only if a) viable markets are identified and b) Individuals' own agro-enterprise and marketing skills have been enhanced.

6. Capacity of Farmers' Organizations already multiplying new varieties. Select farmer organization (organisations paysannes- OPs) links might be specifically catalyzed to tie such decentralized variety producers with a) continuing and new sources of germplasm (from INERA and elsewhere) and b) buyers, including localized shops.

Moving to broader recommendations to make high quality seed available:

- 7 Traders and seed quality. Given that local markets are *the first most important source for seed*, the quality of seed in open markets might explicitly improved. Hence, traders (as above) might be engaged actively in *safeguarding and improving the quality of seed they put on offer*. This could involve actions such as: linking traders to credible sources of good quality seed; working with them on techniques of seed bulking; advising and supporting traders in better storage options....
- 8 Farmers own seed selection and conditioning. Given that farmer-produced and stored seed is *the second most important source of planting material*, farmers' own field selection, post-harvest activity and grain/seed storage processes should be fine-tuned. This will involve widespread technical advice and support activity. Better management of home-saved seed makes sense as a key strategic investment—helping most farmers improve seed quality at the primal source. (*Note that the issue of better storage is dealt with in more detail point #III below*).

In sum, seed production recommendations suggest building on existing decentralized production and delivery efforts, not creating new structures. In addition, a multi-thrust approach for supported seed quality is recommended that can affect seed quality at scale: Beyond certified seed production by specialists---- efforts should address how best to improve the quality of seed available in local markets and in farmers' home stocks. Activities should be programmed explicitly to work with traders and farming households on seed selection and maintenance.

III. Storage: reducing grain and seed storage losses

9. Storage management. Storage losses on-farm need to be combatted in multiple ways and the need is urgent as current storage losses range between 25 and 95 %, particularly with crops such as maize and cowpea. Different storage options should be systematically tested: perhaps, metal silo containers made by local blacksmiths or hermetic bagging techniques promoted by organizations such as Purdue ('PICs) or GrainPro, or use of local containers (plastic bottles/clay pots). INERA has likely done work on local storage methods (e.g ash, dung, urine) and this body of research might also be reviewed. Storage methods on which INERA has done research. Key is that a) farmer demand for any technique be understood – and raised, if necessary, and b) that a supply chain to manufacture and sustain any solution be put in place quickly. (Note that for PICs bags, there is an existing manufacturer in Kigali Rwanda).

IV. Insect and Pest Problems: select focus on products

10. Insect/pest control. Several plant pests and diseases were identified as effecting particularly acute damage: striga and *Alectra vogelii* (maize and cowpea). In the

short term, chemical products might be put on offer for sale, in approved shops that can handle such carefully-regulated inputs.

V. Soil Fertility Enhancement: first steps

While soil fertility issues *per se* were not an initial focus of this SSSA, their direct influence on how farmers choose crops/varieties and how farmer adjust sowing densities to combat low fertility means that a first set of ameliorating actions seems important to include—even in a seed system security assessment. Obviously, a comprehensive soil fertility management program is warranted (to be led by specialists).

11. Improved fallows and legume rotations. The efficacy of rotations with a range of legumes is already well known (and INERA particularly suggested the sequence of cassava, cowpea and maize for food crops). Also, the possibilities of fallows with varied agro-forestry such as *Mucuna*, might be tested. Key, of course, is farmer acceptance of the agronomic technique as well as its technical effectiveness.
12. Nitrogen fixing trees. Preparing for longer-term horizons (beyond the 4-year project), diagnostic trials with 'best bet' nitrogen-fixing trees, might be piloted now as added as an explicit work stream. Soil fertility improvement and management (including adding of biomass) demands that interventions think long from the start.

VI. Farmer-centered Information Systems : raising awareness and demand: range of improved techniques

Finally, as a last set of recommendations, we focus on information systems. Kasai Oriental farmers currently receive little information about improved techniques for sustainable and profitable agricultural production. The SSSA teams noted a lack of familiarity not just with new varieties but with even basic 'good practice' agricultural techniques, e.g. crop rotation and use manure, improved storage possibilities. There is an urgent need to stimulate a) a learning and experimentation environment, especially in rural areas; b) an environment that provides a wealth of technical information; and c) information channels that foster feedback mechanisms- quickly and directly.

Several recommendations appear below related to information innovation follow. The focus here is on enabling the small farmer to draw in much needed innovations, to make more informed choices among multiple agricultural options—and to feedback to those helping to generate research and supply side advances.

13. Community experiential learning. Face-to-face on-farm experimentation models need to be catalyzed within communities; experimental community fields or farmer field schools are but two models. Important is that women and youth (and particularly those returning from the mines) be included in these interactive learning processes.
14. Agricultural-linked technical information and dissemination. Agricultural-linked technical information also has to be passed through a range of media. Some farmers (and traders) do have access to mobile phones (and concrete SMS messages could be key in passing concrete variety and seed-linked information). The effectiveness of existing grassroots communication mechanisms, through schools and faith-based organizations might also be explored to share

information on good practice and available innovations. Even more classic information methods, like development of 'new variety posters and illustrations' would be an important addition.

15. Global strategy for communication in communities (cascading strategy). Overall, the gap in relation to agricultural information within communities is so vast and deep, that the prime recommendation here might be to develop (from near scratch) a global strategy for two-way communication that embraces actors at various levels and allows dynamic interactions (and corrections in course). The term 'cascading strategy' has been suggested for this process.

In sum, overall, this SSSA has 15 precise recommendations that are practical and doable in the four-year time frame of the DFAP project. While all can be moved forward in the short term, all can potentially lead to long-term, sustainable impacts in this chronically-stressed Kasai Oriental region. The operative framework is 'short term' but not 'short-sighted'. There is an urgent need for systemic problem solving right now that lead to durable solutions and measurable jumps in agricultural productivity and resilience in the Kasai Oriental region.

VI. REFERENCES

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VII. ANNEX: ACTION PLANS

Action Plan: French (as agreed by partners)

Action Plan: English version

Problèmes	Activités	Commentaires
<p>Non accès aux nouvelles variétés</p>	<ol style="list-style-type: none"> 1. Rendre disponible en petits sachet les semences 2. Identifier les points de vente près de la communauté <ul style="list-style-type: none"> • Point de vente spécialisée pour intrant • Point de vente généralisé, Exemple : ceux qui vendent du sucre, huile, etc. 3. Faire le SVP/sélection variétale participative et les champs de démonstration à cote des boutiques qui vendent des semences, faites les champs de démonstration avec plusieurs partenaires y compris l'Eglise et les marchés locaux. 4. Renforcer la connaissance des commerçants en matière d'identification des nouvelles variétés y compris spécialement les femmes 5. Renforcer les capacités de petits boutiquiers, soit spécialisées ou généralisées en marketing des semences 6. Créer les CECI/SILC 	<ul style="list-style-type: none"> - Exemple pour les légumes : 100gr ;250gr ;500gr - Point de vente au sein de la communauté - Pour les points de vente généralisés, les gens doivent être formés en matière de gestion de semences. - Prendre l'engagement avec l'église en agriculture (ça a disparue récemment) - Rendre disponible les fiches techniques aux commerçants - Rappelons que ce sont les femmes qui sont plus vendeuses principales pour les légumineuses et le maïs surtout au village. - Suivre le modèle de MERCY CORPS en Ouganda - CECI : Communauté d'Epargne et de Crédit Interne
<p>Pas de disponibilité de nouvelles variétés</p>	<ol style="list-style-type: none"> 1. Renforcer les capacités des agri multiplicateurs et APSKO en technique de marketing 2. Créer des liens entre les producteurs des semences et les petites boutiques 3. Travailler avec les OPs pour multiplier et vendre les semences potentielles 	<ul style="list-style-type: none"> - Etre sure que la production des semences est durable - Travailler avec APSKO (Association des Producteurs de Semence du Kasai Oriental) - Assurer qu'une gamme de cultures devient disponible y compris le maïs VPO (Variété a Pollinisation Ouverte), le niébé, le maïs a court cycle et arachide (Peut être aussi le soja)

<p>Pertes élevées des graines et des semences pendant le stockage</p>	<ol style="list-style-type: none"> 1. Tester différentes options de stockage surtout : <ul style="list-style-type: none"> • Bidons métalliques qui peuvent être fabriqués localement par les forgerons • PICS (Purdue improved crops storage) dans ce cas on doit identifier un fabricant ou de les importer de Kigali. 2. Revoir les recherches d'INERA sur l'efficacité de méthode de stockage traditionnelles 3. Avec n'importe quelle méthode, le projet doit faciliter l'offre soit avec les forgerons soit avec les fabricants de sacs PICS. 4. Avec n'importe quelles méthodes, le projet doit faciliter la demande des producteurs 	<ul style="list-style-type: none"> - Pas de nécessité de mener encore les enquête, l'ampleur des pertes est déjà confirmée. - Les outils de conservation traditionnels sont de petite taille - Voir si le projet Budkadi veut promouvoir des produits chimiques/insecticides/herbicides/pesticides non plus toxiques
<p>Pas de renseignement sur les pratiques agricoles améliorées</p>	<ol style="list-style-type: none"> 1. Créer les fiches techniques des nouvelles variétés avec des photos illustratives avec INERA 2. Utiliser les radios communautaires pour passer les messages 3. Créer une stratégie globale de communication communautaire (cascading strategy) 	<ul style="list-style-type: none"> - Créer une stratégie globale de communication communautaire
<p>Faible fertilité du sol</p>	<ol style="list-style-type: none"> 7 Promouvoir les rotations avec les légumineuses 8 Promouvoir la production et l'utilisation du fumier 9 Promouvoir les Champs Ecoles Paysans 	<ul style="list-style-type: none"> - INERA suggère les rotations Manioc-Nièbé- Maïs - Arachide-Nièbé pour les légumineuses alimentaires - Mucuna pour les légumineuses non alimentaires - Voir si les paysans apprécient la rotation avec le Mucuna
<p>Ravageurs et insectes surtout pour le maïs et nièbé</p>	<ol style="list-style-type: none"> 1. Rendre disponible les produits pour lutter contre les insectes et ravageurs 	<ul style="list-style-type: none"> - Promotion, ventes par les commerçants

SSSA Action Plan- Kasai- _Oriental- linked to seed system security (ENGLISH)

Problems	Activities	Comments
Non access to new varieties	<ol style="list-style-type: none"> 1. Make seeds available in small sachets 2. Identify sale points near communities 3. Specialized input sale points 4. Generalized sale points, example : those selling sugar, oil, etc. 5. Conduct PVS /participatory variety selection and demonstration sites near shops where seeds are sold, establish demonstration plots with many partners including churches and local markets. 6. Strengthen knowledge for traders and mainly women, regarding identification of new varieties 7. Strengthen the capacity of small shop owners in marketing seeds 8. Create SILC groups 	<ul style="list-style-type: none"> - Example for legumes : 100gr ; 250 gr ; 500 gr - Sale points in the communities - For generalized sale points, people should be trained in seed management - Make commitment with Church for agriculture (recently disappeared) - Make technical guidelines available to traders - Remember that women are the main vendors of legumes and maize at the village level - Follow the Mercy Corps Uganda model - SILC : Savings and Internal Loans Community
Unavailability of new varieties	<ol style="list-style-type: none"> 1. Strengthen the capacity of seed multipliers and APSKO in marketing skills Create linkages between seed producers and small shops 2. Work with FOs for producing and selling potential seeds 	<ul style="list-style-type: none"> - Ensure that seed production is sustainable - Work with APSKO (Association of Seed Producers in the Kasai Oriental) Ensure that a large variety of crops is available including maize (open pollinated variety), cowpeas, short cycle maize variety and peanuts (maybe soybeans as well)
High grain and seed losses during storage	<ol style="list-style-type: none"> 1. Test different storage options mainly : <ul style="list-style-type: none"> • Metal containers which can be made by local blacksmiths • PICS (Purdue improved crops storage) in that case identify a local manufacturer or consider importing from Kigali. 	<ul style="list-style-type: none"> - No need for additional surveys the level of damage is already confirmed. - Traditional storage systems are smaller in size - Find out whether Budikadiidi project could promote the use of chemicals/insecticides/herbicides/non toxic pesticides

	<ol style="list-style-type: none"> 2. Revisit INERA research results concerning the efficiency of traditional storage methods 3. With any selected method, the project facilitate supply from local blacksmiths and local PICS bags manufacturers 3. With any selected method, the project should facilitate demand from producers 	
No information on improved agricultural practices	<ol style="list-style-type: none"> 1. Develop technical guidelines on new seed varieties with INERA illustrative pictures from Use community radios to broadcast messages 2. Develop a global strategy for communication in the communities (cascading strategy) 3. Promote crop rotations with legumes 4. Promotion production and use organic manure 5. Promote Farmers Field Schools 	<ul style="list-style-type: none"> - Develop a global strategy for community communication
Poor soil fertility	<ol style="list-style-type: none"> 6. Make sure pest control products available 	<ul style="list-style-type: none"> - INERA is proposing rotations with Cassava-Cowpeas-Maize - Peanuts-Cowpeas for food legumes - Mucuna for non food legumes - Find out whether farmers accept rotations with Mucuna
Insect pests mainly for maize and cowpeas		<ul style="list-style-type: none"> -Promotion, sales by small traders

There are areas beyond project control and authority :

- Exaggerated taxes
 - Degraded and dilapidated roads
- Recommendations from group discussions
- A topic on access to credit should be added
 - A topic on soil fertility improvement should be added in the project action plan