

# Social relationships, local institutions, and the diffusion of improved variety seed and field management techniques in rural communities: six case studies in South Kivu, DRC

---

**December 2015**

## **Authors**

*Jennifer Kendzior*

*Jean-Paul Zibika*

*Maarten Voors*

*Conny Almekinders*



The views presented in this publication are those of the author(s) and do not necessarily represent the views of **DFID**, **ESRC** or **Wageningen University**.



Research jointly supported by the ESRC and DFID

## Contents

---

|   |    |
|---|----|
| Acknowledgments.....  | 5  |
| Summary .....   | 6  |
| 1. Introduction .....   | 8  |
| Background.....   | 8  |
| <i>N2Africa – responding to challenges faced by smallholder farmers</i> .....                                       | 8  |
| <i>South Kivu</i> .....   | 10 |
| <i>Diffusion of seeds and information in rural communities</i> .....  | 13 |
| <i>Research aims and questions</i> .....  | 13 |
| <i>Research methods</i> .....   | 14 |
| 2. Case studies .....   | 16 |
| Introduction to case studies.....   | 16 |
| <i>Key notes on the research methodology</i> .....  | 16 |
| <i>Key notes about the intervention</i> .....   | 17 |
| <i>Background of case study sites</i> .....   | 18 |
| DIOBASS (La Démarche pour l’Interaction des Organisations à la Base et Autres Sources de Savoir) .                  | 19 |
| <i>Mission, structure, work themes</i> .....  | 19 |
| <i>N2Africa</i> .....   | 19 |
| <i>Case study performed in Kashenyi, Bugore</i> .....   | 20 |
| PAD (Programme d’appui au développement durable).....   | 25 |
| <i>Mission, structure, work themes</i> .....  | 25 |
| <i>N2Africa</i> .....   | 25 |
| <i>Case study performed in Murhesa, Kabare</i> .....  | 26 |
| SARCAF (Service d’Accompagnement et de Renforcement des Capacités d’Auto promotion de la<br>Femme au Sud-Kivu)..... | 31 |
| <i>Mission, structure, work themes</i> .....  | 31 |
| <i>N2Africa</i> .....   | 31 |
| <i>Case study performed in Cagombe, Walungu</i> .....   | 31 |
| CDC (Centre de Développement Communautaire) KIRINGE.....  | 38 |
| <i>Mission, structure, work themes</i> .....  | 38 |
| <i>N2Africa</i> .....   | 38 |
| <i>Case study conducted in Luvungi</i> .....  | 39 |
| IPLCI (Initiative Paysanne Pour Lutter Contre l’Ignorance) .....  | 44 |
| <i>Mission, structure, work themes</i> .....  | 44 |

|   |    |
|---|----|
| N2Africa.....   | 44 |
| Case study performed in Majengo I and Majengo II, Katogota .....                  | 45 |
| Case study performed in Kasha, Katogota .....                                     | 47 |
| Women for Women .....   | 52 |
| Mission, Structure, work themes.....  | 52 |
| N2Africa.....   | 52 |
| Case study performed in Kiyaya .....  | 54 |
| Case study conducted at Sange.....  | 58 |
| 3. Observations drawn across case studies .....                                   | 64 |
| Description of N2Africa implementation .....                                      | 64 |
| Institutional structure.....  | 64 |
| Master–satellite farmer model .....   | 65 |
| “N2Africa” and “DFID” .....   | 65 |
| Flow of inputs and techniques.....  | 66 |
| Technology diffusion: What did farmers learn?.....                                | 67 |
| Perceptions of soil fertility.....  | 67 |
| Farmer perception of treatment performance.....                                   | 68 |
| On-farm experiences and subsequent crop development: improved seed varieties..... | 68 |
| On-farm experiences and subsequent crop development-techniques .....              | 69 |
| Focus on soy .....  | 70 |
| Social of seed and info sharing.....  | 71 |
| Gender dynamics, roles and crop preferences .....                                 | 71 |
| Expectations of a good member of the community .....                              | 72 |
| Role of local institutions .....  | 73 |
| Who was prioritized in sharing of seed and information? .....                     | 74 |
| Additional aspects of seed sharing.....   | 74 |
| Additional aspects of sharing information .....                                   | 76 |
| 4. Key lessons.....   | 78 |
| Research question 1 .....   | 78 |
| Set up of the demonstration fields, trainings, and input distribution .....       | 78 |
| Master-satellite farmer model .....   | 78 |
| Motivation to participate .....   | 79 |
| Research question 2 .....   | 79 |
| Farmer perception of treatment performance in demonstration fields.....           | 79 |
| Influence on their on-farm decisions and their subsequent crop performances.....  | 80 |
| Perceptions of soil fertility.....  | 80 |
| Research Question 3 .....   | 80 |

|  |    |
|--|----|
| <i>Social and agricultural context</i> .....   | 80 |
| <i>Social relationships between farmers who exchanged information and seed</i> .....       | 81 |
| <i>Social conditions of passing on seed and information</i> .....                          | 81 |
| <i>Role of local institutions</i> .....  | 82 |
| <i>Additional comments from NGO agronomists</i> .....                                      | 82 |
| 5. Conclusions .....   | 83 |
| 6. References .....  | 84 |
| Appendices.....  | 85 |
| Appendix I: Sample of demonstration field instructions from IITA to implementing NGOs..... | 85 |
| Appendix II. Sample question guide used during individual and focus group interviews ..... | 92 |
| Appendix III. Workshop minutes 12 December. ....   | 94 |

## Acknowledgments

The authors would like to extend their gratitude to all of the farmers who participated in the study, as well as staff of N2Africa (Ken Giller and Linus Franke), IITA (most notably Jean-Marie Sanginga and Bernard Vanlauwe) and the six implementing NGOs (Diobass, PAD, SARCAF, IPLCI, CDC Kiringe, and Women for Women), in particular, the agronomists Jean Chizungu, Etienne Bitonwalunyil, Safari Kwinanika, Jean Matabishi, Freddy Bashilwango, Moise Masumbuko, and Sylvie Citera. Thanks, also, to agronomist Alphonse Bisusa for sharing his time and knowledge, and Marielle Bahizire Ciza for translation between Kiswahili and French. We gratefully acknowledge financial support from DFID-ESRC Growth Research Programme (DEGRP) grant # ES/J009009/1.

## Summary

This study is part of an evaluation of the impact of the N2Africa intervention in South Kivu, Democratic Republic of the Congo (DRC), conducted by the Development Economics chair group of Wageningen University (the Netherlands) and funded by the Economic and Social Research Council (ESRC). The N2Africa intervention in South Kivu (phase one, 2009-2014) included dissemination of improved variety seeds (beans, cassava, maize, soy) and field management techniques (e.g. line sowing, cereal-legume associations, fertilizer application, and use of rhizobium inoculum for soy), the focus being benefits of biological nitrogen fixation (BNF).

*Research aims and questions:* The aim of this study is to analyse how improved variety seeds and information traveled through rural communities, with attention to social relationships and local institutions as well as the intervention set up. Three research questions focused on conditions of the technology introduction, what farmers learned, and the nature of social relationships between those who shared inputs and new techniques.

*Research methods:* Semi-structured interviews were conducted with farmers (67 individuals, of which 18 were men, and 9 focus groups) as well as staff of the implementing NGOs and research institute. Field interviews were conducted in six sites, selected to represent one for each NGO and for their dispersal throughout three of the five territories where N2Africa was implemented.

### *Key lessons*

- The set-up of the demonstration fields, trainings, and input distribution varied depending on the NGO and local association, though the general format included a practical training with demo field and distribution of inputs.
- The six implementing NGOs distributed inputs and techniques using the master-satellite farmer model, which despite certain disadvantages, was generally approved of by farmers and NGO staff. The distinction between master and satellite farmer was not always apparent.
- After observations in the demo fields, some field management techniques (line sowing, inoculum, fertilisers) and crops (soy) generally received more interest than others.
- In their own fields, overall, farmers found that the introduced varieties performed better than those previously available, and continued to produce them as long as they produced a yield. Line sowing and use of compost fertilizer were techniques most applied. There was relatively little familiarity or use of inoculum.
- Farmers made very little mention of soil fertility benefits provided by legumes, and did not typically practice crop rotations. Rainfall, inherent soil fertility, and application of compost were the three factors described to most affect soil fertility.
- Information and seed flowed between family, field or house neighbours, and members of the same associations. Family members were ideally prioritized, but in actuality it was not always the case because they may have been located far away due to virilocal marriage patterns or displacement due to insecurity. Distance to family, distance between house and fields, and social cohesiveness of the local association affected choices to share technologies.
- Seed and information were typically given when requested, with varying expectations of reciprocity. There were some female networks where they exchanged regularly without being asked and without any immediate expectations.
- The local agricultural, development associations played a key role in structuring and disseminating the new technologies.

*Conclusions:* The improved varieties and field management techniques were typically diffused at two levels: first, through farmer-associations, and second, from individual farmers to family, field and house neighbours, or (new) association members. Though ideally, family were prioritized, which of these relationships were deemed most important depended on local factors. Seed and information exchanges were characterized by a moral ideal of distributing new variety seed (considered communally owned), and both delayed and immediate reciprocity. Farmers generally received the improved variety seeds positively, evidenced by continued production and feedback on higher yields. Line sowing and use of mineral and organic fertilizer were techniques of most interest, evidenced by continued use which was reportedly due to the tangible effect on increased yields. Associations that functioned better than others seem to have resulted in a wider seed and information distribution.

# 1. Introduction

## Background

### *N2Africa – responding to challenges faced by smallholder farmers*

#### *Biological Nitrogen Fixation (BNF)*

Smallholder farming in most parts of sub-Saharan Africa is characterized by low-input and low productivity. Intensification of low-input farming has contributed to soil degradation and nutrient depletion, consequently decreasing food production and food security. Briefly summarized, the N2Africa project attempts to respond to these challenges by promoting smallholder use of legumes, which have been shown to increase inputs through biological nitrogen fixation (BNF), to improve soil health and household incomes, as well as the family food-protein supply. BNF is a natural process by which atmospheric nitrogen is made bio-available through a symbiotic relationship between legumes and bacteria (different bacterial strains are collectively referred to as rhizobia). The bacteria reside in nodules that form on the legume roots. Legumes differ in their relationships with bacteria. Some are non-specific while others are very specific, meaning they form partnerships with only certain bacterial strains or species. In such cases, commercially produced inoculum is likely required for nodulation and BNF to occur<sup>1</sup>. Nitrogen being the most limiting factor in plant growth, and the estimated global contribution of grain legumes alone to fixed nitrogen on farms being substantial, N2Africa argues that the significance of BNF cannot be overemphasized.

N2Africa was implemented in South Kivu, in the eastern part of the Democratic Republic of the Congo (DRC), from 2009 to 2013, claiming to have reached approximately 20,000 households (Woomer et al., 2014). The national partner was the International Institute for Tropical Agriculture (IITA), based in Kalambo. The project also ran in seven other sub-Saharan African countries.

#### *Technology dissemination approach*

N2Africa's dissemination approach was founded on a group-based, train-the-trainer model. The following is summarized from project documents and interviews with IITA N2Africa staff. Those trained and who received agricultural inputs (new products) were considered master or lead farmers (direct beneficiaries), of whom 50% should have been women, who were then expected to recruit satellite farmers (indirect beneficiaries), 50% of whom should have been female-headed households. It was considered important that the master/lead farmers were able to evaluate the new products at the field and household level after one season. This would enable several next steps: first, seed produced in the first year could be distributed to other farmers in the second year, thereby initiating community-based seed production and encouraging farmer collective action; second, it would help to strengthen household food security; and third, it could enable modest surpluses for collective marketing, that would hopefully link to agricultural value chains. All of this would thereby have constituted engagement in participatory research and development. The project design emphasized that specialist support, farmer-to-farmer extension, and peer support were pivotal to success. Though it was estimated that five to ten years were necessary to achieve full impact, previous experiences suggested that signs of tangible benefits should be apparent within one to two years.

In accordance with the train-the-trainer model, the IITA worked with six different locally operating NGOs to implement the N2Africa intervention: Women for Women, Diobass, SARCAF, IPLCI, CDC Kiringe, and PAD. The IITA worked first with PAD, Diobass, and SARCAF in the areas around Bukavu, and expanded south to work in the Ruzizi Plain with IPLCI, Women for Women, and CDC Kiringe in 2012. The first three organizations were selected because they had carried out activities with IITA for previous legume-focused

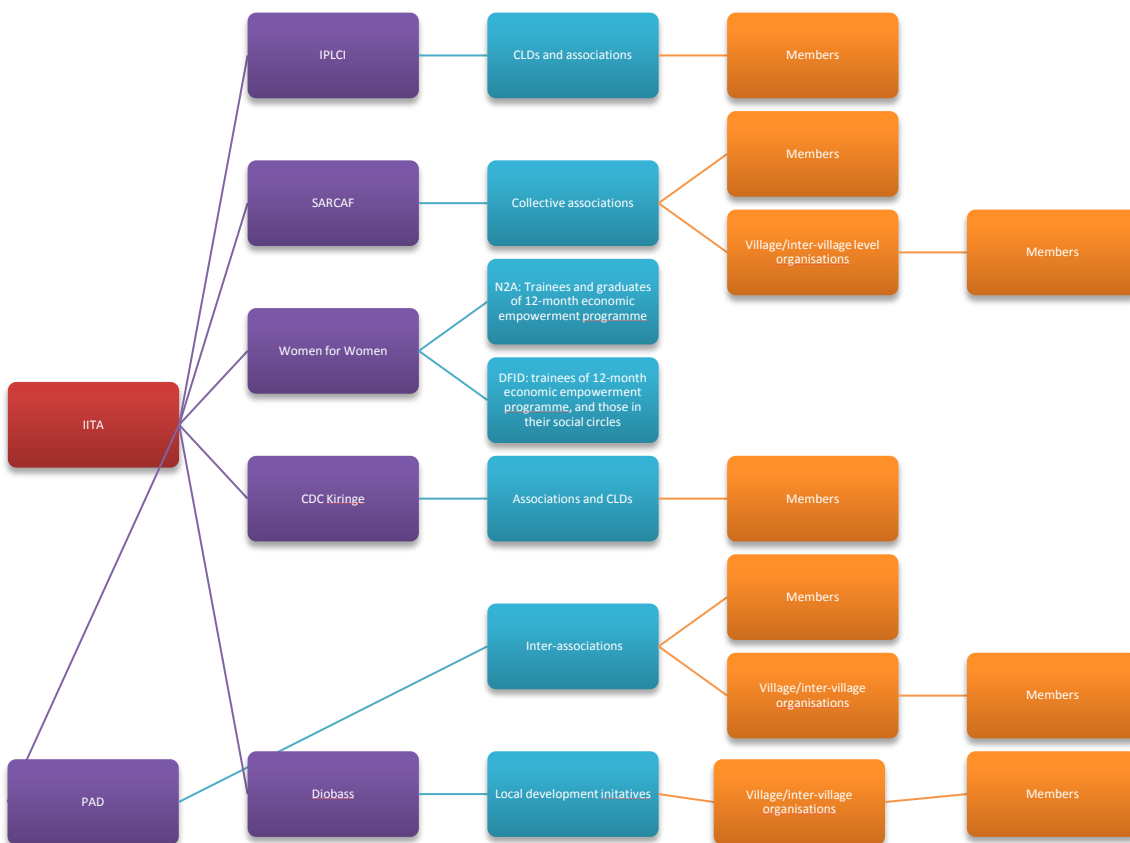
---

<sup>1</sup> This explanation being highly simplified, see [N2Africa's website](#) for further information about BNF and other aspects of the project.



project, the Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA). The IITA had made an announcement about N2Africa activities in the Ruzizi Plain, to which the second three NGOs responded, and were selected after IITA had approved their involvement thanks to their perceived capacity to reach enough households.

Project staff at the IITA instructed senior agronomists from each NGO in technologies and implementation of N2Africa, and the senior agronomists then trained field technicians in their respective organisations (see Appendix I: Sample of demonstration field instructions from IITA to implementing NGOs for an example of demonstration field instructions). Seeds were acquired by the IITA or designated NGOs and distributed to other NGOs. Though each organisation had their own priorities and approach, all operated with a similar structure where both information and agricultural inputs were distributed to increasing numbers of people through a train-the-trainer model. Typically, an NGO worked at the level of inter-associations that grouped representatives from smaller, village- or inter-village level associations. The NGO's senior agronomist would train their field technicians and facilitators, who would train the inter-association members, who were then responsible for transmitting the information and inputs back to members of their own local associations. Furthermore, certain active members of local associations were sometimes charged with informally training and sharing seeds amongst non-members in their community. See Figure 1 for an illustration of this model, and the case studies section of the report for more details about how each NGO operated.



**Figure 1. Inputs and information were typically passed to individual farmers or households (members, in orange) through a series of steps: NGOs (purple), groupings of farmers representing their local associations (blue), and finally local associations. Some farmer groups (blue) had direct membership, representatives through smaller associations, or both.**

## 2. Case studies

South Kivu

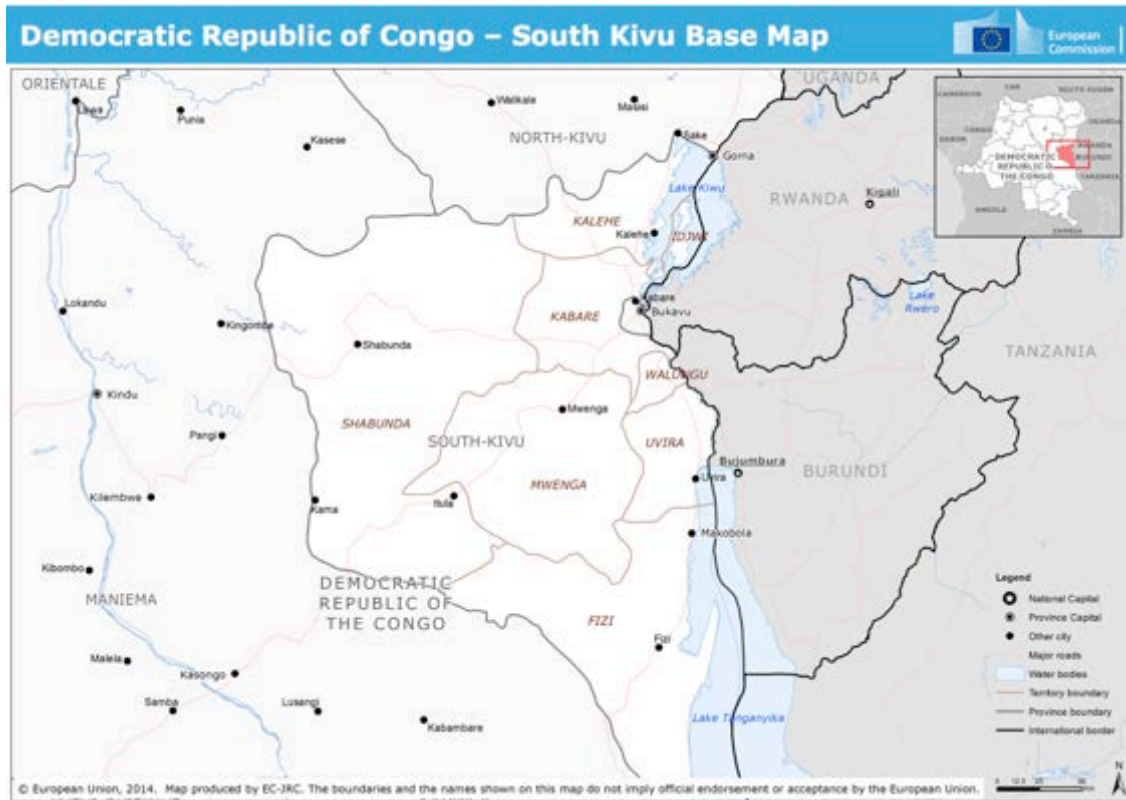


Figure 2. Map of South Kivu province with territories indicated, Democratic Republic of the Congo. Source: OCHA

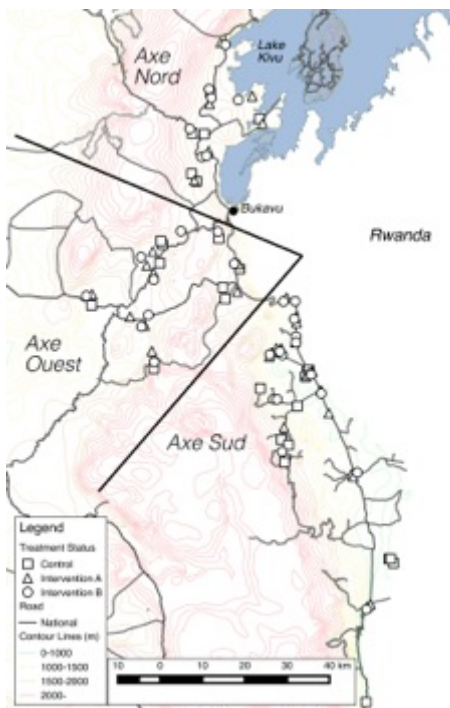


Figure 3. Map of South Kivu with black lines showing research areas defined as northern (nord), western (ouest), and southern (sud) axes, and blue dots indicating villages.

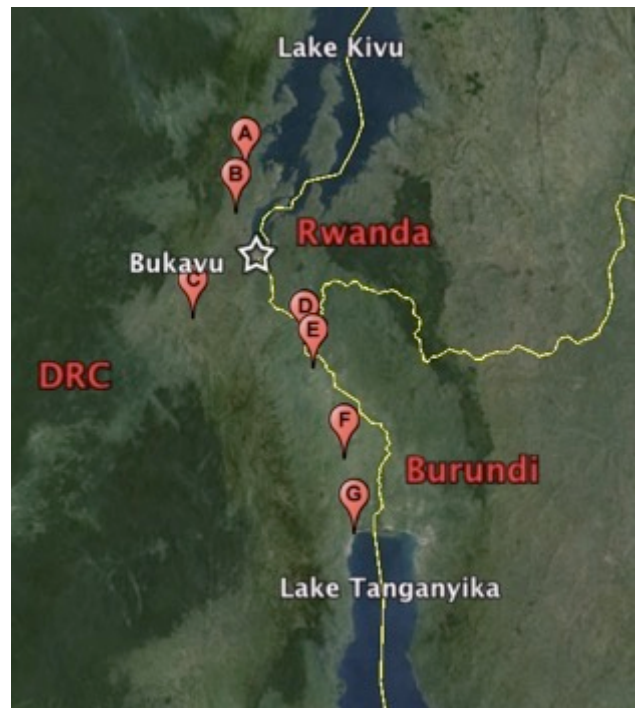


Figure 4. Map of case study locations. Markers indicate case study sites: A Kashenyi (Kabare territory), B Murhesa (Kabare) C Cagombe (Walungu), D Katogota, E Luvungi, F Sange, G Kiyaya (D through G are in Uvira territory). All sites were on or very close to main travel routes. Yellow lines indicate international borders.

The province of South Kivu shares international borders with Rwanda, Burundi and Tanzania. The frontier line passes through land as well as the Great Lakes Kivu and Tanganyika, at the northern and southern limits of the province (Figure 2). Within the DRC, it borders North Kivu province to the north, Maniema to the east, and Katanga to the south. South Kivu is divided into eight territories: Fizi, Idjwi, Kabare, Kalehe, Mwenga, Shabunda, Uvira and Walungu. The capital and largest city is Bukavu, situated at the southernmost part of Lake Kivu (population figures vary with fluctuations caused in part by insecurity in the surrounding regions, but general estimates are about 800,000). Other main cities include Uvira (Uvira territory) and Baraka (Fizi territory). The province spans high and low lands, elevation of lakes Kivu and Tanganyika at about 1500 m and 800 m, respectively.

Soils in the region vary from fertile soils, rich from volcanic deposits, to highly weathered, degraded soils. These include relatively young volcanic soils, red clayey ferralsols and nitisols, in landscapes that range from rainforests to highlands, to dry pastoral plains. Rainfall is bimodal with two growing seasons: one from mid-September to mid-January (season A); and the second from mid-February to mid-June (season B).<sup>2</sup> However, rainfall predictability and patterns vary greatly throughout the province.

South Kivu has one of the highest population densities in the DRC, particularly in the areas surrounding Bukavu. The province is typically described as having four ethnic groups: Shi-Havu group (Bashi-Bahavu), Lega-Bembe group (Barega, Babembe), and Fuliru-Vira (Bavira-Bafulero) group and other minorities. Minorities are often assimilated into other groups, and may have ties with more than one. Barundi and Banyamulenge have origins in the former kingdoms of Burundi and Rwanda, respectively. While the Barundi are considered integrated, tensions exist between Banyamulenge and other groups (see Mushi 2012).

#### *Farming environments of Kabare, Walungu, and Uvira territories*

This study refers to research areas defined in three axes: northern, western and southern (Figure 4). Cultural aspects and farming environments of the northern and western axes are generally more similar when compared to the southern axis. As this study concerned territories of Kabare (northern axis), Walungu (western axis), and Uvira (southern axis), the remainder of the report will focus on them.

There is relatively little available documentation about soil characterization and land use in South Kivu (and perhaps in eastern parts of DRC in general). Therefore, a brief overview as summarized by local agronomists and farmers will provide this background.

Northern parts of Kabare territory are considered very fertile due to past volcanic activity. Farmers in the territory also benefit from relatively predictable rainfall, starting beginning September and finishing beginning of June. Beans and soy grow well here, and the latter can be processed in local mills for home consumption or for sale. Other typical crops for home consumption are cassava and maize, supplemented by smaller quantities of crops such as sunflower, squash, and green leafy plants (e.g. *lengalenga*). Cash crops include sugarcane, rice and vegetables (e.g. tomatoes, aubergines), in addition to the option of selling maize and beans. Livestock include cattle, pigs, goats and small animals such as chickens, guinea pigs and rabbits.

Soils in Walungu territory vary, many areas being described as having poor soils, partly due to the erosion on slopes. *Kanombe* refers to red, eroded soils on the hills, and *chivu* to the darker, more fertile soils in basins and valleys that receive much of the eroded soils from the hills. Rains typically start beginning September

---

<sup>2</sup> There is relatively little documented, available data regarding soil characterisation and land use in South Kivu, and perhaps in general for eastern parts of the DRC. Some data were available from the IITA, Université Catholique de Bukavu (UCB), and Africa Soil information Service (AFSIS), which have been involved in collecting and analysing soil samples in the region, but were not included here as they did not necessarily correspond to the study area.

and finish end of April or beginning May, and may be torrential. Livestock and crops are similar to those grown in Kabare, but also include rice and sweet potatoes (the latter known as *culture de soudure*, or a lean period crop). Soy is not as prevalent as in Kabare, and it was said by some that cassava does not grow particularly well.

Uvira territory is situated on the Ruzizi Plain. The climate is generally hotter in the plain itself, though the higher elevations of the hills (and *moyen plateau*) around the plain are slightly cooler. Soils are generally clay-sand and are considered fertile in the plain. On the hills laterite soils dominate (high clay content and rich in aluminium and iron), frequently with many small rocks due to erosion. Rainfall in the plain is less predictable, starting anywhere between early October to November and finishing around mid-April. Sometimes farmers do not benefit from the second rainy season (B), and frequently when rains arrive they have the potential to destroy crops as they are very heavy. It is said that the wind from Lake Tanganyika pushes the clouds away towards the hills. Typical crops are maize, cassava, beans, groundnuts, and vegetables and rice where there are water sources. Beans and maize are typically sown around October in order to benefit from the more certain rainy season, whereas maize, only, tends to be sown for the second season in November or December. Soy is grown least here compared to the other two territories. Goats and cattle are prevalent livestock species.

### *Recent history*

South Kivu, and surrounding eastern provinces, where the unfortunate epicenter of the two Congo Wars, bearing witness to horrific crimes. The first, from 1996 to 1997, the second from 1998 to 2003, as well as the subsequent transition years from 2003-2006 and the period up to the present are extremely complex narratives, involving multiple dimensions of geo- and historical-politics. The conflict is mentioned here only briefly, not to make little of its significance, but to stress its effect on certain societal and civil dynamics that are relevant to this study, namely, population movements and food security<sup>3</sup>.

Due to internal conflicts and those related to conflicts originating within bordering countries (e.g. Uganda, Rwanda), the DRC was estimated as having the highest number of internally displaced persons (IDPs) in Africa. Hundreds of thousands have fled, only to have perhaps returned and fled again, within any one province alone. Livelihoods based on agriculture clearly suffered with the consequent difficulties—in accessing land, lack of consistency in maintaining a crop to harvest, accessing inputs and markets, just to name a few.

Prior to the Congo wars, the eastern provinces of the DRC, rich in natural resources, suffered under exploitative land policies and dysfunctional economic and transport infrastructures. Based on fieldwork conducted in North and South Kivu in 2005, Lecoutere et al. (2009) emphasized land alienation and reduction in market access caused by the conflict, and the deteriorated food security of rural households. Using the few data available to compare food security during pre- and inter- war periods, they show that it was (unsurprisingly) worse during the wars. Though household food security improved afterwards, a study conducted in 2007-8 estimated 11.7% of households in South Kivu still having poor food consumption<sup>4</sup>, and approximately 33% having borderline food consumption (UNWFP, 2009). Another UNWFP study, conducted in several eastern provinces in 2011-12 found that more than one third of households had poor or limited food consumption (UNWFP, 2014). The conflict and insecurity escalating again in late 2012 and 2013 caused

---

<sup>3</sup> For more information about the conflict and surrounding context see, for example, publications from the Usalama project of the Rift Valley Institute and others such as Vlassenroot and Huggins, 2004; Lecoutere et al., 2009.

<sup>4</sup> Poor food consumption defined as less than two meals per day, consisting primarily of starches with little to no proteins; borderline food consumption defined as consuming slightly more than poor food consumption, including some small quantity of vegetables and protein. (Lecoutere et al., 2009)

more displacement and destruction of assets and livelihoods, negatively affecting rural household food security in affected areas.

Conflict in the Ruzizi Plain, in which Uvira territory is situated, is specifically relevant to this study with its consequences of population displacement and destruction of market infrastructure. Long-standing conflict between certain ethnic groups, related to decades of socio-economic underdevelopment and problematic governance dating since colonial rule, has fueled inter-communal violence that involves actors in local and national politics, as well as state institutions (for an in-depth analysis see International Crisis Group, 2013).

### *Diffusion of seeds and information in rural communities*

While farmer-to-farmer diffusion of improved variety seeds and accompanying techniques was pivotal in the N2Africa approach, there seemed to be little elaboration regarding how this highly social process actually takes place. Understanding more about the nature of social relationships between farmers who share seeds and information (or not) could offer practical insights. This is an especially pertinent point when considering farming environments, landscapes (including market infrastructure), and cultures may vary not just between countries and regions, but even between and within villages.

Research focusing on seed sharing in rural communities at the household level, though relatively limited (McGuire, 2008), has emphasized the social embeddedness<sup>5</sup> of seeds and information. Much of this research is primarily concerned with the (flow of) crop genetic diversity, in which researchers recognize the lack of detailed understanding about the nature of social relationships and their effects on agricultural technology diffusion. From these studies and others, several observations are relevant to this study.

First, farmers typically obtain seed in four (see Almekinders et al., 1994) or five ways: saved from previous harvest; purchased in markets; exchanged with other farmers (whether with a condition of reimbursement, an automatic or habitual exchange with certain people, or the contested “gift”); harvesting other farmer's crops, or work in exchange for seed.

Second, sharing patterns amongst farmers can vary tremendously (Sperling and Loevinsohn, 1996; David and Sperling, 1999). For instance, while investigating bean seed diffusion in pre- and post-war Rwanda, Sperling (2001) found that there was very little sharing with neighbours and that people had relatively narrow sharing networks (1999). In contrast, other studies found that neighbours frequently exchanged seed, and that seed diffusion networks could be very wide (e.g. David, 1996 in Uganda). Taking a different approach, Delêtre's research (2011) in Gabon highlighted the relationship between gender and certain crops (in this case, women and cassava), and the role of kinship in regional patterns of genetic diversity and local patterns of seed exchange. Third, attempts to explain the social context underlying these exchanges refer to theories of reciprocity, gifts, social capital, social exchange, trust, and moral economy, amongst others.

### *Research aims and questions*

The aim of this study was to:

1. Analyse how improved variety (legume) seeds and associated information diffused through rural communities.
2. Gather insight on whether a) the intervention setup and b) some social relationships in some locations were more efficient for social learning and technology diffusion than others.
3. Gather insight on the influence of village social dynamics and market integration on experimentation and adoption of (legume) seed technologies.

---

<sup>5</sup> Social embeddedness, in other words, refers to socio-cultural aspects that influence the perception and use of any technology.

These were approached with three research questions:

#### *Research question 1*

What were set up and conditions of the demo trial and participation?

- A. What were conditions of the demo trial?
- B. Who were the satellite farmers?
- C. What are lead and satellite farmers' motivation to participate?

#### *Research question 2*

What did lead and satellite farmers learn from the demo-trials?

- A. What was the influence on their on-farm decisions and their subsequent crop performance?
- B. How do farmers explain soil fertility - in general/pre-demo and related to legumes and rhizobium?
- C. Farmer perception of treatment performance?

#### *Research question 3*

How does the social of relationships affect seed and information transfer behavior between and amongst lead and satellite farmers?

- A. What are the social relationships between farmers who exchanged information and seed?
- B. What were the social conditions of passing on the seeds and or information?
- C. What role did intermediary community / village institutions play in this process?

### **Research methods**

Research was conducted in three of the five territories where N2Africa was implemented: Kabare, Walungu, and Uvira. This was done over two months, from 15 October to 15 December 2014. Fieldwork consisted almost solely of interviews, with participant observation playing a minor role as time spent in the villages were limited to day trips (for security reasons it was not considered appropriate to stay overnight).

With the intention to work in at least one village per each of the six NGOs, and taking into account the two-month time period available for fieldwork, six sites were chosen. They were not selected to make inferences about the general population of South Kivu, but rather, to observe and describe individual farmer experiences and dynamics related to the (sharing of) seed and technologies introduced by N2Africa, across the range of approaches used by the different NGOs. Therefore, each site was chosen based on having received an N2Africa intervention. For security reasons and to facilitate transportation during the rainy season, sites were located on, or very close to, main routes ( Figure 3).

Interviews were held in one village, although interviewees typically came from surrounding villages as well. In one site interviews were conducted in two villages several kilometers apart.

Interviewees were primarily members of local farmer associations because, as described above, N2Africa was implemented through these community structures. Upon arriving in a village the NGO-affiliated facilitator was contacted, and he or she provided a written or verbal list of people who had participated in the N2Africa demonstration fields (these were people who had participated in the project trainings and received project inputs). Approximately five people were selected at random from the list by the researchers as the initial interviewees, but in some cases it proved impossible to avoid involvement of an association representative in the selection process. These initial interviewees were usually master/lead farmers, who then introduced us to other interviewees – either other master/lead farmers (who had also participated in the training and received inputs) or farmers to whom they had given seed (satellite farmers). The majority of interviewees were master/lead farmers, either because those to whom they gave seed were unavailable for

various reasons (e.g. lived far away, were working in their fields) or because they had joined the association after receiving seeds. Most interviewees were women (49 women compared to 18 men) because two of the six NGOs specifically focused on women, and in some cases women were the initiators and main participants in the local associations. In all cases, the availability of farmers was a deciding factor regarding who was interviewed. In some locations, people were given small sums of money to help contact people and set up appointment times, and interviewees were sometimes given small incentives such as soap or small sums of money (e.g. 1000CF/person/interview).

Interviews with a total of 67 individuals and 9 focus groups were conducted, the focus groups being gender segregated (6 groups were women-only) and consisting of three to twelve participants. Both types of interviews lasted between one to one and a half hours, and were structured by an open-ended question guide (Appendix II. Sample question guide used during individual and focus group interviews). One section addressed household details, another general cultural practices (societal and agricultural), and the last encouraged them to elicit their experiences with N2Africa inputs and technologies, including with whom they may have shared them. Interviews were conducted in Kiswahili (and a minority in Shi) with French translation.

Interviews with the NGO senior agronomists, IITA project staff, and founders/staff of local (inter)village-level associations were also conducted. A final workshop with the senior agronomists was conducted on 12 December (after fieldwork in villages had been completed) in order to hear their feedback regarding initial conclusions and other thoughts they wanted to share (Appendix III. Workshop minutes 12 December.).

#### *Report structure*

Section II comprises the six case studies. Each case study has a part that relates what the NGO described about itself (“Mission, structure, work themes” and “N2Africa”), followed by a summary of interviews presented according to specific themes (e.g. “Inputs distributed”, “On-farm experiences”, “Seed and information sharing”).

Section III draws conclusions across all the case studies. It explores generalisations, themes, and some notable exceptions.

Section IV summarizes key lessons according to research questions, providing a streamlined overview of section III.

Section V concludes by responding to the aims of this study.



## 2. Case studies

### Introduction to case studies

#### *Key notes on the research methodology*

The following eight case studies were constructed according to individual and focus group interviews with farmers as well as senior agronomists of each implementing NGO. All of the farmers interviewed had received improved variety seed either through a direct link to N2Africa (e.g. membership of a CLD<sup>6</sup> or association) or an indirect link (e.g. not an association member themselves, but received seed through their neighbour who participated in association activities with N2Africa). The majority of interviewees were women because two of the six NGOs work exclusively with women. The two-month timeframe allotted for fieldwork allowed several days per village. This was just enough time to organise and conduct interviews with individuals who had a first or second degree relationship to the association, but not enough to explore experiences of those who were not association members.

The structure for each case study is similar, but availability of information varies according to the context of each study. This includes the access to and communication style of NGOs and their senior agronomists (e.g. Were there written records? Were they receptive to discussing their experiences with N2Africa?), as well as the atmosphere in each of the sites (e.g. Were farmers—especially women—available or very busy with agricultural and household tasks? Were they comfortable sharing their opinions and experiences with outsiders? Did they perceive any benefits to communicating with outsiders? What were the group dynamics, leadership, and communication styles in their CLD or association?). The first sections (“Mission, structure and work themes”, and “N2Africa”) provide a description generally provided by the NGO. The remainder portrays what happened as described and observed during interviews with farmers and facilitators per site.

Given the variety of contexts, and brief involvement in each, the case studies offer a miniature generalisation not of a region or even the studied site, but rather of the collective experiences of a certain group of people, who were interviewed according to their direct or indirect participation in the N2Africa project and their availability on the days we happened to be in their village. This does not allow for quantitative comparison between sites, or a precise description of how an NGO generally carried out the N2Africa intervention, but rather, a contextual description of the intervention and the nature of social relationships involved in the diffusion of new technologies.

Sites, rather than villages, were the basis of the case studies due to the typical association structure that assembled people from different villages (Table 1). One site was selected per NGO, and was chosen for proximity to a main route (given that it was the rainy season, this was primarily to reduce potential transportation issues, especially in areas where there were any measure of security concerns). Sites were also selected to represent different geographical areas throughout the northern, western, and southern axes (Figure 3)

---

<sup>6</sup> A *comité locale de développement* (CLD) or local development committee, is a general term that may describe different structures. In this case, it is a local organisation that is less official and organised than an association – which is registered with a name, has a physical location, and is more likely to liaise with larger institutions to collaborate on projects. In other cases, a CLD may refer to a collection of regional associations (this is also referred to as an inter-association, or association collective).



**Table 1: Overview of the six case study sites, including implementing NGO, location, and types of interviews.**

| Implementing NGO | Village(s)   | Site     | Territory | Axe   | Interviews conducted  |
|------------------|--|----------|-----------|-------|---|
| SARCAF           | Cagombe  | Cagombe  | Walungu   | West  | <ul style="list-style-type: none"> <li>• 13 individual interviews (2 men)</li> <li>• 1 focus group (10 women)</li> </ul>                      |
| PAD              | Murhesa<br>Konge I<br>Konge 4                            | Murhesa  | Kabare    | North | <ul style="list-style-type: none"> <li>• 6 individual interviews (2 men)</li> <li>• 2 focus groups (12 women, and the other 9 men)</li> </ul> |
| Diobass          | Kashenyi<br>(sub-villages:<br>Bwengehera<br>and Mulamba) | Kavumu   | Kabare    | North | <ul style="list-style-type: none"> <li>• 14 individual interviews (5 men)</li> <li>• 1 focus group (5 women)</li> </ul>                       |
| CDC Kiringe      | Lumumba I<br>Mirundu Mayengo                             | Luvungi  | Uvira     | South | <ul style="list-style-type: none"> <li>• 13 interviews (6 men)</li> </ul>   |
| IPLCI            | Majengo I<br>Majengo II                                  | Katogota | Uvira     | South | <ul style="list-style-type: none"> <li>• 2 individual interviews (2 men)</li> <li>• 2 focus groups (5 women, and 6 men)</li> </ul>            |
| IPLCI            | Kasha  | Katogota | Uvira     | South | <ul style="list-style-type: none"> <li>• 11 individual interviews (1 man)</li> <li>• 1 focus group (4 women)</li> </ul>                       |
| Women for Women  | Kiyaya   | Kiyaya   | Uvira     | South | <ul style="list-style-type: none"> <li>• 8 individual interviews (all women)</li> <li>• 1 focus group (12 women)</li> </ul>                   |
| Women for Women  | ?  | Sange    | Uvira     | South | <ul style="list-style-type: none"> <li>• 1 focus group (3 women)</li> </ul>   |

### **Key notes about the intervention**

The general structure of input and information flow started with N2Africa’s local partner, the International Institute of Tropical Agriculture (IITA), which trained senior agronomists from the six implementing NGOs, who in turn trained their field technicians and facilitators in different sites, who were then responsible for passing on seed and information as they saw fit to members of their association, or members of the sub-associations. Some NGOs worked more closely with individual farmers at the village level, and some focused on the assemblies of local associations (inter-associations/collective associations/local development initiatives).

The NGOs generally operated with the master-satellite farmer model (i.e. distribution to one group of farmers who were supposed to then pass on the seed to the “second generation” of beneficiaries; or otherwise said, direct and indirect beneficiaries). Master farmers were typically people who had a combination of the following: were literate, spoke French, were capable and interested in sharing information in their community, implemented techniques taught in their own fields (and even better if they had done so with little encouragement or inputs from the NGO), and were not shy to speak to visitors.

The interpretation, however, did differ subtly between some NGOs. For IPLCI, master farmers (MF) may have been men or women, and were those willing to try a new technology. They usually elected a facilitator, who had the role of communicating with IPLCI or other outsiders. When a master farmer adopted the technology, they became a model farmer (*paysan modèle*), and others who showed active interest in trying a new technology became the new master farmers. For Women for Women, MFs were those who implemented new techniques in their fields and were comfortable communicating their experiences with visitors of visiting organisations (e.g. IITA). They were selected as representatives (of their training programme group) during field days (*journées champêtres*), and during training sessions (e.g. soy processing, how to use inoculum). In both cases they were expected to convey the information to their respective groups.

Satellite farmers, everybody agreed, were those who received seed or information from master farmers, model farmers, and, in some cases facilitators (sometimes facilitators distributed technology to master farmers as association members, and sometimes they distributed to their neighbours and family).

### *Background of case study sites*

The northern and western axes had more similarities regarding culture and farming environments when compared to the southern axis. See the Introduction section on South Kivu for more details.

Nevertheless, some generalizations across the three axes:

- Typical crops grown for household consumption were cassava (tubers and leaves), beans (grains and leaves), sweet potatoes, maize, and groundnuts. Typical crops grown for cash included vegetables (e.g. aubergine, tomatoes, onions, potatoes), bananas, rice, fruits (e.g. avocados, oranges, mangoes). Crop preferences varied depending on the region. (see Figure 5, Figure 6, Figure 7 for photos).
- Men were less involved in agriculture in the northern and western axes than in the south, perhaps because they often seek opportunities in the mining sector.
- Dynamics between genders differed noticeably throughout the sites. It appeared that in the Ruzizi Plain women participated less in public roles. It was, however, out of the scope of this research to investigate this further.
- Beans were an important crop and household staple in Kabare, slightly less so in Walungu, and even less so in Uvira. The farming environment in the plain was less conducive to beans and soy, so other crops were deemed equally important (notably cassava, maize, and sometimes groundnuts).
- There had been much more training and exposure to soy in Kabare and Walungu than in Uvira. Indeed, there are mills specifically for soy processing in the first two territories, whereas N2Africa was said to have been the first time soy was introduced in the plain. Challenges to growing soy, specifically in Uvira, included a lack of experience with the crop, climate challenges (rainfall is unpredictable, often starting late or stopping early), and in the case of some N2Africa interventions the seed arrived too late in the season.

## DIOBASS (La Démarche pour l'Interaction des Organisations à la Base et Autres Sources de Savoir)

### *Mission, structure, work themes*

Diobass, founded in 1996, is a platform that groups together several farmer associations, operating in North Kivu (territories of Goma, Nyiragongo, Rutshuru, Masisi) and South Kivu (territories of Kabare, Walungu, Mwenga, Fizi). Their aim is to develop the capacity of associations through action research alongside farmers. This is done by working through local-level organisations known as Initiatives Locales de Développement (ILD), which are comparable to previously described local development committees (*comité locale de développement*, CLD). The four work themes are agro-pastoralism, farmer action-research, natural resource governance, and sanitation.

### *N2Africa*

1. Following the N2Africa training in Bukavu, Diobass replicated the trainings in selected sites. They worked at the level of ILDs, from season 2010B to 2013B, and distributed inputs to household members. Training followed input distribution. Inputs were distributed in six packages: 1) Soy (PK6) and cassava (*sawa sawa*), 2) Soy (SB24) + cassava (*sawa sawa*), 3) Soy (CK6) and maize, 4) Soy (SB24) and maize, 5) Beans and maize, 6) Beans and cassava.
2. Each association was supposed to send at least three members who would then train their own local-level association members, who were then supposed to apply those techniques and inputs in their own fields, supported by field visits and exchanges with Diobass facilitators and agronomists throughout the season.
3. Techniques were taught first in a class, and then in practice during the field days in demonstration fields. They included line sowing (with appropriate spacing between seed pockets), function and application of inoculum, seed storage, characteristics of improved variety seed, fertilizer use, and anti-erosion measures. The training focused on the live model of the demonstration field, which was divided into four parts: two to compare inoculated and uninoculated soy, and two for broadcast and line sowing (maize and beans). The training was given to those who received inputs.
4. Soy processing was instructed using the locally available mortar and pestle, and a sieve and filter.

Regarding facilitation of market access, Diobass does purchase grain from farmers with whom they work, and who are typically organised into cooperatives. They encourage farmers to conduct group or cooperative sales in order to sell at higher prices.

Some comments from the NGO staff:

- Many people did not own land but still wished to receive inputs (sometimes one could find a field to rent just in time for the season), which could explain why a significant number of people apparently ate the seeds without having the opportunity to sow them.
- Changing farmers' mindset was a considerable issue because not everybody was receptive to the new technology.
- Seed input quantities were small (300 to 600g), making it challenging to share with all who wanted some seeds.
- Inputs were frequently sent with delays, which resulted in sowing too late. Seeds did not germinate or emerged too late.
- Poor quality soil, or infertile soils, in some areas (e.g. Burhinyi in Mwenga) created difficulties in demonstrating the new technologies.

## *Case study performed in Kashenyi, Bugore*

### *Background*

It seems that people tend to grow beans in both seasons A and B as the rainy season tends to be predictable and long, and frequently spread the residues in the soil. When their performance starts to diminish, some described adding a rotation of sorghum as a common practice. Maize, squash, cassava and sunflower are interspersed throughout the field and continue to grow with the beans. Beans were remarkably prolific throughout the fields surrounding the village (see Figure 5, D for a photo).

### *Comments about fieldwork*

We began fieldwork by arriving directly in the sub-village of Bwengehera, and were introduced to an active member of an association by the village chief. We conducted 14 individual interviews (5 men), and a focus group with five women.

It should be noted that of all the research sites where we worked, this was by far the most dynamic group. We spoke mainly with women (as they were the majority of association members), who appeared very much at ease to share their opinions and experiences, even if there were differing points of view or men present. It was also very easy to contact other association members, or arrange meetings ahead of time through fellow members, suggesting a good working relationship amongst them. When several women were asked why they seemed to have a cooperative work dynamic, they explained that they had the responsibility of taking care of the household and children. They therefore had to figure things out for themselves, with or without the participation of their husbands. An additional factor seems also to have been the weekly meetings held at the level of their inter-association, where they were encouraged to participate in management decisions, as well as exchange ideas and experiences related to agricultural development.

### *Association structure*

ADEA (*Association pour le Developpement de l'Élevage et de l'Agriculture*) is the local association that encompasses 43 smaller associations. Interviewees belonged one, some, or none of the several associations active in Kashenyi and sub-villages. To give one example of an association - AFP (*Association Feminine contre la Pauvreté*) membership requires a payment of 1000CF/person for registration and 500CF/month. AFP is not only an agricultural organisation, as members can ask to receive help for school fees and school uniforms. Both men and women can be members, though membership is usually as a couple (a household), with the wife being most actively involved. There are about 50 households in Bwengehera members of AFP, and about 280 in total throughout the association.

### *N2Africa training*

ADEA went to different local organisations (sometimes referred to as cellules) to choose people who would participate in the training. The chief was always invited, and it was otherwise open to those who were active members who were capable and interested in sharing the information to their cellule. The training lasted one day, was conducted in a field, and had approximately 18 participants. Diobass and ADEA staff were present.

There was one demonstration field in Bwengehera, but several others (created for other associations) were located close by and could easily be observed if one wished. The field was selected during a meeting when it was asked who had a field near the village, that was near the road, and already ploughed. It is not clear whether ADEA or a local organisation managed this demo field, as people described it as both.

Key messages communicated to the farmers interviewed were line planting, use and functioning of inoculum, introduction to new improved varieties.

The soy processing training was performed at the ADEA meeting space, attended by selected people from the smaller associations who were then supposed to share the training in their villages, accompanied by the head of the association. There was no remuneration for this task, but just a requirement of the will to share the knowledge for the community's benefit, with emphasis on children's health.

### *Observations from demo field*

Comments were very similar, centering on the noticeably improved performance of crops with mineral fertilizer, and soy with mineral fertilizer and inoculum. However, there were some observations that the difference between parcels with and without inoculum was not very big. When asked about this, the senior agronomist at ADEA said that the high soil fertility in the area most likely accounted for the small effect. Several people also mentioned the advantages of sowing in lines, namely that it allows plants to "breathe better".

### *Inputs distributed*

Diobass provided inputs to ADEA, which then distributed them accordingly through the smaller associations to active members, only (see Table 2 for examples of inputs received). Reimbursement of seed with interest was expected. As it was the first time inoculum was being demonstrated, the decision was taken to inoculate soy before giving it to farmers in the interest of preventing wastage or incorrect techniques that could reduce the beneficial properties. The size of the package given depended on whether the household had already (partially) sown for that season and the size of their field.

**Table 2. Inputs received and post-harvest decisions for Kashenyi case study. Grey shading indicates an indirect beneficiary (a person who received inputs from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender                | Inputs received |  | What was done with the harvest   |
|-----------------------|-----------------|--|--|
|                       | Date            | Inputs   |  |
| Man                   | 2012            | Beans: RWR10 ("afrique du sud"), and MH21<br>Soy: PK10, PK6<br>Cassava<br>Maize<br>Fertilizer 2 kg | Household consumption<br>Reimbursed association<br><br>Gave beans to four people in the village:<br>1) Man, a neighbour who had asked for bean seed, gave 1.5 kg<br>2) Man, a neighbour who asked for bean seed, gave 1.5kg<br>3) Woman, neighbour, widow, asked for bean seed, gave 6kg   |
| Man and woman, couple | 2012            | Beans: RWR10 3kg<br>Soy 4kg<br>maize 2 kg<br>manioc 100 stems<br>Fertilizer 4kg<br>Urea 4kg        | Household consumption<br>Reimbursed association<br><br>Gave seed to three people:<br>1) Woman, neighbour, asked for beans and maize<br>2) Woman, family (elder sister of wife), neighbour, gave beans<br>3) Man, family (father-in-law of husband), live a few kms away, gave cassava and maize<br>*Family members did not ask for seed, it was proposed to them   |
| Woman                 | 2013            | Beans: RWR10 2kg   | Household consumption<br><br>Gave some RWR10 seed to a female neighbour. Though the neighbour already grew the variety, the seed was accepted as it was intended as an exchange for seed of a locally available climbing bean variety.   |
| Woman                 | 2013            | Beans RWR10 2 kg<br>Fertilizer   | Household consumption<br>Seed for next season<br>Reimbursed to association<br>Sold some at a roadside stand<br><br>Gave to four people:<br>1) Woman, elderly, belongs to same church, neighbour, gave one cup of beans when she asked.<br>2) Three married daughters, live in Kavumu (a couple of kms away). They didn't ask for any seed, in fact they produce well enough themselves, some even more than her. |

|       |           |  |  |
|-------|-----------|--|--|
| Woman | 2013      | Beans: RWR10 2kg<br>Beans, 6 kg<br>Soy 3kg<br>Maize 2 kg<br>Cassava 24 stems<br>NPK 20 kg  | Gave combinations of bean, maize and soy seed to three people:<br>1) Woman, mother, a few kms away. She saw the beans in the field while visiting and asked for some. She subsequently shared it with the family with whom she lives.<br>2) Woman, neighbour<br>3) Woman, neighbour<br>*The two female neighbours didn't ask for the seed, but she gave it anyway as they frequently exchange seed amongst each other. She is the bigger producer amongst the three.   |
| Woman | 2013      | Beans RWR10 2kg<br>Soy 2 kg<br>Cassava 24 stems<br>Fertilizer 10 kg  | Household consumption<br>Seed for next season<br>Sold some in local market<br><br>Gave beans and soy seed to four people:<br>1) Brother's wife, Kavumu (a couple of kms away)<br>2) Brother's wife, Kavumu (a couple of kms away)<br>3) Sister-in-law (husband's brother's wife), Kavumu (a couple of kms away)<br>4) Sister-in-law (husband's brother's wife), Goma.<br>* They did not ask for the seed, she just gave it to them as is their habit. She occasionally receives seed from them, unasked for, too. She is the biggest producer amongst all. |
| Woman | 2014      | Received one cup of beans RWR10. She asked the giver (a woman in the same village) directly as she was curious to try the new variety. | Beans were in the field at time of interview, they were not growing well.  |
| Man   | 2014      | Received 1kg beans from neighbour  | Beans were in the field at time of interview, they were growing well. One passer-by asked some general questions about the bean variety  |
| Man   | 2014<br>B | Asked his neighbour for bean seed  | Beans were in the field at time of interview, they were growing well. Several passers-by have enquired about the bean variety.   |
| Woman | /         | Received 1 cup beans and 2 ears of maize after asking her neighbour.   | Household consumption and seed<br><br>Gave to three people who all asked directly or indirectly, all live in the same village<br>1) Mother in law<br>2) Mother<br>3) Woman, neighbour with whom she exchanges regularly  |
| Woman | /         | Received 6 kg of beans from her neighbour who works closely with the association   | Harvest failure due to strong sun  |

### *On-farm experiences*

Farmers said that after growing inoculated and uninoculated soy in their own fields there was generally a notable difference, however, they do not know where to purchase it outside of Bukavu. They said they could acquire inoculum if it were distributed by ADEA. Interestingly, however, the ADEA field coordinator said he had rhizobium available at the cost of 1 USD for 10 g. Farmers said this was a price they could afford. During a focus group, women asked if inoculum for other crops, exists, too.

Several farmers noted that the previously grown soy variety had no fertility effect, but with the new one, if the roots are left in the soil it will give a good effect for the next crop. They did not consider it too much work to cut the stems one by one in order to leave the roots in the soil.

There was consensus amongst farmers about the good performance of the improved varieties. This was attributed to both the new varieties, and the use of mineral and compost fertilizer. Surprisingly, few people mentioned the advantage of growing in lines until asked about it, upon which they said it helped plants breath better (and therefore improve their performance). It was confirmed that this was a new technique introduced with the N2Africa training.

### *Gender and crop preferences, agricultural tasks*

When soy is sold in the market it might go to anybody (i.e. big or small buyers). At harvest time, 1 *nahama*<sup>7</sup> sells for 700 cf. Prior to selling in the market they will often ask neighbours first if they'd like to buy any. There are mills in the area for both grinding flour and grinding fresh beans for milk (the latter at ADEA).

Regarding differences in agricultural work between genders, men and women at first insisted that men and women both work in the same fields, take care of the same crops, and share the same agricultural tasks. However, during individual interviews when people were asked to describe more precisely, different details emerged.

- Women tend to be more interested than men in legumes because they are responsible for feeding the household, especially children. They notice that children have more energy and better health when they eat beans instead of maize, and especially instead of cassava. One woman mentioned that kwashiorkor was a potential consequence of exclusive cassava consumption. Beans may also be sold for cash to pay for school-related expenses, grow faster than soy (beans approximately three months to maturity, compared to soy at four to five months), and store well. Soy is appreciated for nutritional content, as well as selling in the market, but as it requires more work people often prefer to grow beans. In addition to legumes, women prioritize maize, sweet potatoes, and to some degree cassava (last in preference because in addition to the perceived lower nutritional content, it takes one year to mature). Men tend to prefer bananas, vegetables (tomatoes, onions), rice, beans, groundnuts, sorghum, soy, and manioc when they can be sold for cash.
- Women, said they take care of children at home, and are also responsible for making sure their school fees and clothes are paid for. Money for such expenses comes from crop sales, which are ideally discussed and decided together by husband and wife.
- Women say they apply money to household needs and purposes, whereas men use money for purposes that are outside of the household. Women are responsible for finding seeds and agricultural or household investments (e.g. small livestock).
- According to women during individual and focus group interviews, many men do not care about their family, although there are of course some who put energy towards finding solutions to family problems. Much of the time the man's role is just a social one, to be a husband (likened to a like a socially necessary placeholder without any other purpose). Sometimes men do work in the field to cultivate crops with the women, but without the women, they would be unable to complete the work. Men are generally less interested in agricultural work, and if they do have another job it is typically as a day labourer in somebody's field, masonry, teaching, administration. A common criticism from the women is that men too frequently do nothing, and spend too much time and money drinking.

### *Seed and info transfer*

If people hadn't participated in the training, they said they didn't know what inoculum was, though they may have heard of the name. People didn't seem to be aware of legumes nitrogen fixing qualities in general. See Table 2 for inputs received by members and what they reported doing with the harvest.

According to the focus group women, people tend to marry amongst themselves (meaning, the women don't relocate far as their husbands families are from close-by communities). So the priority between biological family and family in law should be the family-in-law (in order to show you are not attached to yours, and also because the field cultivated by the couple comes from them), but in reality both are important if they are around. It is possible that tension can come from this dynamic. Many people moved to the area due to insecurity elsewhere, and they will ask seed from those who live there already. These people tend to buy or rent land from larger land owners. They are welcome to join the association for the usual fee of 1000 cf/month and a few *nahama* of beans.

---

<sup>7</sup> A *nahama* is a local measurement, described as a plateful.

The head of Rhudosangye group (Mirindi) attended the training and gave seeds and information session (repetition of the training by Diobass) to 25 members of the group (these are the “active members”).

People wouldn't give seeds to others unasked because 1) they have limited resources (especially some farmers who only have one field, for example), 2) somebody may not want it or need it, or they may have their own particular variety preferences 3) that would just be really strange, weird, and crazy (here was mentioned crazy or like witchcraft – something not logical and negative connotation) to just try to hand out seeds to people randomly, 4) while a variety may be new to one person, others may already have it through their own (different) connections, 5) people tend to have pretty similar crops and varieties

It seems that between family (immediate and spouses of immediates) and close friends (who are like family), one can directly ask and receive or even propose if the giver perceives they may want to try. This seems to be based on habitual seed exchanges, for example, one woman said she and her sister in law always exchange some seed at each harvest (follow up on this).

People feel free to ask within their associations as their function is to support each other. For example, a woman can easily ask a man, or a man can easily ask a woman whom they don't know particularly well if they are part of the same association. This compared to the inappropriateness of a woman approaching a man (i.e. husband of somebody else) with whom she has no publically recognized/formal social ties and asking him for seed.

A neighbour (of residence or fields) can request seed directly or indirectly (e.g. exclaiming something like “oh if I could have some of this seed I would plant it and see how it grows”).

The seed flow is sometimes unidirectional (i.e. bigger producer to smaller) but it can also move in the other direction, even if the producers have a clear difference in productive capacity. This could be related to family ties, friendship, and social status.

Women tend to exchange more amongst themselves, but this is a function of their already established frequent contact rather than exclusivity.

Ideally, husband and wife make seed sharing decisions together.

What is the best way to spread a new technology or seeds ? Association membership because people are obliged to train everybody. Also, members try to recruit new members as it reduces requests from others (i.e. takes responsibility away from individual donations and puts it on the community) A church is a particularly good method as the hierarchy can prevent people of lower statuses from getting info or goods.



## PAD (Programme d'appui au développement durable)

### *Mission, structure, work themes*

PAD operates in three territories, working directly with inter-associations (IA): eight in Kalehe, ten in Walungu, and ten in Kabare. Each IA is typically composed of approximately 12 associations, which are formed by membership at the village (or inter-village) level. In each association there may be 15-50 members, one member usually being the household, rather than an individual person. PAD has one salaried, on-site technician per IA (*conseiller villageois*). This technician is supported locally by facilitators, who are selected for their literacy and capacity to carry out activities as needed.

Work sites are categorized according to progress. Type "A" are sites that have attained good levels of agricultural production but need links to markets and food processing training. "B" are sites that are starting to engage in improving production techniques. "C" are sites that are just starting to organize and structure community members into newly formed associations.

The ten work themes are vegetable farming, staple food crops, anti-erosion, animal husbandry, fruit trees, agroforestry, organization and structuring of village and inter-associations, continuation of structuring of village and inter-associations, birth control, and vegetable farming. N2Africa fell under the theme of staple food crops.

### *N2Africa*

1. Following the training given by IITA to the six partner NGOs, PAD made their IAs aware of the upcoming N2Africa project. The IAs of category "B" were selected (see above).
2. The lead agronomist at PAD then repeated the training she had received to each IA. This was performed on-site, and was directed towards the local, salaried technician as well as a number of facilitators. The training consisted of theory (explanation conducted during an indoor meeting) and field practice, lasting one day each. The field component was accomplished with one demo field per IA location, where they sowed each of the six different packages in equal sized plots.
3. The input packages were distributed, one per household, to any household that expressed interest, at no cost. The six packages were:
  - 600g Soya (SB24), 500g maize (SW333), and 300g NPK
  - 600g Soya (PK6), 500g maize (SW333), and 300g NPK
  - 600g Soya (SB24), 60m manioc (*sawa sawa*), and 300g NPK
  - 600g Soya (PK6), 60m manioc (*sawa sawa*), 300g NPK
  - 600g Beans (COD MLB001), 60m manioc (*sawa sawa*), and 300g NPK
  - 600g Beans (COD MLB001), 500g maize (SW333), and 300g NPKInoculum (for soy only) was distributed in different amounts, for example 200g per village level association to be shared amongst the members.
4. The facilitators, trained at the demo fields at the IA level, were expected to visit the households and encourage people to sow the seeds and implement the techniques. How the facilitators wanted to pass on the information and techniques was up to them and their affiliated association (e.g. if they wanted to organise a formal training with a demonstration field rented by the association, or just in small informal groups as they saw fit).
5. In Feb 2014 "DFID"<sup>8</sup> arrived, announcing that they would give out larger quantities of inputs, however, it seems PAD did not have enough time to announce this upcoming intervention to the IAs. So the local technician identified a list of households that would receive the input package based on the following criteria: active membership of an association (active meaning they participate in group work and are

<sup>8</sup> DFID refers to the latter period of N2Africa Phase I when the Development Fund for International Development funded input distribution. A key difference was the larger quantities of inputs. See "N2Africa" and "DFID" in section III for a full description.

present at meetings), and owner or renter of a field at least 6x10 m. In addition, households selected were not supposed to be the same as those that had received “N2Africa” inputs. Each household had to meet additional conditions upon receiving seed: a contribution of 500CF to the IA, purchase of their choice of input package, and reimbursement of the seed with interest to the IA (there wasn’t a set interest rate, but if one received 2 kg, for instance, they were expected to return 3 kg). The 500CF was intended for the IA to buy fertilizer to be sold during the next season to the next round of farmers, who could purchase seeds at the same prices as the DFID packages. In this way, the seeds and fertilizer could theoretically continue to be shared with other members in the community. The PAD agronomist expressed that this measure of accountability was a way to oblige the farmers to engage with the new techniques and seeds – compared to the free input packages of N2Africa where it was quite possible that some recipients ate the seeds without testing the new techniques and varieties. The number of households reached with N2Africa was much higher compared to those reached by DFID, but exact figures were not easily available.

### ***Case study performed in Murhesa, Kabare***

#### *Comments about fieldwork*

First went to one of the villages where there was an N2Africa intervention, however, upon finding nobody available who knew anything about it we contacted the facilitator recommended by PAD. As he lived in Murhesa, had established an agricultural development association (which had worked with N2Africa), and insisted that we hold interviews at his house, this became the base from where we worked.

Individual interviews began with two women, one of whom was the wife of the facilitator. She helped organise two focus groups a couple of days later, one with women and the other with men. There were 12 women, and 9 men. The women’s focus group yielded very little information about the project, the overall atmosphere being one of evident disinterest and little response to our efforts to motivate them to share their feedback. Though only four of about eight scheduled interviews took place, they did provide some information regarding how the intervention was carried out.

The men’s focus group (nine men) had a more dynamic atmosphere, and was followed up with four individual interviews (with men). These included the president of the local IA, the secretary, one of the demonstration field owners, and another member. While motivated to share the information they had about N2Africa, they did not have much to explain regarding the training and input distribution process as they seemed somewhat distanced from PAD.

#### *Association structure*

The local facilitator was connected to the inter-association named Kamole, founded in 1997 by PAD in an effort to help organise and structure the local associations. The IA grouped together ten smaller associations: Polepole, Tuungane, Abaguma, ADECACI, Rhulangane, Maendeleo, Namulisa, Mazingira, 5e CELPA, and AFID. Kamole focuses on agricultural development for the farmers of Murhesa-Mudaka (two centers just several kilometers apart) and has its base in Murhesa. One could obtain membership through one of the smaller associations, which usually involved a monthly financial contribution, part of which was passed on to Kamole. The associations included both men and women and did not seem to have an emphasis on one gender.

#### *N2Africa training*

The training was given by Kajangu (who received the training from the senior PAD agronomist) and several other technicians from Bukavu connected to PAD. There were three demonstration fields in total, each in a different location and season. One for seasons 2011A and B, another for 2012A and B, and the last for 2013

A and B. The demonstration fields had sub-parcels where soy, maize, and beans were sown separately and associated, and both broadcast and line sown.

Techniques taught during the training, as listed by farmers:

- Line sowing
- Mineral and compost fertilizer
- Anti-erosion measures (primarily to help surface water runoff during heavy rains)
- Rhizobium application (using the sugar and water method)
- Soy processing (milk, flour, tofu, donuts)

Conditions for demo fields varied per season. For instance:

- The demo field of 2011 was owned by a woman, a widow who was a member of the association. She was compensated 35 USD for seasons A and B, each. The fieldwork was performed by both women and men who were compensated 1500CF per day of work by IITA staff when they came to visit. The harvest was then kept in Kamole's depot.
- The demo field for season 2013A was asked as her field was near the road and the association meeting centre, and as her field was prepared but she hadn't yet sowed. She supplied all the seed, except for soy. She performed all the work (except the eight people paid to sow the field) and kept the harvest, except for a quantity of soya that was reimbursed.

The soy processing training was demonstrated with seed purchased by Kamole.

#### *Observations from demonstration fields*

They also noted that rhizobium gave a noticeable positive effect compared to fields without rhizobium application: the seeds germinated earlier; there were a higher number of pods; the plants were generally bigger; and other crops seemed to benefit, as well (crops associated with inoculated soy grew better during and after the growing season).

#### *Inputs distributed*

Inputs given to the inter-association Kamole were not enough to reach all members. Instead, each farmer was asked to contribute some seed to the IA each season and it was subsequently given to another household. Facilitators and leaders of Kamole identified beneficiaries. While the facilitator confirmed that everybody had a choice to make amongst the six input packages, most of the farmers interviewed said the packets were delivered regardless of their individual needs or choices. See Table 3 for examples of inputs received.

**Table 3. Inputs received and post-harvest decisions for Murhesa case study.**

| Gender | Inputs received |  | What was done with the harvest  |
|--------|-----------------|--|---|
|        | Date            | Inputs   |   |
| woman  | September 2010  | Soy 100 g<br>Beans (mshweshwe)<br>Maize<br>Cassava<br>Mineral fertilizer<br>Inoculum<br>Package contents her choice                          | Speaking about the different crops together: household consumption, seed, reimbursement to association, and gave some away.<br><br>Gave soy to five people:<br>1) Two women, both daughters, who live 3 hours away<br>2) Three women, all field neighbours who asked for seed.  |
| woman  | September 2011  | Soy 600 g<br>Beans 600 g<br>Cassava 12 stems<br>Mineral fertilizer<br>Inoculum<br>Package contents not her choice, preferred beans and maize | Soy - sold all to IITA<br>Beans - Reimbursed association, household consumption and seed.   |
| woman  | February 2012   | Soy 200 g<br>Beans 600 g<br>Maize 300 G<br>Cassava 120 stems<br>Mineral fertilizer 600 g<br>Inoculum<br>Package contents her choice          | Soy - sold to PAD through the association, household consumption, seed.<br>Beans - Household consumption, seed, and gave some away to three women, all members of the same association; and five women who are not: two neighbours two field neighbours, and one sister-in-law. |
| woman  | August 2012     | Maize<br>Soy<br>Cassava<br>Mineral fertilizer<br>Inoculum<br>Package given without her choice  | Gave soy to two women, who had move to the area due to insecurity elsewhere, who ate it as it was too long before they found a field to rent. The maize and beans she gave to other people were to eat rather than to sow.  |

#### *On-farm experiences*

When people sowed in their own fields, they were asked to perform both broadcast and line sowing. The first was for their own household consumption, to harvest when they wanted (with beans, for example, people harvest as the grains mature and consume the leaves as well). The second was to be harvested all at once and measured together with the association.

The work groups from the demonstration fields (which were maintained collectively, rather than by one individual) frequently continued even in farmers' own fields, as they found that it sped up the work.

During the men's focus group, they expressed great satisfaction with the harvests of the improved variety seeds. See Table 4 for a general comparison.

**Table 4. Yield comparisons between previously available and improved variety seed according to men’s focus group in Murhesa.**

| Crop    | Quantity received | Yield (Previously available varieties)     | Yield (Improved varieties introduced by N2Africa) |
|---------|-------------------|--|---|
| Beans   | 600 gr            | Less than 10 kg                            | 30 kg   |
| Soy     | 600 gr            | Less than 5 kg                             | 15 kg   |
| Maize   | 600 gr            | Hard to measure but lower production       | Hard to measure but by far a bigger production.   |
| Cassava | 150 stems         | Less than 5 baskets due to mosaic disease. | 10 baskets  |

They did qualify, however, that the high production figures did require a certain amount of effort regarding field management, and the production was not due to improved varieties alone.

Men during the focus group also expressed that they found it unfortunate that some families ate the seed inputs rather than using them to test the new technologies. According to them, anybody unhappy with the performance of the new varieties were likely to have eaten most of the seed and planted just a small quantity.

Challenges experienced included:

- Rats often consume new inputs before the harvest (it was not clear whether this was for a particular crop such as maize, and if it was particular to certain years or the new seed varieties).
- While the harvest quantities were pleasingly high, people are not especially motivated to produce as much as they could have, because they have trouble finding buyers and therefore prioritize family consumption .
- Mineral fertilizers are not available (or accessible, affordable), and rhizobium is impossible to find.

#### *Gender and crop preferences, agricultural tasks*

In the ideal, men and women do the same tasks in the field, but in some couples women say they do everything concerning maintenance of the household. Again in the ideal, a couple will decide together what crops to grow in the upcoming season. However, in reality, though some people say that is what happens, most men and women say that it is the man who has the final say.

According to women, men prefer soy, maize and vegetables (such as tomatoes and aubergines) as they are sold for cash, whereas they prefer manioc and beans as it feeds the household. According to the men, they prefer to grow vegetables (tomatoes, aubergines, onions), sugar cane, bananas, coffee, and some leafy vegetables (*lengalenga*); and women prefer to grow beans, cassava, maize, sweet potatoes, groundnuts, and soy. The discrepancies may have been due to personal opinions or what is typically practiced in their own families. It was consistently said, however, that men tend to choose crops that bring in money whereas women choose crops that feed the household.

#### *Seed and info transfer*

Members were formally encouraged to share seeds and techniques in the following moments:

- Members were required to bring one measure (*namaha*, a plateful) during the general meetings for Kamole, intended for other members in the following season.
- During meetings they were encouraged to share the seeds and techniques with their neighbours.

According to interviewees, people prioritized their family members who lived close by for seed distribution, but association members were also considered a priority. Following these two categories, came other people such as church members, neighbours and colleagues. See Table 3 for examples of seed-sharing relationships.

They suggested that the best moment to learn about a new technology was during the demonstration field, though unfortunately, « not many » people were present. Trying to pass on the new techniques without practical demonstration was difficult to impossible. Another opportune moment to pass on information, they said, was to encourage people to participate or observe when association members (who practiced the new techniques) were working in their fields.

Regarding the role of local institutions, interviewees were in agreement that the best way to introduce new technologies into the community is through the local associations (that focus on agricultural development). Churches were the second choice. Passing by the chiefs was not recommended as they are highly likely to be preferential in the distribution, and lack the appropriate resources to follow up and support the intervention. The farmers also remarked that working through a large NGO was not efficient as they perceived the follow-up (and therefore the impact) to be very diluted (due to the many activities of a large NGO that works with many communities).

## SARCAF (Service d'Accompagnement et de Renforcement des Capacités d'Auto promotion de la Femme au Sud-Kivu)

### *Mission, structure, work themes*

Founded in 2001 by the current director, Noella Rugenge Mwavita, SARCAF operates in five territories: Kabare, Walungu, Kalehe, Shabunda, and Mwenga. In each territory there are several collective associations (*collectifs d'associations*), which are composed of multiple (inter)village-level associations or organisations (*organisations de base*). The latter consist of approximately twenty people per village. Working with women, SARCAF has five axes of intervention: organization and functioning of village associations; promotion and defense of women's interests and rights; fight against domestic and sexual violence; conflict resolution; and food security<sup>9</sup>. N2Africa fell under their food security theme. Staff emphasized that SARCAF's approach is to demonstrate new techniques clearly and give people an opportunity to observe the results themselves, and then leave them the choice to adopt or adapt the technology or not. They do not want to impose innovations. Regarding facilitation of market access, SARCAF does help put buyers in touch with the farmers they work with. Generally, they purchase seeds for distribution in conjunction with specific projects.

### *N2Africa*

- 1) Following the training given by IITA to the six partner NGOs, SARCAF made their collective associations aware of the upcoming N2Africa project. The announcement included some awareness training regarding the value of legumes in soil fertility and human nutrition, as well as the importance of crop associations.
- 2) SARCAF conducted a training at each site. There was no classroom/theoretical component, all was done in practice using the demo field with four opportunities to observe and discuss the new techniques and seed varieties: during sowing, slightly after germination, during flowering, and during the harvest. All the work was performed collectively by the active members.
- 3) N2Africa inputs packets were distributed only to those who participated in the training sessions.
- 4) After the harvest, SARCAF conducted a soy processing training. The soy would typically be purchased from a member who had a good harvest. They wanted to focus on addressing malnutrition and so emphasized making soya milk, though they did also show how to make donuts and flour. They focused on using locally available tools (such as pestle and mortar, hand cranked grinder), rather than other machines that farmers were unlikely to access or purchase. This training was open for anybody interested to participate.

### *Case study performed in Cagombe, Walungu*

#### *Comments about fieldwork*

We contacted the local facilitator recommended by SARCAF several days before arriving, who organised a focus group of women, about ten in total. They were all members of the local association, Bololoke, and had all received N2Africa inputs and training of some form. Over the next three days we conducted 11 individual interviews with women, and 4 men. Of the four men who had expressed interest in participating in a focus group, two arrived at different times and so were interviewed individually. At the women's suggestion, the majority of interviews were conducted in a school building next to the association's office, and the remaining at their homes.

---

<sup>9</sup> Their food security approach rests on helping women produce more, and better quality harvests thanks to the introduction of new technologies, which enables women to increase their incomes and invest in renting another field or even purchasing land. This decreases their dependence on husbands, who often control the money and harvests of their wives. According to the director, several women have even managed to purchase small plots of land through such types of savings, and that some women are even hesitant to (re)marry as they fear losing all that they have created for themselves. It costs approximately 200 USD to rent 10 are for one year; approximately 2000 USD to purchase 10 are.

### *Association structures*

SARCAF worked with the local association Bololoke, founded in 2003 and located at Cagombe. It currently has just over 100 members from surrounding villages, with the vast majority described by members as actively involved. Joining requires a single payment of 1000CF. The (female) facilitator serves for a period of time before the position rotates to somebody else (e.g. two years). The association was founded by women, inspired by a radio broadcast about other women who had done the same. After creating their group, they searched for partners who were better established and could, in turn, help them access more resources (e.g. projects, information, inputs). In this manner they founded a relationship with SARCAF. With SARCAF's help, the association has addressed issues such as production of compost with local materials, literacy, anti-erosion measures in the fields (creating field run-off channels and planting trees and grass), women's empowerment, line sowing, dosage and precision application of both local and mineral fertilizer. The association did have a seed credit system, but due to rainfall problems and poor harvests during the last two years it is no longer functional.

Women form the overwhelming majority of members, the men's interest and involvement being observed only recently when the men saw that their wives (or other women in the community) were starting to obtain useful resources and lucrative results thanks to their participation in the N2Africa project. Indeed, it was frequently said by women in the village as well as some NGO staff that women do most of the agricultural fieldwork, all of the housework, and are often the ones to test and search for strategies and new opportunities to feed the household – including those related to staple food crops. When the women have success with something that the men recognize as financially profitable, the latter then usually succeed in exerting control over the resource. For instance, a story told frequently by female interviewees: men were not particularly interested in Bololoke until they saw people arriving in cars (people from outside the village, seen as bringing benefits to the association), and until they saw that their wives or other women were producing higher quantities of maize, cassava, beans and soy with the improved varieties. Some women believed that the men joined the association because they were afraid that the women might become more knowledgeable than them. In other cases, some wives encouraged their husbands to join. For example, during a planning discussion with SARCAF it was asked whether there were farmers who could offer a field to serve as a demo field; the women then spoke with their husbands (who were owners of the fields), and when their field was used they became association members, too.

According to interviewees, people displaced due to insecurity are also welcome and active members. Indeed, several interviewees explained that they had moved from far away to Cagombe due to insecurity. Several members also reported giving seed to non-members who have since moved away (it was implied that they returned home) after their temporary stay in Cagombe.

It appears that women actively encouraged others to join the association, and that indeed several interviewees had joined after receiving seeds from a member – as one said “after she understood the advantages of membership”. There were several explanations for the motivation to recruit members. One was cultural inclusiveness, or a general responsibility to help those around you. Two supporting quotes: “The person who cultivates alone cultivates on Sunday”, and “Many people live in obscurity”. Second, in cases where a household may feel pressure to share a larger amount of seed than they are able, or would like, the responsibility is transferred to the larger community. Examples may include when a neighbour is in dire need of large seed quantities, or when certain people ask repeatedly for seed without necessarily sharing anything in return or are perceived as not taking care of the seed. Third, people expressed pleasure and pride at being part of an association with a large and united membership base.

### *Training*



The demo fields were proposed by members, and were all owned by men (see above). They were selected based on accessibility (close to a main road, accessible by vehicle), relatively fertile and flat conditions, size of one hectare, and a lower risk of theft or cattle and goat divagation. SARCAF provided inputs and financial compensation for people to work in the field (e.g. 1000CF per person for one day of ploughing or weeding), and the harvest was for the farmer to keep except for a certain quantity of seed reimbursed to SARCAF. The demo field was divided into 16 parcels, according to the experimental plan communicated by IITA. There were five demo fields in total from 2010 to 2013, each with a different owner and implemented in a different season. When asked why, women during a focus group explained that it was because more than one person wanted to benefit from the free inputs (they received seeds and fertilizer, kept the harvest, and labour was paid for by SARCAF).

The soy processing training was conducted in a village several kilometres away, with representatives of Boloke in attendance. Those representatives returned with the responsibility of communicating the techniques they learned. According to a focus group of nine women (who were all members of the association, participated in the demo field trainings, and received N2A inputs), most of them heard a description of the process but did not witness it. However, most of them said they make soy milk for their children at home, and add the remaining crushed soy beans to leaf vegetable dishes.

#### *Rhizobium*

There was firm consensus during the individual and focus group interviews that rhizobium attracts “health” or fertilizer from the air into the soil. Some people mentioned that the roots should be left in the soil with the “little eggs” (nodules, see Figure 5 C for a photo). However, as rhizobium is no longer available (now that the intervention has come to an end), they said it’s not worth it to continue so they just uproot the plants. They don’t know where to buy it, except perhaps at Bukavu. And although SARCAF offers help to provide access to fertilizer, even they were unable to provide any additional inoculum.

#### *Observations from demo field*

Regarding crops in the demo plots, women seemed most interested in beans, maize and cassava as these are typically grown in the area. Regarding techniques, most people described line sowing and use of mineral and compost fertilizer as something new and valuable. The advantage of planting in lines was attributed to the creation of channels that allow water run-off, and the efficient application of fertilizer (mineral or organic). As one woman clarified, even with fertilizer broadcast sowing will yield good results. Mineral fertilizer was perceived to give better results, but nobody interviewed purchased it. Instead, they use compost they make themselves.

Several women also said they appreciated the opportunity to speak and participate with others in a common activity that aimed at improving their work. One said that, formerly, as a woman, she didn't feel that she had the right to do so. Others also mentioned that they were grateful for general guidance and opportunity to discuss field management techniques together.

#### *Inputs distributed*

N2Africa introduced two varieties the first being COD001 (local name *njwejwe*) and then later a second locally called *tokachini*. See Table 5 for examples of inputs received.

**Table 5. Inputs received and post-harvest decisions for Cagombe case study. Grey shading indicates indirect benefit (receiving inputs from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender | Inputs received             |  | What was done with the harvest   |
|--------|-----------------------------|--|--|
|        | Date                        | Inputs   |  |
| woman  | September 2010              | Soy<br>Maize<br>Beans<br>Mineral fertilizer<br>Inoculum<br>Package was presented without choice of contents                      | Soy - sold all<br>Beans: gave to her mother with whom she frequently exchanges. Maize: sold all  |
| woman  | September 2011              | Soy<br>Beans<br>Maize<br>Cassava   | soy - Household consumption, kept for seed, sold some, gave some away (which people ate)<br>Beans - sold 50 kg, 10 kg hh consumption and seed, gave some away<br>Maize - sold 5 kg, household consumption, gave some away<br><br>Gave beans and maize to several women in her family-in-law, with whom she exchanges seed regularly. Gave maize, only, to three female neighbours who asked for some.  |
| woman  | maize, soya, min fertilizer | Soy<br>Maize<br>Mineral fertilizer   | Harvested a large quantity of soy, but no further info as interview ended  |
| woman  | 2011 A                      | Soy<br>Maize   | Soy - household consumption, seed, sold some, reimbursed association, gave some away to a man who had been criticizing their experimentation with soy and techniques (using inoculum and sowing in lines).   |
|        | 2011 B                      | Beans<br>Cassava   | Beans - gave away to three people:<br>1) Woman, a neighbour, whose son proposed to work for her in return for beans (and soy).<br>2) Woman, neighbor who asked for some seed<br>3) Man, neighbour, who asked for some seed   |
| woman  | September 2012              | Beans<br>Maize<br>Mineral fertilizer<br>Package was presented without choice of contents   | Beans - household consumption, seed, sold some, gave some away.<br>Maize -household consumption, seed, sold some<br><br>Gave beans to four women, neighbours, all of whom asked her indirectly while she was harvesting. Also gave beans to her mother, who did not ask but with whom she exchanges seed regularly.  |
| woman  | September 2012              | Maize<br>Beans<br>Soy<br>Package was her choice  | Maize and beans were kept for household consumption and seed, and gave some away.<br><br>Beans - gave to her mother through baptism<br>Maize - offered maize without being asked to a cousin, a woman,   |
| woman  | September 2011              | Cassava - from association (refused mineral fertilizer)<br>Beans and maize - from association member                             | Gave cassava to three people, all who asked, and from whom she has never received any seed:<br>1) Woman, neighbour who asked, has since moved away<br>2) Woman, not member of assoc., who asked<br>3) Woman, not member of assoc., who asked<br>Gave beans to two people:<br>1) Woman, neighbour, who saw the crop and asked, and who has given her maize in the past<br>2) Woman, neighbour, who has since moved away and was not a member of the association |
| woman  | September 2010              | Beans<br>Cassava<br>Mineral fertilizer<br>Soy - bought from association facilitator  | Soy - household consumption, seed, sold in market or to neighbours, gave to two people:<br>1) Woman, saw it in her field and asked indirectly<br>2) Man, saw it in her field and asked for some<br><br>Cassava -gave to one association member who didn't receive any in their input package, as well as many other people (men and women) who asked.  |
| woman  | September 2010              | Cassava - received from an association member in August, which prompted her to join the association.<br>Soy (already inoculated) | Soy - household consumption, seed, sold some, gave some away to her family members (mother, aunt) and neighbours who asked.<br>Beans - gave to three people<br>1)Man, son, who asked<br>2) Woman, mother-in-law, who asked   |

|       |                   |  |   |
|-------|-------------------|--|---|
|       |                   | Beans<br>Maize<br>Mineral fertilizer   | 3) Woman, mother, who didn't ask. The mother then gave seed to her other daughter.<br>Gave cassava to many people, whoever asked.   |
| woman | Sept/Oct<br>2010  | Beans (njwejwe)<br>Soy<br>Maize<br>Cassava<br>Package was according to her choice  | No info as interview ended  |
| woman | September<br>2013 | Beans (njwejwe) 1 kg<br>Cassava<br>The package was presented without choice of contents<br>Maize - asked for some from an association member | Beans: sold some, ate some, gave some away to one woman neighbour who saw them in the field and asked for some, and to women in her family-in-law.<br>Also gave cassava away.<br>Maize - gave to three people:<br>1) Woman, neighbour, she gave without being asked so that the neighbour's children wouldn't steal around harvest time<br>2) Woman, sister-in-law, neighbour<br>3) Woman, daughter, gave her for food rather than seeds, lives in Bukavu |

### On-farm experiences

Overall, people were satisfied and even pleased with the performance of the new varieties.

Although almost nobody mentioned being particularly interested or impressed with soy in the demonstration fields. Of the eight women who received soy seed, all but two continue to grow some quantity of it today. Of the two who did not, one had harvested a large quantity and sold it all to one buyer and purchased a pig and a new roof for her house. The other said she had received such a small quantity that she didn't produce enough seed to sow again after feeding some to her children. Those who continue to produce soy say they do so using compost, generally sow in lines, and consider it a valuable nutritional component – particularly in the form of milk in their children's diets. Additionally, soy can be sold for cash as it is always possible to find buyers in the local markets.

It seems that people generally did continue to sow in lines—if not in the entire field, then in parts. Some women said they replicated certain aspects of the demonstration field in their own, such as sections with line or broadcast sowing, sections with mineral or compost fertilizer. Several people seemed to consider sowing in lines dependent on using compost (or mineral fertilizer), therefore, when there was a lack of compost they no longer sowed in lines. Compost was clearly a technique that was appreciated and continued. With sales of harvests, several women invested in guinea pigs and rabbits, whose droppings they considered important to incorporate into compost production.

People observed that the new cassava variety, *sawa sawa*, did not get infected by mosaic virus as did the others in the past.

Regarding beans, *njwejwe* is grown mainly in season B because it does not grow well with the heavy rains of season A. It is well appreciated as it takes less time to cook, easier to digest, doesn't absorb—and therefore require—much oil, and there no need for baking soda. It can now easily be found in the market at the right time of year, the previously available varieties now being hard to find. *Tokacini* is preferred for season A.

Women mentioned that a local problem is the eventual mixing of bean varieties after several growing seasons. For now, they explained, the two bean varieties are readily found in the market, and former varieties (e.g. *kabumba*, *karaote*, *mafutamo*) are actually difficult to find. What will happen, they asked, in the future when the varieties start to mix together?

### Gender and crop preferences, agricultural tasks

During the women's focus group, they said that in theory, men and women share all of the same tasks except for the heavier work such as ploughing – which is often done by the men with the women following behind, sowing seeds. In actuality, however, most of the women during individual interviews explained that they do almost all of the field work as the men are not very involved in agriculture. There were, however, two people (one man and one woman) who said that the man in their couple does most of the agricultural fieldwork. In one of these cases, the woman was the wife of the village chief, and it appeared that she was engaged in a business brewing banana beer and distilled alcohol from maize and cassava. When asked about men's occupations, the responses were mixed, ranging from mining to rice cultivation to general idleness (which may have been a consequence of lack of mining work).

People summarized that women tend to grow cassava, beans, soy, leafy greens (*lengalenga*), and sweet potatoes (Figure 6) – all foods that are consumed directly by the household or sold for cash. Beans and sweet potatoes mature quickly, which makes them preferred crops. Men tend to grow maize, rice, trees, aubergines, tomatoes and onions – all which can be sold for cash.

Men tend to prioritize rice if they are able to grow it (meaning if they have enough land, and the appropriate land type). The crop was introduced to the area by a development project around 2010, and its popularity is helped by the fact that there is a local mill. According to the women interviewees, with N2Africa and the introduction of new bean varieties, men's interest in the legumes has been awakened as they see the opportunity to sell harvests for cash. Between maize, soy, and beans, the latter is preferred because they can be grown in seasons both A and B. People explained that maize and soy don't grow well during season B due to strong sun and less rain, which makes the plants susceptible to insect pests.

Interviewees reported average distances of 5-20 minutes walk between their home and their fields (owned or rented). One woman who rented a parcel far away moved there recently due to insecurity elsewhere.

#### *Seed and information transfer*

In order of priority, women said they would share seed with (see [Table 5](#)):

- SARCAF (according to reimbursement conditions—though they are not very strict—as this will help spread the seed)
- Other members of the association Bololoke
- Family members
- All others, ideally, whoever is in need

Ways in which seed can be shared include:

- Giving seed between individuals or households with a condition of reimbursement. This can happen amongst neighbours as well as family members. As one woman put it, when deciding whether she should give seed while asking for reimbursement she asks herself, “Will this person be negligent?”. If a person is perceived as lazy (e.g. putting less effort than deemed appropriate into field maintenance, or eating seed rather than investing resources to multiply it), they are less likely to receive seed when asking, or will receive with a request to return it after the next growing season.
- Working in somebody's field in exchange for some requested seed. Sometimes this is preferred to asking a family member as there is no condition of reimbursement.
- If one gets along well with certain people, seed may be offered as a gift. For instance, one woman said "doesn't have any problems" with her three neighbours and sisters-in-law, so she gave them seed without being asked and without any specific purpose (it could have been received as seed or grains to eat). In fact, the women already had seeds of the new variety but the idea was so give just in the sense of a gift, as a good neighbour or sister-in-law, as they do the same for her.

- It was observed that women frequently shared seed with other women who were not members of Bololoke. This was described more than once as a technique to encourage them to join. Slightly different, but related in that seed accompanied an appeal to support the association, was a story of a man who was mocking the efforts of the women to grow soy in lines (as recommended by N2Africa). The woman who told the story said that in response, she gave him a cupful of soy seeds from her own stock. During the next growing season, the man planted it (though it is not clear if he did so in lines or broadcast) and was pleased with the results. In addition to being given some soy seed, he was also asked to volunteer the use of a field as a demonstration plot (where he received free inputs).
- One can give seed “for love, to share and not be alone with the seed”.

## CDC (Centre de Développement Communautaire) KIRINGE

### *Mission, structure, work themes*

The Italian NGO AVSI established CDC Kiringe in 1971 after the Congo Civil War to help the returning farmers process crops and access markets. CDC's goal is capacity building in agricultural communities.

For several years the organisation produced groundnut oil, hulled and sorted rice, and acted as a primary conduit between farmers and large-scale buyers. However, during the conflict of the 1990s and 2000s the infrastructure deteriorated due not only to a lack of maintenance but also destroyed by soldiers who took up residence there. Although the machines remain, as if a museum display, they are no longer functional (Figure 6). Today, CDC purchases rice paddy (though in quantities much smaller than before), processes it with limited machinery (in comparison to former operations), and sells to large-scale buyers such as Bralima and Olive. They also purchase groundnuts directly from growers, which they process to make oil and sell to large buyers. With this production, they can then distribute a certain quantity of groundnut seeds to other farmers in order to promote the crop. As soy is produced in small quantities, they cannot give it away at no charge, so they request reimbursement in-kind. As a consequence of their limited capacity following destruction of their machinery, other associations have acted upon the opportunity to take on an intermediary, collector role.

CDC works in 11 sites. Each village has a representative who liaises with CDC. This is further managed by *shauri*, which are committees composed of representatives of *kamati*, which are village-level organisations. In the past, members were required to pay a membership fee, but the current requirements were unclear.

They have four different services: technical (e.g. they have a workshop, machines, tractors); administrative and financial; agronomic (this is related to research field experimentation with new varieties etc. in their approximately 20 ha of experimental fields, as well as on-farm field experiments conducted from Kamanyola to Kamvimvira and liaised by an on-site village representative); and production and outreach (outreach to surrounding farmers for agronomic and processing technologies).

### *N2Africa*

1. Following the N2Africa training in Bukavu, CDC Kiringe replicated the trainings at their base, as well as five sites in total. They started in 2011 with three sites - Kiringe, Nyamutriri, Luvungi - and the next year expanded to Bwegera and Ndolera.
2. CDC worked with CLDs created specifically for N2Africa, as well as local associations. The CLDs were responsible for distributing the inputs and technologies as they saw fit. There was a demonstration field for each site, with several days of training at key stages of crop development. Techniques included line sowing (with appropriate spacing between seed pockets), function and application of inoculum, and general field techniques such as ploughing and weeding.
3. They distributed all inputs at no charge to the CLDs, and the producers were required only to pay 500CF to their local CLD as way of engagement in the project.
4. The details of the soy processing training were not clear, but it was conducted at CDC's base for representatives from various CLDs and associations. They used a food processor (Moulinex) and a *malayeur*.

Some additional comments from the senior agronomist:

- CDC focuses on those CLDs and associations which are motivated to engage voluntarily. In other words, they are not paid nor generally given free inputs.

- The 300g input packages offered discouragingly small quantities, and that the larger packets were better appreciated by farmers. Some of the recipients ate the legume and cereal inputs rather than using them as seeds.
- In the sites with mountainous terrain people prioritized beans as the climate is slightly cooler than in the plain, and in the plain people prioritized soya as it was a relatively new crop.
- General challenges he notes during his work are that farmers tend to mix varieties after several growing seasons (making it impossible to keep varieties, and therefore their characteristics, separate), and that there is a general lack of communication of research results from institutions and their organisation.

### *Case study conducted in Luvungi*

#### *Background*

Typical crops include maize, beans, cassava, groundnuts, rice (irrigated as there is a water source). Soya is not very common (see below).

#### *Comments about fieldwork*

We began fieldwork without a facilitator contact in the village of Lumumba I, which eventually led to contact with the local association ADPA. It was through their structure that many people in surrounding villages (or *quartiers*) received N2Africa inputs and training. We conducted 13 individual interviews over four days, seven of which were with women. It proved very difficult to escape local politics, and almost all interviewees were selected by an influential member of the association – although they were selected amongst a list of members who had received intervention inputs. It was decided not to hold a focus group as time was too limited.

#### *Association structure*

ADPA was founded in 2003. It initially had two goals. One was social organisation in an effort to unite different producers, especially those who sold rice paddy. The second concerned logistics of collecting and selling rice paddy to buyers from Rwanda, and in DRC (e.g. Olive, DARTCO). At that time it was very difficult to find rice buyers due to the regional conflict. Sometimes they organized a departing truck, and sometimes a buyer came in. From 1996 to 2006 there was little to no market activity involving large buyers and markets in Luvungi.

The association has about 150 members, spread throughout the surrounding villages. ADPA has three primary activities. One is seed distribution. People may request a certain amount of seed and must reimburse in kind with interest. A second is grain collection, buying and selling (primarily for rice, but also other crops such as maize but in smaller quantities). The third is seed multiplication. This is done in fields managed in conjunction with other local organisations. There is no fee to become a member, rather, contributions depend on specific activities (e.g. reimbursement of seeds). When they conduct other activities, they tend to be focused on specific crops. For example, N2Africa was related to soy.

#### *N2Africa training*

CDC Kiringe trained eight representatives of ADPA, two of whom were women, who then replicated the training for interested members. As ADPA's involvement in N2Africa focused on soy, the representatives were soy growers themselves. The trainings were open to those who were already soy growers, or who had a clear interest in starting, and who had access to fields measuring a minimum of 10 are. There were between twenty and thirty members who actively participated in the trainings conducted by ADPA. They subsequently received inputs according to their choice amongst the six "DFID" packages.

There were three demo fields, intentionally located near to the main road to facilitate access and visibility. The fields were rented by ADPA from farmers (who participated in the training at CDC Kiringi). Some notes on the demo fields given by the field coordinator:

- Seasons 2012A and B the field was in Rugobagoba. The treatments included soy with and without inoculum. Yield from the first treatment compared to the second was almost doubled. It was observed that the cassava in the inoculated field also performed better. The association hopes to continue experimenting to better determine whether this is a beneficial effect of using inoculum.
- Season 2013 B the field was in Itara. Treatments included soy with and without inoculum, but due to a lack of rain/strong sun the crops did not develop well.
- Season 2014 A the field was in Kanganiro. Treatments included soy with and without inoculum, and yields were similar between the two treatments.

ADPA described participating in three trainings held at CDC Kiringi. The first training was in season 2012 A, and focused on rhizobium (theory only, no field practice). In 2012 B there was a soy processing training, which included nutritional aspects. And finally in 2013 A the training was conducted in the field to communicate techniques such as sowing in lines, fertilizer and inoculum application. The ADPA representatives then recreated these trainings for their members. The trainings were both formal (e.g. demo fields) and informal (e.g. those people who held positions of leadership in an association informally demonstrated field techniques to field neighbours and others who had expressed interest).

#### *Rhizobium*

Interviewees provided mixed information when asked about inoculum's role and purpose. This may have been a result not only of individual interpretation by the interviewee, but also by the ADPA representative who recreated the training received at CDC. For example, one person explained that soil should be placed between inoculum and seed so that the former doesn't burn the latter (this is actually a technique frequently advised for mineral fertilizer application). Another believed the inoculum should be thrown up into the air as it will then capture the atmospheric fertilizer, delivering it to the soil once it falls down. And yet another said the inoculum should be mixed with a small amount of water and sugar then planted straight away. No matter the response, people clarified that they did not yet have enough practical experience with inoculum, so they were not entirely confident with what they had learned.

#### *Inputs distributed*

Members could choose amongst DFID packages according to the laminated cards. It seems that the representatives who attended the training received inputs at no charge (perhaps in compensation for their involvement in the training), while some people purchased the packages at the price marked on the card, and others who received seed directly from ADPA did so at no charge but with the condition of reimbursement in kind with interest. See Table 6. for examples of inputs received.

#### *Observations from demo field*

When asked what interested them most, farmers commented upon a variety of observations:

- Appreciation of the *ecavel* maize variety (good production despite strong sun)
- Improved soy performance with inoculum
- Interest in seeing soy grown for the first time. Related to this, one woman said soy might be a good replacement for nutrition offered by groundnuts, and may also bring new opportunities to earn money through the processing techniques
- Interest in seeing soy associated with other locally grown crops such as maize
- Demonstration of techniques and crops in their local soils gives motivation to try it in their own fields.
- Good development of bean variety



- Lack of interest due to poor development of maize and beans (referring to the demonstration field of 2013B)

### On-farm experiences

Several people remarked that the inoculum has beneficial effects on crops sown in association with soy (e.g. maize). This was noted in the demonstration fields as well as personal fields.

Regarding the improved varieties:

- *Ecavel* (maize) seemed very popular, as people described a good taste, higher productivity (approximately two ears per stem instead of one as with the previous varieties) even with a “strong sun” (lack of water), and that it grew quite fast.
- Beans (variety unclear) were less appreciated, as farmers found that they didn’t grow well. This was ascribed to a “strong sun” or not being “adapted to their soils” – both of which seem to have been references to climatic factors.
- The new soy variety (PK6) was also appreciated in comparison to the previous varieties (which were purchased from Burundi or Rwanda), but farmers found it difficult to determine whether the improved performance was due the variety itself or the effects of inoculum.

**Table 6. Inputs received and post-harvest decisions for Luvungi case study. Grey shading indicates an indirect beneficiary (a person who received inputs from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender | Inputs received |   | What was done with the harvest   |
|--------|-----------------|---|--|
|        | Date            | Inputs  |  |
| woman  | /               | Soy 60 g<br>Beans 2 kg<br>Maize 8 kg  | Experienced harvest failure for beans.<br><br>Gave soy to four people, all had observed the field and seen either the grains at her house or the crop in the field and requested a small quantity:<br>1) Man, neighbour<br>2) Woman who lives in Lumumba I<br>3) Woman, field neighbour, lives in a nearby village<br>4) Man, field neighbour, lives in a nearby village   |
| woman  | October 2013    | Maize 2 kg<br>Soy 2 kg<br>Beans 2 kg  | Experienced harvest failure with beans.<br><br>Gave soy and maize to five people:<br>1) Man, brother, lives nearby<br>2) Man, brother who lives nearby<br>3) Woman, sister who lives nearby<br>4) Woman, aunt who lives nearby<br>5) Woman, field neighbour, she asked for the seed.   |
| man    | October 2013    | Soya 4 (SB24) kg<br>Inoculum 10 g,<br>Mineral fertilizer 12.5 kg<br>NPK               | Gave soy to several people:<br>1) His three wives (2 kg each)<br>2) To neighbours, as a reward for responding to his invitation to come and see the demo field<br>3) Field neighbours who asked for the seed, three men and 2 women (1 kg each)  |
| woman  | 2013 B          | Soy 4kg<br>Maize 16 kg<br>Beans 4 kg<br>Mineral fertilizer, 1 kg purchased for 5 USD. | Soy - sold some to ADPA (20 kg); household consumption and seed (65 kg); gave some away<br>Maize - gave some away<br>Beans - no harvest<br><br>Gave soy and maize away to five people, all of whom asked for seed:<br>1) Woman, neighbour with whom she exchanges seed regularly, 1 kg soy and handful of maize<br>2) Woman, passed by her field, 1 kg soy<br>3) Woman, married daughter who lives about 30 km away<br>4) Man, brother-in-law who lives nearby<br>5) Woman, sister-in-law who lives nearby |
| man    | 2013            | Soy 1 kg<br>Beans 1 kg<br>Maize 1 kgAlso got 1  | He had just planted them and hadn't yet harvested.   |

|       |            |   |  |
|-------|------------|---|--|
|       |            | packet of inoculum and 1 kg fertilizer.                                 |  |
| woman | March 2014 | Beans 2 kg<br>Maize 2 kg  | Harvest failure for both beans and maize   |
| man   | March 2014 | Soy 2 kg<br>Beans 2 kg<br>Maize 2 kg                                    | Reimbursed 1 kg of soy<br>Kept 3-4 kg to resow in 2015 A<br><br>Plans to give soy seed to a man field neighbour who has already requested.   |
| man   | /          | Soy<br>Beans<br>Maize   |  |
| man   | 2013 B     | Soy 2 kg<br>Beans 1 kg<br>Maize 2 kg<br>Mineral fertilizer 1 kg         | Due to his role with the association (trainer) he gave different seeds to about twenty people.   |
| man   | 2013 B     | Soy 2 kg<br>Beans 1 kg<br>Maize 2 kg<br>Mineral fertilizer 1 kg         | Harvest failure for beans.<br>Soy and maize - kept some for household consumption and seed, gave some away<br><br>Gave away soy to<br>1) Man, neighbour, asked for the seeds and techniques<br>2) Man, neighbour, asked for the seeds and techniques<br>3) Woman, neighbour, divorced, she asked for the seeds and techniques<br>4) Man, field neighbour, asked for the seed.<br>5) Gave some maize to his family who lives far away in the mountains. Didn't give any soy as it wouldn't grow well there. |
| woman | Feb 2013   | Soy, received from her husband  | Harvested about 16kg and sold 7 kg, kept the rest for household consumption and seed, and gave some away.<br><br>Gave soy to three people:<br>1) Woman, mother who lives nearby, had seen the grains drying at her house during a visit and asked<br>2) Woman, younger sister, lives nearby, saw beans at her mother's house and was told to ask for some<br>3) Woman, field neighbour who lives not far, asked for some seed  |
| woman | /          | Soy, received from her neighbour who was drying the grains at her house | Seeds were in the field during time of interview   |

### *Gender and crop preferences, agricultural tasks*

Interviewees said that ideally, or in theory, men and women share all agricultural tasks except for heavy work such as felling trees or ploughing, which is men's work. During individual interviews women explained that in reality, they did more physical labour in the fields and at home than their husbands. Men, during individual interviews, insisted that they, too, worked in the fields alongside their wives and if they didn't it was due to other occupations.

There were no overall strong expressions of gendered preferences for certain crops. For instance, one man proposed that men prefer maize and rice as they are sold for cash, whereas women like manioc and beans for the household. However, this wasn't echoed by anybody else even when his description was repeated. When trying to broach the subject from different angles, the emerging theme was that all of the crops were equally important. Furthermore, women did not voice a strong preference for soy or beans over manioc or maize, as in some other regions (which is not surprising as beans do not grow as well in the hot plain as they do in other regions at higher elevations). Of those who praised soy's nutritional content (protein, energy, vitamins), there were both men and women.

Several farmers said that although soy was grown in the past, it fell out of practice first because it was very difficult to find buyers during the recent wars, and second because it is not a typical crop that feeds the household. Although it is now undergoing a reintroduction, from the seeds to techniques to post-harvest processing, there are several challenges that cause people to hesitate investing in it further. One, there is no

local mill that specializes in grinding the soya into powder, so people must send it to Rwanda through a chain of intermediaries if they want to do so. There are some local mills, but since soya is not a major crop in the region those who would like to mill their soy must wait until everybody else has finished. Most people cannot afford to waste a whole day in waiting. Two, it is still not easy to find local buyers of large quantities. Three, as people are not really used to consuming much soy in this area, it limits local sales, as well. Soy flour is relatively easy to find in big markets where it can be purchased in little sachets at an affordable price (100CF for a measure of a small tomato concentrate-sized tin) (Figure 5). Men were unanimous in their belief that if there were a local depot—or even better, a local processing facility—at Luvungi people would be motivated to produce soy as there would be a clear means to obtain cash.

Some market prices, varying with the season and availability: soy and beans sell at Bujumbura for 1200BF/kg (unclear which season); soy sells at Luvungi for 1500 CF/kg when the supply is low (e.g. beginning of the season when farmers need to sow their fields), and for 700 CF/kg when there supply is higher (e.g. end of the season after harvest).

## IPLCI (Initiative Paysanne Pour Lutter Contre l'Ignorance)

### *Mission, structure, work themes*

Founded in 2002 by seven people—five women and two men—who were all living in Kamanyola at the time. Two have since passed away, two have moved away, and three remain actively involved. The senior agronomist was one of the founders. They were initially motivated to address general insecurity in the region (due to the conflict at the time), and selected food security as the priority; by improving techniques and therefore agricultural production, the income of families could also increase, hopefully bringing about other opportunities. They sought relationships with local research institutions (IITA, CIAT, INERA) in order to bring emerging technologies to producers.

IPLCI works in ten different sites, with four to six villages in each. IPLCI works at the level of CLDs (*comité locale de développement*, or local development committee), which may group members from different villages, and one village can have more than one CLD. Any one CLD may have ten to fifty members. Each CLD has at least one facilitator (someone who is literate, has some background that qualifies them as an agricultural technician) who is elected by the member farmers.

Being well aware of the local challenge for farmers to find buyers for agricultural products, IPLCI created a depot. However, when they found they could not afford the time and resources to maintain it, they suggested that the farmers form a committee to take over management responsibility. The committee was indeed formed, but fell apart fairly quickly. There is no longer a functioning depot. However IPLCI does, upon request, help farmers find buyers for large quantities of harvest. Likewise, they also put enquiring buyers in touch with farmers who may have produce to sell.

### *N2Africa*

1. Following the N2Africa training in Bukavu, IPLCI replicated the trainings in three of their ten sites. They started in 2012 in sites selected according to accessibility afforded by security conditions at the time.
2. At each site there was one day of indoor training (theory), which included about 25 people, facilitators only. Subjects addressed were rhizobium, use of mineral and compost fertilizers, differences between seed varieties including those introduced by N2Africa, and what challenges farmers encountered. Responses to the last point included: access to rhizobium; determining the correct dosage of fertilizer; how to better store seeds and protect from insects; need better links to markets (more specifically, 1) farmers often buy seeds at a high price just before the planting season, and selling directly after the harvest while the supply is high is disadvantageous as the price is much lower, and 2) lack of state intervention and years of conflict-related difficulties have destroyed the local market structures). Subsequently, there was a practical training in the field, lasting one day at each major step (first, sowing in lines, spacing, crop associations; second, weeding in two sessions; third, harvest; fourth, soy processing). The field training was open to anybody who wanted to participate, but the facilitators and master farmers received priority. There were three demo fields in each site, each in a different season. The first was in 2013A, followed by 2013B, and 2014A.
3. Inputs were distributed to those who had contributed 500CF to either their existing association, or a CLD created specifically for the purpose. The 500CF was required as an incentive for people to feel responsibility in receiving the seed (rather than receiving it as a free input). Seed varieties distributed were:
  - COMLD001 (beans, biofortified)
  - HM21 (beans)
  - Marungi (local name, beans)
  - Ecavel (maize)

- Soy

4. A soy processing training was conducted with master farmers and facilitators present, as well as any others who were interested to observe.

### *Case study performed in Majengo I and Majengo II, Katogota*

#### *Background*

Like some other areas in the Ruzizi Plain, there were pockets of insecurity lasting even into 2012. The years during the war had disrupted market links and farming (and other livelihood) activities. According to different local NGO staff members, years of emergency humanitarian aid in the region had conditioned people to receive inputs without much accountability.

The area, like others in the plain, can experience unpredictable rainfall.

#### *Comments about fieldwork*

We first met with the senior agronomist of IPLCI, and asked for the name of the facilitator in Majengo I, a village that we had selected. Following an individual interview with two facilitators, we conducted one focus group with six men and one with five women. No further individual interviews were conducted as there was relatively little dissemination of seed or information, and information conversations seemed to follow the same predictable pattern. One observation worth mentioning was the outspokenness of men compared to women, who remained very quiet and offered little in terms of their own opinions even without the presence of men.

#### *Association structure*

The CLD “Majengo” was created in 2012, for the purpose of N2Africa. Anybody could join, as long as they were from the surrounding villages and paid 500CF/household as a one-time fee that went towards renting the demonstration fields. In total, they have about 177 members (individual members, not households) throughout villages in Katogota. They were further grouped into four sections, each with their own facilitator, for the sake of organisation. The members per group were not evenly distributed; the number of members depended on the interested neighbours of the facilitator.

#### *Observations from demo field*

The comments regarding the demonstration field were so general and repetitive that they were not taken very seriously. In summary, interviewees found the crops “interesting” and that “they grew well”.

#### *N2Africa training and inputs distributed*

There were two demonstration fields, both located just next to Majengo I.

In season 2013 A farmers received 300g of soy seed, without any payments required. The facilitators were given inoculum and fertilizer to distribute, as well, but it seems that they did not distribute them, except perhaps to select friends. Though some people ate the seeds, most planted them and had varying degrees of success regarding the harvest.

In season 2014A people were asked to create a CLD with a joining fee of 500CF if they wanted to receive input packages from N2Africa. This constituted the “DFID” phase. They did not have to pay anything further, and received the seeds to plant in season 2013B. There were 23 households who wanted to receive the packets, however, of those 15 received them as there were limited quantities. According to the CLD written record, people overwhelmingly chose packets 1 and 5. People weren’t interested in the beans as the varieties were apparently already available in the villages after work done by CIALCA and IPLCI. Apparently,

none of these soya seeds germinated, and they blamed this on bad seed. Farmers' explanation was that the seed was too old, however, the IPLCI agronomist confirmed that the seed was good, and the failure to germinate was due to a lack of rain following sowing.

DFID soy seeds apparently didn't germinate. The farmers say that the seed was bad, that it must have expired, and they believe the responsibility is on the IITA side. According to the senior agronomist at IPLCI, the seed was good and the problem was the lack of rain. (See Table 7 for more details regarding inputs received).

**Table 7. Inputs received and post-harvest decisions for Katogota case study, villages of Majengo I and II. Grey shading indicates an indirect beneficiary (a person who received inputs from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender | Inputs received |  | What was done with the harvest  |
|--------|-----------------|--|---|
|        | Date            | Inputs   |   |
| Man    | 2012            | Soy 300 g  | Household consumption and seed<br>Nobody asked him for seed and he didn't propose to anybody  |
|        | 2013 A          | "Package 1"<br>Soya (PK6) 4 kg<br>Maize (ecavel) 3 kg<br>Mineral fertilizer 8 kg | Soy didn't germinate<br>Maize gave a small harvest due to lack of rain  |
| Man    | 2012            | Soy 300g   | Sold 150 kgs<br>Remainder for household consumption, seed<br>It seems that he sold and gave small quantities away to people who asked (often CLD members) |
|        | 2013 A          | "Package 5"<br>Soya (SB24) 4 kg<br>Mineral fertilizer 8 kg<br>Inoculum 10 g      | Soy did not germinate   |
| Woman  | 2013 A          | Soy 1 kg, purchased from CLD   | No harvest, seed didn't germinate   |
| Woman  | 2013 A          | "Package 1"<br>Soya (PK6) 4 kg<br>Maize (ecavel) 3 kg<br>Mineral fertilizer 8 kg | No harvest, seed didn't germinate   |
| Man    | 2014 A          | Soy  | No harvest, seed didn't germinate   |
| Man    | 2014 A          | Soy<br>Mineral fertilizer<br>Inoculum  | Didn't sow the soy, still in his house  |
| Man    | 2014 A          | Soy<br>Mineral fertilizer  | No harvest, seed didn't germinate   |
| Man    | 2014 A          | Soy<br>Mineral fertilizer<br>Inoculum  | Household consumption and seed<br>Did not give any soy away, though he did share bean and maize seed with neighbours                                      |
| Man    | 2014 A          | Soy<br>Mineral fertilizer  | No harvest  |
| Man    | 2014 A          | Soy<br>Mineral fertilizer  | No harvest  |
| Woman  | 2013            | 200 kg soy, received from her husband  | Household consumption<br>(Harvested small quantity due to lack of rain)   |

### *On-farm experiences*

There was relatively little spread of soy seed, inoculum, or information in this CLD. In summary, it seems that the facilitators played a key role in obstructing diffusion of seed and information from IPLCI to their CLD members, though other factors related to climate and market links also contributed.

Regarding the first point above, one can't help but wonder if it was just a coincidence that the three people who report having succeeded at producing a soy harvest were also the only three who had access to inoculum. Two were facilitators, and the third had his field next to one of the facilitator's. When posed this question, the facilitators said that they were successful in producing a harvest as their soils have more water

available due to their location (possibly near a water source) and shade offered by palm trees. Relative to the quantity they possessed, and considering the implied social responsibility to distribute new varieties within a community, none of the three appeared to have actively shared seed outside of their immediate family unless it was to sell. It appeared that the two facilitators were not involved in passing on information regarding soy processing techniques - except to their immediate family or neighbours. They said that they were expecting "support", and when that didn't arrive they lost motivation. The support expected may have been financial remuneration or perhaps construction of a seed depot by IPLCI.

The second factor that apparently stopped seed and accompanying techniques from diffusing amongst the CLD members was a lack of rain, resulting in a complete failure to harvest. The third factor was described as a lack of machinery to crush the soy seed (for home consumption, or even for local market opportunities), and, most importantly, a way to sell large quantities. Here they were specifically referring to the need for a depot that would allow them to group produce and attract large buyers.

#### *Gender and crop preferences, agricultural tasks*

Farmers said they preferred the improved variety beans HM21 (biofortified, high production, good taste) and *marungi* (grows fast, and cooks fast).

Both men and women say that men and women share the same farming tasks, except perhaps for heavier work such as ploughing. The women, however, specify that although that may be the ideal, they usually do much more work, even while their husbands are available to contribute labour.

Men tend to prefer crops that can be sold for cash, while the women prioritize crops to feed the household as well as those will bring cash.

#### *Seed and info transfer*

There seemed to be very little understanding of inoculum, and evidently the information did not go much further than the facilitators. Some people who participated in the field demonstration learned something about it, but few actually received inoculum, and then the soy harvest was so minimal that there has been little opportunity to practice and reflect (see Table 7). The men seemed to have slightly more information about how to use it, and the women didn't even seem to have heard of it (they consistently confused it with a kind of pesticide or fertilizer applied with a pump). Of those who did grow soy with inoculum, and who understood that the advised technique was to retain the roots in the soil, they all said it was too much work to cut the stems of each soy plant, so they pull them up by the roots. They added that the residues are thrown into a pile near the house, and the resulting compost isn't necessarily applied anywhere.

### ***Case study performed in Kasha, Katogota***

#### *Comments about fieldwork*

Returning to IPLCI after working in Majengo I and II, we asked if there were examples of communities nearby that had had more success in sharing seed or techniques. Following his suggestion, we met the president and facilitator of an association in another village, Kasha, and subsequently held a focus group with four women and ten individual interviews (including one man).

#### *Association structure*

AFEDR began as a CLD, and later transformed into an association. Though women founded it, men administered it. When asked why, some women (who were members) explained that previously, the administrators were women but they were not very flexible or open to new technologies or projects. They attributed this to their gender, rather than individual characters, and therefore chose men for the role

instead. One became a member by contributing 5 USD or about 20 kg of maize seed. Seed is distributed upon the sole condition of membership, and entails reimbursement in kind with interest. However, it seems that in practice this was not a strict rule, as several people whose harvests were smaller than expected did not reimburse in full. This seed credit system is managed by the association office, which includes a small depot. However, due to the failure of soy seed to germinate (due to strong sun or bad seed, depending on whom one asked) their stocks are now almost depleted and almost all who took seed on credit were unable to return it as they harvested nothing.

#### *N2Africa training*

AFEDR had worked with CIALCA and IPLCI in the past, hosting trainings and a demonstration field, and subsequently did the same with N2Africa.

The demonstration field in season 2012A with CIALCA was a test of ten different soy varieties. There seems to have been some diffusion of soy from this time, either through personal connections or through AFEDR's seed credit system. In season 2012B they established an N2Africa demo field, followed by another demo field in 2013A. It is not clear whether there was a third field.

It seems that participation in the demo field trainings was sometimes inhibited by other work responsibilities. Women said they were usually able to catch up on the information through somebody else – either by asking directly or joining in when somebody was explaining to others.

#### *Inputs distributed*

Inputs were distributed with similar conditions to in Majengo (see above), including a 500CF joining fee. See Table 8 for examples of inputs received.



**Table 8. Inputs received and post-harvest decisions for Katogota case study, village of Kasha. Grey shading indicates an indirect beneficiary (a person who received seed from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender | Inputs received |   | What was done with harvest   |
|--------|-----------------|---|--|
|        | Date            | Inputs  |  |
| woman  | 2014 A          | Soy<br>Inoculum   | No soy or bean harvest due to strong sun   |
|        | 2013 A          | Soy (from demo field harvest)   | Household consumption and seed<br>Gave some away to one man, member of family-in-law who lives nearby, and who asked for soy as his crop had failed.   |
| woman  | 2014 A          | Soy<br>Maize<br>Mineral fertilizer  | Household consumption and seed<br>Gave soy seed to four people, all of whom asked for some when they saw it drying at her house:<br>1) Woman, neighbour with whom she exchanges often<br>2) Woman, neighbour, they have exchanged seed in the past<br>3) Woman, neighbour, with whom she used to exchange seeds regularly but she has since moved away<br>4) Man, son of brother-in-law), neighbour. |
| woman  | Oct-12          | Soy and mineral fertilizer - from association<br>Maize and beans - from association member    | Soy - reimbursed association, household consumption, sold some in Rwanda<br>Maize - household consumption and seed, sold some in local market<br>Beans - reimbursed association, household consumption and seed<br><br>Gave soy seed to one person, a woman, field neighbour who asked, they exchange regularly  |
| woman  | 2013 A          | Soy<br>Maize<br>Beans<br>Mineral fertilizer<br>Inoculum                                       | Soy - reimbursed association, household consumption and seed,<br>Gave seed to three women, neighbours, all of whom asked for some when they saw it drying at her house. It was the first time there was a seed transfer with these particular women.   |
| man    | 2013 A          | Soy<br>Maize<br>Mineral fertilizer  | Soy - Kept for some household consumption but mainly seed (he had harvested very little), did not share any seed.<br>Maize - did not harvest anything  |
| woman  | 2013            | Soy, from a woman member of association. She has given the woman maize and beans in the past. | No harvest due to lack of rain   |
| woman  | 2013            | Soy, from woman member of association. They have never exchanged seed in the past.            | No harvest due to lack of rain   |
| woman  | 2013            | Soy, from a woman member of association   | No harvest due to lack of rain   |
| woman  | 2013            | Soy, from a woman member of association   | No harvest due to lack of rain   |
| woman  | 2013            | Soy, from a woman member of association   | No harvest due to lack of rain   |

### *Observations from demo field*

When asked about their observations from the demonstration field, people most often mentioned the noticeable, positive effects of inoculum and mineral fertilizer. However, one woman said she noticed no difference between parcels with and without rhizobium, and another commented that if soil fertility is very poor, then with or without inoculum the result will be poor crop development. There was some mention of the advantages of growing in lines, but it was brought up less frequently than in some other villages. It may be the case that the CIALCA soy tests used line sowing, and so it was not new for farmers.

### *On-farm experiences*

Most women did not harvest any soy they had sown due to failure of the seeds to germinate. There was therefore very little to no seed available to distribute, though women did express interest to produce it in the future. They are drawn by the nutritional values they have heard attributed to soy, as well as potential cash benefits through sales locally or afar. For example, a couple of women who did harvest a soy crop sent it to Rwanda to be milled into flour and transported back for local sales and household consumption, or sold there in grain form.

The maize variety *ecavel* was well appreciated for its higher yields (when compared to previously available varieties). Of the bean varieties introduced, *marungi* and HM21 were preferred. Marungi for its short growing period and short cooking time, and HM21 for its taste and high yields.

Of all the techniques perpetuated amongst farmers, sowing in lines was mentioned the most frequently. Almost all of the interviewees described trying it at least once, and some continued as they observed that it allows the plants to "breathe better". It was not clear, however, if they noticed a measurable difference in production. Others discontinued, saying it requires too much work, while yet other farmers said this attitude was just laziness.

#### *Gender and crop preferences, agricultural tasks*

In summary, people agreed that while women prioritized crops to feed the household and also gain cash, men prioritized those that brought in cash.

When women were asked which crops they prefer amongst those that feed the household, there didn't seem to be any one that was valued more than others. For example, during the focus group two women said they consider cassava, maize, soy and beans all-important, as it is the diversity that counts. In addition, they give different options to earn cash, which is important for fulfilling household needs – school fees, above all. The other two women said they prefer maize and beans as they grow quickly. One also added that she would like to grow groundnuts for household consumption but it is hard to find good seed.

In theory, all agricultural tasks are shared equally between men and women. For instance, if the fieldwork was done together, the harvest should ideally be done together, too. In reality, though, women say they do a lot more work than men because they have additional, physically laborious tasks. When asked to elaborate they listed the following: 1) In addition to the shared work in the fields, they have food preparation that starts in the field (e.g. harvesting and peeling cassava); 2) It is common for men to just order women to do work, and they have no choice but to follow; 3) Household responsibilities include finding wood, taking care of the children, and providing sex for the husband.

Field ownership is passed down through the husband's lineage, though a couple may decide to purchase a field together. It is also possible that a woman may manage to buy a field for herself, and this is not a surprising occurrence. In such a case, the woman is entirely responsible for managing that field herself.

When produce is sold, the transactions for maize, beans and cassava are done at the house to local buyers or neighbours here and there, rather than to any one large buyer or collector. Soy, however, is ideally sold in larger quantities to the local NGO (e.g. IPLCI) or is sent to Rwanda to be sold as grains or milled into flour, and transported back to Kamanyola to be sold in the market. Regarding cash earned from any harvest sales, if a husband is good he will share the money and the couple will make plans for its use together, taking into account needs of the household.

#### *Seed and information transfer*

It is notable that there were several women who participated in the soy processing training (members and non-members) but not the field demonstration. Nonetheless they described sowing in lines as one of the techniques they had learned from N2Africa. When asked how they acquired this new technique, without having participated in the trainings, they said other women explained it to them when they gave them seeds (either as project inputs or personal transfers amongst members). Information regarding inoculum, however, didn't seem to spread at all.

Three main themes emerged from the focus group and individual interviews regarding seed sharing rules (see Table 8 for examples of seed sharing conditions). First, one gives seed to anybody - the family is not prioritized because they might be located far away, so it is best to help those around you as it is they who are better placed to help you in the future. Kin may be far due to movements caused by insecurity, or because women move to the household of their husband, who remains near his family (virilocal, or patrilocal marriage pattern). Second, women share more amongst themselves because it would be inappropriate for a woman to approach another's husband. The exception is when there is an already-established, socially recognized connection such as family, family-in-law, or membership in the same association. Third, seed is usually given when asked for, except between women who are very close and exchange regularly (e.g. family, neighbours)<sup>10</sup>.

---

<sup>10</sup> There was one story, an exception, which piqued our curiosity precisely because it was unusual. We interviewed one woman who had supposedly received seed from another interviewee. It was said that she had requested the seed from the interviewee, who lived in the same village. When interviewed, however, she insisted that she had not asked for seed at all, and that the association had wanted to share it with her by transferring it through a female member. In fact, she said that she doesn't give or receive any seeds at all, and instead goes to the market when she needs to purchase some. When we asked several members and one of the association leaders about this, they likewise insisted that seed was never distributed without being asked for.

## Women for Women

### *Mission, Structure, work themes*

Women for Women, an international NGO, has headquarters in Bukavu as well as a branch based in Uvira centre. Research for this study relied on contacts from the Uvira-based branch, which works in seven sites: Makobola, Kiliba, Kiyaya, Muteri, Kamanyola, Lubarika, and Luvungi (they previously worked in Sange but recently stopped).

They focus on four themes: social empowerment, economic empowerment, business skills, and in 2012 started a new program targeting men in order to address domestic problems. They target vulnerable women, described as being refugees, victims of violence, women whose husbands do not (or cannot) contribute to household income, single mothers and widows. N2Africa was implemented under the theme of economic empowerment, which aims to equip women with skills for a variety of livelihoods including soap making, bakery arts, culinary arts, beautician - with an optional focus on agribusiness for those who have a field available. These themes are materialised through 12 month programmes, with meetings several times per month and a 10 USD encouragement stipend at the end of each month (intended to help stimulate practice of economic activities learned). They aim for eighty women per course, with about 16 groups per site, and each group is further divided into a subgroup of 25, headed by a group-elected president who is also a member of the educational course. In general, they purchase seeds and distribute them to women in their programmes. Women for Women searches for suppliers who can provide seeds coming from nationally certified seed. They do not purchase produce directly from producers, but rather facilitate relationships with large buyers.

### *N2Africa*

1. Following a training in Bukavu for the Women for Women agronomists, they replicated a similar training as part of the agribusiness component of their educational programme. The women were either in training or recent graduates, were selected for participation in N2Africa. The women were 18-45 years old, and had to have access to a field, either owned or rented.
2. N2Africa activities began in Kamvimvira and Sange in 2010, using cassava (*sawa sawa* variety), beans, and about eight different types of soy. Soy distribution should have been accompanied by 5 g of inoculum per person. They expanded to Luvungi and Kiliba in 2011, and then Bwegera, Kiyaya, and Kamanyola in 2012, and finally Makobola in 2013.

Typically, each agribusiness group in a W4W site pools money to rent a demonstration field for the duration of their programme. For N2Africa, however, Women for Women rented a field and the tractor to plough. The demonstration field was laid out in the experimental plan communicated by IITA. Ideally, inputs were distributed at the beginning of season A so that the women would have them before starting work in the demo field, the idea being that they could follow the training and immediately implement what they learned in their own field. This was to be followed by a harvest at the end of season A, and resowing for season B.

Training in the field consisted of several days with the agronomist. One day was spent on field practices such as how to plough, line sowing, seed pocket spacing, crop associations, function and application of inoculum, application of mineral and organic fertilizer. Another day focused on weeding, and another during the harvest. The women also organised amongst themselves to maintain the field in work groups.

3. While there was a demonstration field for each site, the soy training was conducted at a location that combined women from different sites or training groups. They were open to anybody who wanted to

observe, but prioritized “master farmers” and “satellite farmers”. According to one of the agronomists, Women for Women considers a master farmer one who has implemented what they learned during the training in their own fields, and especially if they continue even without direct technical and material support. A satellite farmer has done the same, but they are capable of reading and writing, as well as communicating comfortably with visiting staff people from NGOs and research centres. They are typically “first in class” during the trainings, and are responsible for taking information back from such meetings to their communities – such as with the soy processing training.

4. Unlike the “N2Africa” phase, the “DFID” intervention was not restricted to women with a connection to Women for Women, but also to those in their social circles. Many such women subsequently joined a 12 month training programme. The women were required to create a CLD with a 500 CF membership payment, meant as a symbolic fee of engagement rather than for any particular purpose. When people received the inputs, they were encouraged to reimburse in kind to the CLD, but not necessarily with interest. If the reimbursement conditions were respected, it meant that the farmers essentially “purchased” the seeds at a discounted rate (e.g. 18 USD value was expected to be reimbursed at 11 USD worth of seed – of any crop). Reimbursement was enforced by threats to involve the local chief, who could then turn to the local police. Although some people did not reimburse, this threat was not enforced. The contents of the DFID packages were made according to feedback of the six different NGOs, in turn according to their feedback from farmers/facilitators.

Also different from “N2Africa” phase, “DFID” saw no demonstration fields, only a distribution of inputs as part of the agribusiness component of the 12 month training programme. This was because there was “no support provided” in addition to the inputs. The agronomists explained the package contents to the CLD committee members, and those women were instructed to share the information in an informal way with the others. Those who selected packages containing soy seed (which should also have included 5g of inoculum per package) were then gathered together and were given an explanation of inoculum (purpose and how to apply) by the responsible agronomist. Women were told that they were required to reimburse seed in-kind to the CLD, but not necessarily with interest. The contents of the DFID packages was made according to feedback of the six different NGOs, in turn according to their feedback from farmers/facilitators. Women for Women did not facilitate any sales between farmers and large buyers as the harvests were too small (this applied to soy, beans, and maize).

5. The soy processing training was given as part of the agribusiness training as well, using harvest from the demonstration field. It may have been done at a site, or at a central location relying on the master or satellite farmers to transmit the information back to their group members. The training included a session on how to separate biomass (grain from the rest), and was conducted using a variety of tools, depending on the area and what was available: electric or manual food processor, the local mortar and pestle, vitagoat (wood powered) and soycow (electric)<sup>11</sup>.

Agronomists who worked with N2Africa wanted to communicate the following challenges, or points to improve in future interventions.

- The biggest issue was the lack of follow-up. The agronomists worked according to a contract with Women for Women, and when that came to an end they no longer had support to continue working in that site. Even worse was that “DFID” didn’t offer any remuneration at all, so they worked with the women sporadically, “when they asked for help”, without being paid. In other words, there was little to

---

<sup>11</sup> Vitagoat and soycow are soy processing technologies developed and distributed by Malnutrition Matters, a Canadian-registered non profit. See <http://www.malnutrition.org/vitagoat.php> and <http://www.malnutrition.org/soycow.php>

no follow up after the training programme. Introducing new technologies in this way was compared to bringing a baby into the world and then abandoning it too young. They argued that the women need follow up support so they are encouraged and guided in their first experiences with an unknown technology. The training about inoculum, for example, was very short (just a couple of hours) and they didn't think it realistic that the women would be able to understand after such a quick introduction.

- Farmers' enthusiasm for the *sawa sawa* cassava variety has begun to wane. Although it was well appreciated in the beginning due to good production characteristics (bigger tubers, higher resistance against mosaic virus), there were cases of mosaic virus. In addition, that people enjoyed the taste (described as sweet), apparently led to harvest thefts.
- The seed procurement was late and did not match farmers' requests. This issue was explained without placing blame on anybody, as the supply chain of the project seeds was unclear. Farmers asked for the bean variety "*pigeon vert*", to which they are accustomed to growing as it does well in their farming environment, but they received "*najuju*" instead – which failed for almost everybody who planted it. The failure may have been because the variety doesn't do well in their soils, or it may have been because it arrived late in the season, so the women weren't able to sow in the right period.

### **Case study performed in Kiyaya**

#### *Background*

Fields near the hills have more stones, and in the valley some areas have high salt concentrations. Most people don't use synthetic or organic fertilizer (too expensive, consume most of plant so little left to compost), except perhaps for vegetables and other cash crops. Women for Women taught them about creating compost by mixing plant material and human feces but most people seemed to find that idea unappealing. Cattle manure is used, but rarely. Women describe the soils as being inherently fertile, and sometimes leave some crop residues in the field. Maize and beans are typically sown together in a field, as are cassava and beans. Groundnuts are also grown when possible.

The women with whom we spoke worked in fields that were often rented and 1-3 hours walk away<sup>12</sup>. This was not surprising, given that Kiyaya is connected to the urban center of Uvira, and fields close by are in high demand (Figure 7). All but one of the women interviewed had to walk between two and three hours to reach their fields, which were not infrequently rented rather than owned. That many of them had relocated there either for their husbands to find work, or in escaping from insecurity in more rural areas, meant that they were less likely to buy land, and even less likely to purchase land close by. The ethnic composition of the groups seemed more heterogeneous than in other case studies, due to a lot of movement towards the city centre resulting from insecurity.

#### *Comments on fieldwork*

We started with a visit to Women for Women's Uvira branch where we were introduced to the course instructor who worked with the women at Kiyaya. She organised a general meeting with about seven people, from which we organised and conducted eight individual interviews and one focus group of about 12 participants. At the proposal of the branch office, all the interviews were conducted in a private, enclosed Women for Women training centre in Kiyaya.

#### *Association*

As described above, all the women were directly connected to Women for Women either as trainees in the 12-month programme, former graduates, or in their close social circles.

---

<sup>12</sup> Rent for a field of 10 x 50 m in Rutemba (2 hours walk from Kiyaya) is about 200 USD for 2 years. Same size and duration but 3 hours away is about 100 USD.

### *N2Africa training*

According to Women for Women staff, there were a total of 250 participants in Kiyaya. This occurred during two seasons, 2013 A and B, which were part of the “DFID” intervention. In Kiyaya, the first round of participants was recruited when they responded to a megaphone-on-a-truck announcement describing the livelihood training programme. The second round was announced with the help of the local leaders (e.g. chiefs). Women also heard about the training from those in their social network who already had contact with the NGO.

The demonstration field was located two and a half hours away (on foot), during seasons 2014 A and B. It was planted with maize and soy in lines, and maize and soy broadcast sown. It would have been possible to find a closer field, but divagation by goats would have been a problem. Rhizobium was applied during the ploughing, and was also mixed with soy seed just before planting. Other techniques included guidance on how to plough, and adding fertilizer in the same period as weeding.

Some passers-by initially mocked them for sowing in lines because it was a new and little-practiced technique. However, the seeds germinated and grew well until a lack of rain, followed by too much rain, caused most of the soy to rot. They harvested a small quantity that was used during training of soy processing.

In addition to the training days in the demo field, there were field days (*journées champêtres*) that served as opportunities to give feedback to IITA and Women for Women staff, as well as reinforcement of training (e.g. redemonstrate and discuss use of inoculum, line sowing, compost). The women present were “*fermiere modeles*” or “satellite farmers” (or both) selected from various sites.

### *Inputs distributed*

It would have been ideal for the seed inputs to have arrived in October as this is a good time of the year to plant (beginning of season A), but they arrived late, around mid-November. During a focus group meeting the women said that nobody received inoculum with the soy seeds; it was used only in the demo field. According to the agronomist who worked there, however, inoculum was distributed in small packets to group leaders who was supposed to then pass them on in 5g quantities to farmers who chose packages with soy. See Table 9 for examples of inputs received.

### *Observations from demo field*

A couple of women believed that the seeds they sowed in the demo field were not the same as what they received. Evidence, they said, was the far better performance in the demo field of the same crops than in their own fields. When asked if it was due to field management, or availability of mineral fertilizer they were still convinced that the seeds were different.

There was general consensus that maize performed better when sown in lines. Not only was the production higher, but the stems were thicker, leaves bigger, and the ears and grains were bigger.

Regarding soy, it was the first time for many women to actively observe soy in a field. One noted that despite the majority of soy harvest failures, it was possible to obtain a good soy harvest when it was planted at the right moment (she had observed this in somebody’s field, which may have been a demo field for another project).

### *On-farm experiences*

Most people chose packages with maize and beans, and just a few chose one with soy. It seems that many were reluctant to try growing soy for the first time without having more opportunities to observe it first in the field. Some people ate a portion of the seeds (e.g. soy was grilled and given to children to eat), but most people did sow the majority of what they received. When asked about what they learned about soy, there was clear consensus that it is nutritious - for children, especially. However, several agreed with each other that producing soy milk is tiring and takes a lot of time. Few, however, have had the opportunity to practice at home.

Maize grew better in fields in the plain than in the mountains, as in the latter theft by monkeys obliged the farmers to harvest early (before the ears were properly ripened). There was almost no success in harvesting soy. This was attributed to the seeds arriving too late in the season, climatic perturbation (lack of rain, combined with too much rain all at once), and a general lack of experience with the crop. The beans grew well until flowering, but developed no grains. This was blamed on the variety – *najuju* – which was not what they requested. The women had asked for “*pigeon vert*”, a variety they grow regularly that is more drought-tolerant

Inoculum was described as necessary during the trainings, but as women saw in some demo fields that it grew even without, they did not deem it necessary. However, they added that they have not had enough experience with soy to give more reliable feedback. The women agreed that inoculum’s function was to fertilize the soil in order to further the development of the plants, and protect against insects. It didn’t seem very clear, however, and they couldn’t really explain much more. When asked if they had learned anything about nodules, they said yes, they were told that they could be crushed and used again later as fertilizer.

Of all the techniques demonstrated, it seems that line sowing was the most appreciated. Almost all of the women interviewed sowed the project inputs in lines – if not throughout their field then in a part. They said it allowed the plants to breathe better.



**Table 9. Inputs received and post-harvest decisions for Kiyaya case study. Grey shading indicates an indirect beneficiary (a person who received seed from a direct beneficiary, defined as an individual who had received training and inputs from an N2Africa-implementing NGO).**

| Gender | Inputs received |  | What was done with the harvest  |
|--------|-----------------|--|---|
|        | Date            | Inputs   |   |
| woman  | October 2013    | Maize<br>Beans (najuju) 5 kg   | Maize - household consumption and seed, sold some<br>Beans - no harvest due to heavy rain   |
| woman  | October 2013    | Maize (kanjegeri) 4 kg<br>Beans (najuju) 8 kg<br>Mineral fertilizer<br>Did not choose soy as she saw it did not grow well in her field   | Household consumption and seed<br>Gave some maize to two women:<br>1) Woman, a neighbour who had seen the variety growing in somebody's field and saw it drying at her house<br>2) Woman, maternal aunt, lives a couple of kms away, they exchange regularly, gave one cup<br>Two others asked but she refused, as one already had the variety and she had given a lot to the other in the past without receiving anything in exchange  |
| woman  | November 2013   | Maize 3 kg<br>Soy 12 kg<br>This combination was not her choice, but what was presented to her.   | Soy - fed a small quantity to children before sowing.<br>After harvesting a small quantity rats ate much of it in storage, but she kept some for household consumption and seed, and also gave some away.<br>Maize - harvested small quantity (harvested early to avoid theft by monkeys)<br><br>Gave soy and maize seed to 2 people:<br>1) Woman, wife of her brother-in-law, who lives in Kiyaya, and who asked after observing it in the demo field and in her field. They has given her cassava stems in the past.<br>2) Woman, mother-in-law, lives in Kiyaya. |
| woman  | October 2013    | Beans (najuju)<br>Did not choose soy as she thinks her field would be too dry  | No harvest due to lack of rain and seeds planted too late   |
| woman  | October 2013    | Beans (najuju) 3 kg<br>Maize 3 kg<br>No soy by her choice as it was still an unfamiliar crop, although she eventually received a cupful from the demo field                            | Harvested only a small quantity of maize. (Interview ended here)  |
| woman  | October 2013    | Maize 6 kg<br>Soy 6 kg<br>Beans 6 kg<br>Mineral fertilizer 8 kg<br>She received larger quantities as she paid 1000CF instead of 500CF  | Of the three she harvested only some maize. Soy and beans did not produce any harvest.<br><br>Prior to planting the soy, she gave some to a man, a neighbour, who knows her husband and asked her for some seed.  |
| woman  | 2014            | Received one cup of maize from her niece, who participated in a WforW training. She saw it at her house and asked for some.  | Maize was all for household consumption.  |
| woman  | 2014            | Received soy and maize (locally available variety) after asking a woman, a neighbour, who participated in WforW training. She has given groundnuts and maize to the woman in the past. | There was no harvest of maize nor soy.  |

#### *Gender and crop preferences, agricultural tasks*

In theory, women and men do the same agricultural tasks, but women say they end up doing much more work than the men. Though men are involved in all major household decisions, it is they who typically have more say over transactions involving cash. One woman gave what seemed to be a personal example, “a woman can come home to find that the husband has sold one of their goats without consulting her, and she may not see much or even any of the money”. It was likewise described that in the ideal, women and men should make the decision together regarding which crops to plant. However, the man often decides himself without the woman’s input. Field work should also be done together, but the men often leave the work to their wives, or even give her money to pay somebody else to do it.

Nutritionally, the women considered the ensemble of maize, beans, cassava, and groundnuts to be important - “each

has its role to play in the body". Groundnuts give a lot of vitamins, maize and cassava energy, and though they had little experience with it, soy was considered good for energy and vitamins. When asked what they would feed to a sick child, the first choice would be soy flour, and the second vegetables mixed with beans or groundnuts.

Asked to prioritize if one cannot grow them all, women preferred groundnuts, beans and maize, whereas men prefer vegetables such as tomatoes, and rice. The latter require more inputs (fertilizer, pesticides, irrigation, and time), and are sold for cash rather than used for household consumption. Women say they prefer crops that will grow fast and can feed the household, as well as be sold locally in small quantities. Maize, for instance, offers several sales possibilities. It can be dried and sold in the local weekly market, a large quantity can be milled (and sold or consumed), or it can be sold fresh in the neighbourhood.

#### *Seed and info transfer*

In cases where family was far away, there was more seed and technique exchange between neighbours than family. If family was close by, then they were considered a priority in sharing new technologies. The frequent distance between kin was attributed to virilocal marriage patterns, relocation of a household in search of work, and relocations due to insecurity. See Table 9 for seed sharing conditions.

According to the women, ethnicity does not pose a problem when sharing information and seed. As a kind of proof, they described that in their group of 25 there are many different ethnicities because people have moved there from all over. Therefore, as they are all part of one unit, it is expected and normal that they must help each other. What is important, they say, is that there is love or a link somehow, typically through a church membership, association membership, being neighbours, or part of the same family (listed in no particular order).

This can even apply to exchanges between men and women who are not family or part of the same association. One woman gave an example of sharing cassava stems with a man - he was a field neighbour and he proposed to work for a day or two in her field in exchange for stems of the improved variety. Nobody would think of this as an inappropriate interaction. Nevertheless, when women were asked to whom they had given (or from whom they had received) seed or shared new techniques, it was almost always to other women.

One must be asked for seed or information, rather than proposing, because: 1) somebody might refuse and it would therefore be embarrassing or just a waste of your time, 2) if the technique or seed you advised results in negative results it would be your fault, 3) the other person may think you perceive yourself as superior.

Regarding flow of seeds according to social hierarchy, the women said they all have a similar social and economic status, so it would be difficult to differentiate amongst them. However, they said that usually, seed flow goes in the direction from somebody with a bigger production to one with smaller production. However, this was not a reference to production according to wealth or available surface area (i.e. land holdings), but rather the success they have from year to year in any one field. In other words, this was perceived in temporal terms. It happens that sometimes a person who typically has a bigger production might need some seed and it would not be unusual for them to ask somebody who typically produces less.

### ***Case study conducted at Sange***

#### ***Background***

Women said they use no fertilizer of any sort because they consume everything (bean leaves, manioc leaves) and what they don't consume the goats do. The soils in the area are blacker in the hills, and sandy in the valleys. When asked about effects of crop rotations, they said they don't really give much of an effect because sometimes people change crops and they don't necessarily produce a good harvest, while others don't change crops and they harvest well.

### *Comments on fieldwork*

Wanting to explore sites along a north-south continuum of Uvira territory, we selected a village in Sange that had received N2Africa inputs and training in 2011. At the end, fieldwork consisted of only one focus group with three women. We had hoped to speak with a group of six, followed by individual interviews, but people seemed either unavailable or unwilling. Although we were not certain why, this may have been due to women being discouraged by the lack of follow-up by Women for Women (the NGO stopped working in Sange after the N2Africa intervention for unknown reasons), and being very occupied by their fields.

### *Association*

As described above, all the women were directly connected to Women for Women either as trainees in the 12 month programme, former graduates, or in their close social circles.

### *N2Africa training*

In 2011 the women participated in the 12-month agribusiness training. It included planting techniques (such as equal distances between seed holes, sowing in lines) and included crops such as maize, cassava, and soy. They said there was no use of fertilizer or inoculum (however, when asked if they recalled any discussion of nodules, they answered in the affirmative and further explained that although they don't know how the nodules form—perhaps one just has to take good care of the plant—they do recall that it helps pull “health” to the plant). The training started in a meeting room, and then continued in the demonstration field. The explanations in the field lasted about one hour, and were conducted by agronomists (who, we found out later, no longer work for Women for Women). Women for Women, which also paid for ploughing costs, rented the field.

They received seeds after the training, but no follow up (indeed, W4W said they stopped working in Sange a couple of years ago). The inputs received were maize (variety *kanjegere*, which is shorter and grows well in the plain, and the “other variety”, *namula*, which is taller and grows well in the mountains) and cassava in the first season. They had a good harvest. In the second season, after the demo field, they were given maize and soy (which came from the demonstration field harvests), but they did not harvest anything as the rains stopped earlier than expected. The demonstration field was the first time they saw soy being grown, it being an uncommon crop in the area.

The soy processing training was just verbal, no actual demonstration, and given by the agronomist.

They voiced disappointment that the project and Women for Women left so quickly, and that there was no fertilizer or follow up offered. They added that they'd like more seed, but not just for a select group, but for the whole community.

### *Demonstration field observations*

Time being limited, there was little discussion of the demonstration field. The set-up, or even existence, of a demonstration field was not clear.

### *On-farm experiences*

Maize and cassava produced well for the first season, but they had no success in growing soy. For beans, the women wanted *pigeon vert*, which they believed was better for their soil, but received *najuju* instead. They blamed the complete harvest failure on the incorrect variety. Many of the women who received soy used it for home consumption as their lack of experience growing it discouraged them from risking experimentation.

### *Gender and crop preferences, agricultural tasks*

All three women listed beans, cassava, maize and groundnuts as their preferred crops. When asked to prioritize and explain their reasoning, their responses differed slightly. One woman preferred cassava and maize as growing groundnuts was too risky considering the frequent unpredictability of rain. Another chose beans and groundnuts, as beans are good for health and groundnuts good for cash as well as household consumption. The last chose beans and cassava because both are her preferences for household consumption.

Though soy is not a typical crop for the area, soy flour is available in the local market (it comes from elsewhere, guesses included Rwanda, Burundi, and Goma). Asked about when they might consume soy flour, they said typically after the birth of a child, as it is not really a regular part of their diet due to the high price. They said they tend to buy groundnut flour instead (or buy groundnuts and pound the at home). When asked what they would feed a sick child, they answered beans mixed with groundnut flour – as advised by hospital staff. However, when asked if they had the choice between groundnut or soy flour, the prices being equal, they said they would prefer to use soy flour as it is more nutritious. They don't, though, because groundnuts are good for every plate and can be eaten every day, and soy is not always available in the market (it is more expensive and is used more in tea, which they don't typically drink as it is an additional expense).

### *Seed and info transfer*

One's family is the priority, and they should receive new seed or related techniques before anybody else. In the case where a woman has moved to her husband's village, her mother-in-law is her priority because she has become the replacement mother. For others who remain in their family's village, their biological family is the priority.

It is normal and accepted to share between different ethnicities. Indeed, villages typically have members of many different ethnic origins, and intermarriage is common. One exception, however, is with the Banyamulenge (ethnic Tutsis who live in the Ruzizi Plain); they live in their own villages and even if a non-Banyamulenge and a Banyamulenge fall in love their families can never permit the marriage.

Church ties are an opportunity to share, but do not constitute an exclusive or important network for seed or agricultural information sharing. For instance, it is quite typical to share between neighbours, but between neighbours who belong to the same church and those that don't, the former are the first choice because they have an additional tie that strengthens their relationship.

The three women interviewed say they have not received nor given seed in the last couple of years. Instead they go to the market to buy, with money earned by working in other people's fields.



**Figure 5. Photos: A) Two maize varieties and cassava leaves. The woman was separating the leaves from the stems in preparation for cooking. (Uvira territory) B) A demonstration field (maize sown in lines intercropped with inoculated soy) (Kabare). C) Nodules on soy plant roots. The soy had been inoculated with Biofix®. D) An association member in Kashenyi standing in front of a field next to her house, growing maize associated with beans (an improved variety introduced through the N2Africa intervention) (Kabare). E) Soy seed (Ruzizi Plain, Uvira territory). F) Assorted packages of soy flour (different colours are due to different degrees of roasting the beans prior to milling) (Kamanyola market, Uvira).**





Figure 6. Photos: A) Landscape surrounding Cagombe, Walungu. Note the hills and red soils. B) Sweet potatoes in Cagombe (Walungu). C) Women selling beans in the local market at Kamanyola (Uvira). D) Part of the museum-like rice processing facility owned by CDC Kiringe that no longer functions (Uvira territory). E) Some beans sold in the market. Note that the varieties are mixed. (Kamanyola, Uvira)





Figure 7. Photos: A) Early morning on a main road in Uvira centre. Note the hillside villages and fields in the distance. B) Landscape just north of Uvira centre (rice fields in the foreground). C) Landscape just north of Uvira centre (sugar cane, banana trees, rice and vegetable fields in the foreground).

### 3. Observations drawn across case studies

This section outlines N2Africa's theoretical assumptions related to technology diffusion, and compares this to what occurred on the ground. It is an exploration of how expectations compared with what happened, what worked well, and which challenges became apparent. It responds to the following research questions:

*RQ1-What were set up and conditions of the demo trial and participation?*

- A. *What were conditions of the demo trial?*
- B. *Who were the satellite farmers?*

*RQ2-What did lead and satellite farmers learn from the demo-trials?*

- A. *What was the influence on their on-farm decisions and their subsequent crop performance?*
- B. *How do farmers explain soil fertility - in general/pre-demo and related to legumes and rhizobium?*
- C. *Farmer perception of treatment performance?*

#### Description of N2Africa implementation

##### *Institutional structure*

N2Africa's national partner in the DRC is the International Institute of Tropical Agriculture (IITA), located at Kalumbo, South Kivu. The IITA had previously worked with the Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA), a former project that diffused legumes and related agricultural techniques throughout South Kivu. PAD and Diobass, two of the implementing NGOs for CIALCA, were selected to carry out N2Africa activities in 2010 and 2011 along with SARCAF, a third NGO. All three have headquarters in Bukavu, and implemented N2Africa activities in the northern and western axes. The other three partners—Women for Women, IPLCI, and CDC Kiringe—began working with N2Africa later in 2012, and implemented N2Africa activities in the southern axis. All three have offices in the Ruzizi Plain, Uvira territory. Women for Women's headquarters are in Bukavu but they have a regional office in Uvira Centre, IPLCI is based in Kamanyola, and CDC in Kiringe. See individual case studies for more information on each NGO. The second three organisations were selected because they had responded to an information session about N2Africa and were judged by the IITA as having the capacity to reach an adequate number of households.

Although details in the operational structure and approach varied between NGOs, all of their implementation designs followed a similar process of diffusion (see Appendix I: Sample of demonstration field instructions from IITA to implementing NGOs. After attending the IITA-hosted training sessions, the NGO senior agronomists trained their field technicians and programme facilitators. These fieldstaff then, in turn, managed a demonstration field, training sessions, and distributed input packages. The training sessions, whether in the demo field or a classroom, were often conducted with the participation of a senior agronomist. The fieldstaff worked with inter-association groups consisting of representative members of village-level associations or organisations. The representatives, finally, were responsible for diffusing inputs and techniques to their own, smaller organisations. This may have included another demonstration field. Sometimes, however, the NGO fieldstaff worked directly with an inter-village association, rather than a larger so-called inter-association.

IITA staff (more precisely, the senior agronomist specialised in legumes, and the N2Africa country coordinator) visited the primary demonstration fields (i.e. those managed by NGOs through fieldstaff, rather than the demonstration fields managed by the small village-level associations). They were also present at select demonstration fields for the field-visit days (*journées champêtres*), where representative farmers from different villages could give feedback about their experiences. The *journées champêtres* also served several other purposes, depending on the NGO involved: a reiteration of field techniques that were part of the



original training; reach other farmers in the locality who did not yet have contact with N2Africa technologies; offer a sort of seed exhibition where all farmers present could purchase improved variety seed (which may not have been available in local markets).

Another opportunity for feedback came from the notebooks where the demonstration field owners were supposed to keep management and harvest records. This data was then sent back to IITA<sup>13</sup>.

### **Master–satellite farmer model**

The NGOs generally operated with the master-satellite farmer model (i.e. distribution to a “first generation” of farmers who were supposed to then pass on the seed and techniques to the “second generation” of farmer beneficiaries). Master farmers (or lead farmers) were typically people who had a combination of the following: were literate, spoke French, were capable and interested in sharing information in their community, implemented techniques taught in their own fields (and even better if they had done so with little encouragement or inputs from the NGO), and were not shy to speak to visitors.

The interpretation, however, did differ subtly between some NGOs. For IPLCI, master farmers (MF) may have been men or women, and were those willing to try a new technology. They usually elected a facilitator, who had the role of communicating with IPLCI or other outsiders. When a master farmer adopted the technology, they became a model farmer (*paysan modèle*), and others who showed active interest in trying a new technology became the new master farmers. For Women for Women, MFs were those who implemented new techniques in their fields and were comfortable communicating their experiences with visitors of visiting organisations (e.g. IITA). They were selected as representatives (of their training programme group) during field days (*journées champêtres*), and during training sessions (e.g. soy processing, how to use inoculum). In both cases they were expected to convey the information back to their respective groups.

Satellite farmers, everybody agreed, were those who received seed or information from master farmers, model farmers, and, in some cases facilitators (sometimes facilitators distributed technology to master farmers as association members, and sometimes they distributed to their neighbours and family).

The distinction between master and satellite farmer was not always clear. It occurred that an individual may have been both a master and satellite farmer. For example, a farmer who participated in a training at the local-association level was a satellite farmer (because they were trained by a farmer who had participated in a training at the inter-association level), but also a master farmer as they may have then implemented the new techniques and shared them with others in their community.

During a focus group with agronomists from five of the six NGOs, they described some advantages and disadvantages of the master-satellite farmer model. Advantages were that the model: 1) facilitated a structured distribution and follow-up; 2) enabled one NGO to reach more people (by “training the trainer”); and 3) encouraged men and women to work together. Disadvantages were that: 1) there was some exclusion of individuals, specifically, those who didn’t have a field, or the money or will to join an organisation; 2) some people may have hoarded inputs rather than distributing, and could have used them as a way to hire field labour (in exchange for seed).

### **“N2Africa” and “DFID”**

NGOs, field technicians, and some farmers distinguished between two so-called projects, “N2Africa” and “DFID”, although both were in fact part of N2Africa Phase I. Nevertheless, there were several significant differences between the design and implementation of each. While the N2Africa packages contained smaller quantities of inputs, were distributed at no cost, and reached many households, the DFID packages consisted

---

<sup>13</sup> This data has been analysed and documented by the IITA, but proved difficult to access in time for the completion of this report.

of larger input quantities, were usually distributed with a condition of reimbursement in-kind (or, more rarely, direct purchase), and reached fewer households. Also, while support was provided to finance training and follow up for N2Africa, agronomists and facilitators alike disapproved of DFID's perceived lack of follow-up and support around distribution of inputs. In some cases where an NGO did not provide the resources to accompany DFID inputs (e.g. demonstration field, technique trainings, follow-up of possible on-farm implementation), the packages were distributed and that was all. However, people (NGO staff and many farmers) overwhelmingly approved of DFID's required in-kind reimbursement of seed, agreeing that it imposed accountability on the recipient's part. As one senior agronomist explained, it forcibly encouraged farmers to engage with the taught techniques by sowing the seed rather than, for example, consuming it immediately.

Another key difference was that while N2A distribution was limited to existing organisations (e.g. inter-village or village-level associations), DFID worked with existing organisations as well as local development committees (CLDs) created expressly for the purpose. The announcement for the CLD creation may have been made at a church service, by a village chief, by an NGO fieldstaff or facilitator. Apparently, anybody who owned or rented a field and who paid the 500CF joining fee was welcome to join (see individual case studies regarding each NGO's approach). Whether certain individuals were excluded was difficult to ascertain, given the short stays at each site and that most interviews were conducted with people who were association or CLD members. However, it seems that the so-called DFID intervention was handled in different ways by the NGOs, and at the distribution level of village-level organisation. For instance, one NGO found that DFID was announced with very short notice. As a consequence, the field-based technicians or facilitators were asked to create a list of recipients. While this may presumably have been done with some interaction and decision-making with potential recipients, it is also quite possible that certain people with closer ties to the facilitator or their organisation may have been privileged. Another NGO made DFID participation open to women who were either graduates or current trainees of their educational programme, as well as other women who were in their social network. As the women participating in the programmes were often recruited by local, public announcements, it is possible that this approach reached a wider social network.

### *Flow of inputs and techniques*

According to NGO agronomists and farmers<sup>14</sup>, techniques disseminated by the six NGOs were: soy inoculum, line sowing (with appropriate spacing between seed pockets), crop associations, use of mineral and organic fertilizers, plants to combat erosion (legumes and cereals), soy processing, variety selection, management of harvest and conservation of seed, and field days. Use of inoculum and line sowing were the key techniques that differentiated N2Africa from CIALCA. In the plain, introduction of soy was an additional feature that differentiated N2Africa from CIALCA.

Inputs for both "N2Africa" and "DFID" were introduced to NGOs, and then from NGOs to the inter-associations (or in some cases, from NGOs directly to farmers through their regional agronomists), in six packages. The packages offered combinations of the following, which were designed for distribution according to each farmer's choice:

- Maize (variety *ecavel*)
- Soy (varieties PK6, SB24, CK6) and inoculum (Biofix<sup>®</sup>, produced and imported from Kenya)

---

<sup>14</sup> Records that document the specific training information exist at the IITA but were unavailable. It was the same case with details regarding seed sourcing and distribution flow.

- Beans (varieties HM21-7, CODMLB001, and RWR2245 were sourced from HarvestPlus. They were iron and zinc biofortified, and bred for high yield and reduced cooking time; other varieties came from other sources including commercial markets)
- Cassava (variety *sawa sawa*, available through IITA)
- Mineral fertilizers

In reality, farmers received different combinations of inputs, depending on a host of factors including the approach of the NGO and the dynamics of the local association.

The demonstration fields managed directly by NGO staff, and sometimes by smaller associations, tended to follow the experimental plan of 16 sub-parcels distributed by IITA. There were a variety of conditions governing the selection and use of demo fields (for specific details see the individual case studies), but some generalizations can be made:

- Fields were rented either by the NGO or through the membership fees of a local association
- Use of a field was donated by a farmer in exchange for inputs (mineral fertilizer, inoculum, seeds), which usually included labour paid for by the implementing NGO. This labour was usually limited to ploughing and sowing. Weeding and other maintenance was usually the responsibility of the farmer, and the harvest was usually performed with the group as it was an opportunity to discuss the results between sub-parcels.
- In cases where farmers donated their field, the resulting harvest was for them to keep, except for a certain quantity of seed reimbursed to the local organisation or NGO, to be redistributed to other member farmers.
- Farmers who donated use of their field were either members of the association already, or they became active or *de facto* members
- The fields were generally required to be visible and accessible (e.g. located near a main path or road, accessible by vehicle), have a decent level of fertility (i.e. not especially poor or excellent soil fertility), and, in some cases, be located on a relatively flat surface (i.e. not on a hillside) and safe from goat divagation.

## Technology diffusion: What did farmers learn?

### *Perceptions of soil fertility*

Overall, farmers made very little mention of soil fertility benefits provided by legumes, whether beans or soy. While this doesn't exclude the possibility that they had noticed an effect, and were perhaps too shy to share their thoughts or that the question wasn't posed in the right way, the observation is supported by the lack of elaboration on this even when discussing lessons from N2Africa (in the demo field as well as their own on-farm experiences). When asked directly whether beans impart soil fertility benefits according to their own experiences, farmers did answer that when they spread residues (leaves, stems, and bean pods) on the fields they did notice improvement. However, there was no particular distinction between effects of bean residues and other crop residues. Moreover, there was generally relatively little crop organic matter retained in the field because leaves of cassava, beans and sweet potato are consumed. What people don't eat, some women explained, the goats will.

Rainfall (or, conversely, "strong sun"), inherent soil fertility, and application of compost were the factors described to most affect soil fertility. Of the many people who reported applying compost, they described learning this technique during the N2Africa demonstration trainings.

Regarding factors that could affect crop performance and harvest, people described seed variety, seed quality, timing of sowing, animal divagation (goats, monkeys), theft, labour availability to maintain the field (e.g. weeding), and pest or disease prevalence.

In general, people do not practice crop rotations as they continually produce the staple food crops of beans, maize, cassava, and sweet potatoes. They are frequently grown in the same field, broadcast sown and mixed together. If compost was applied, it was typically incorporated into the soil during ploughing (which is typically performed by hand).

Many people expressed wanting to use mineral fertilizer for staple crops, especially after observing the demonstration field comparisons with and without. However, they generally do not as they said it was too expensive and frequently impossible to find without a time-consuming (and expensive) journey. Nevertheless, fertilizers and pesticides are applied to vegetables including tomatoes, potatoes, aubergines, and cabbage. These are considered necessary investments in such crops, which are grown for cash, principally by men. Several farmers, however, did express disinterest in mineral fertilizer (although it may be anecdotal, it should be noted that they were all women). Some referred to the myth (Vanlauwe and Giller, 2006) that mineral fertilizer is known to burn the soil<sup>15</sup>. Several others mentioned they don't want to use it just once, fearing either that subsequent harvests would be lower as a kind of withdrawal effect, or that they would just be disappointed in a significantly lower harvest. Overall, opinions of mineral fertilizer application on staple crops were quite mixed, varying from desire to rejection.

#### *Farmer perception of treatment performance*

There was general consensus amongst farmers that the parcels with inoculum<sup>16</sup> performed better than those without (evidenced by bigger leaves, taller stems, more numerous pods, and bigger pods and grains). Likewise, there was general consensus that parcels with mineral fertilizer or compost performed better than those without, those with mineral fertilizer typically faring better than with compost; and that line sowing produced better crop development and yields than broadcast sowing. Advantages of line sowing included allowing the plants "to breathe" and more efficient use of compost. There are some exceptions worth exploring, however, including these two examples:

- The field coordinator for an inter-association near Kavumu (Kabare territory) noted that parcels with inoculum did not necessarily perform better than those without. He hypothesized that the fertile volcanic soils were responsible for general good crop performance, minimizing the comparative effect of inoculum. Nonetheless, the farmers in the area praised the effects of inoculum and fertilizer. Was this according to their observations in a demonstration field that did show notable differences? Was it a result of believing in the purported benefits? Or perhaps giving an answer that they hoped would please the visiting researcher (whom they associated with N2Africa)?
- What to make of people who observed very different things from the same demonstration field? For instance, while some women said they observed better performance with inoculum and fertilizer, another flatly stated that she saw no difference. Had they actually observed the same demonstration field? Were they referring to different aspects? Were they reacting to something else and expressing it through an opinion of the demo field?

#### *On-farm experiences and subsequent crop development: improved seed varieties*

As long as farmers succeeded in producing a yield, most people did tend to continue growing the newly introduced improved varieties. This was the case even if they might also have acquired another (locally

---

<sup>15</sup> One IITA staff member who works on soil fertility issues directly with farmers suggested that one source of this belief is the stories told by people who had seen colonial-era plantations. People correlated the apparent substantial mineral fertilizer inputs and "burned, poor quality" soils.

<sup>16</sup> Kiswahili terms for inoculum, as used by NGO staff and farmers were: *mbolea ya mu hewani* (atmospheric fertilizer from the air, *engrais de l'air*), *uzuri ya hewani* (freshness from the air, *fraicheur de l'air*), and *afia ya hewani* (health from the air, *santé de l'air*).

available) variety, whether through their social network or purchased in the market. Continued use of an introduced variety was due to several reasons:

- It was an accessible source of seed—as it was the crop they grew, it was the seed they were able to save.
- If it had been introduced just a couple of seasons prior, some farmers indicated that they were still growing it, either in part or all of their field(s), to test and observe.
- An observed improved performance compared to other available varieties.

The cassava variety *sawa sawa* was resistant to mosaic virus (though some agronomists in the Ruzizi Plain had started to notice some cases of the virus in this variety), and reportedly grew larger tubers than previously available varieties, and had an appreciable sweet taste.

Farmers described the maize variety *ecavel* as having shorter stems (therefore more resistant to wind), bigger and more numerous ears. Opinions on the taste varied, some preferring other varieties as they had a softer pericarp, and some saying they were pleased by *ecavel*. Sowing maize in lines with compost was one of the techniques that farmers applied to their own fields, and there were mixed opinions about whether they attributed improved maize performance to the variety or field management alone, or both.

The project distributed different bean varieties throughout the seasons and territories. In the Ruzizi Plain the beans did not grow well, or at all, so people were not able to compare their performance. This was due to climatic factors (rain starting too late, torrential rain that caused plants to rot, rain ending too early), a variety that didn't perform well in a certain farming environment (such as the case in Kiyaya, see Women for Women case study), and/or planting too late (because seed distribution occurred too late in the season). In Walungu women found that the introduced variety (*njwejwe*) produced well and was appropriate for season B with its lighter and shorter rains, rather than season A with the heavier rains. In Kabare, farmers said the introduced variety(ies) produced well, though they seemed to simultaneously value different varieties (perhaps for different seasons, or tastes, but this was not clear).

Reasons that people did not continue with an introduced variety were:

- A failed harvest, and consequentially, no more seed. This was especially notable in the Ruzizi Plain, where there was very little success in harvesting beans or soy (maize fared slightly better). Beans or soy harvests, when they did occur, did not happen more than a couple seasons in a row. By the time of this research, there were little to no soy seeds available—even in association seed depots. Two factors that affected success in harvesting were being able to sow on time, adequate rainfall distributed throughout a season (e.g. rain that started late in a season, followed by torrential rain was frequently cited to have destroyed crops), and a seed variety appropriate for the local farming environment.
- Poor harvests (in the plain) that discouraged people from growing it even if the seeds may have been available.
- No seed was saved. Sometimes was stored in inappropriate conditions, or was eaten by rats. Some women mentioned feeding all the harvest to the household, or selling it all to purchase household investments (livestock such as guinea pigs, rabbits, goats, or pigs; tuition fees; a new roof)

### ***On-farm experiences and subsequent crop development-techniques***

Of all the techniques introduced through N2Africa, line sowing and use of compost fertilizer were most frequently and consistently applied in farmers' fields. Crop associations had a mixed reception.

Farmers described the advantages of line sowing as increased efficiency and application precision regarding fertilizer use, giving space for the plants to “breathe”, and creating channels for water run-off (thereby reducing standing water and rotting crops)—all contributing to higher production. Use of the technique

varied - some people tested line sowing in part of the field, some immediately applied it to all, others just to certain crops (most frequently maize and cassava, followed by soy, and then beans), and some to all. There were some comments about it being tiring or more time consuming, but it seemed that for most people the perception of benefits outweighed the extra work<sup>17</sup>.

In the case studies where production and application of compost was emphasized by the implementing NGO, farmers appeared to implement it into their own fields, saying that it had a noticeable positive effect on harvests. In fact, most people described line sowing and compost application as paired techniques. Some people even said they were inseparable, therefore when they didn't have compost they did not find it worthwhile to sow in lines. This seems part of a theme whereby farmers associate two introduced technologies, considering one dependent upon the other, although it was not necessarily the case. For instance, soy and rhizobium (if one doesn't have rhizobium it is not worth growing soy), or soy and mineral fertilizer, line sowing and mineral fertilizer (if one doesn't have mineral fertilizer it is not worth sowing soy or line sowing).

Associating crops appeared to be appreciated less, and when people did it they seemed to be unsure of the reasoning. One typical response was "it was done like this in the demo field", and that they replicated the technique in their own field (or part of their field) in order to experiment and observe. A few farmers said that it allowed them to grow multiple crops at the same time, as they did already with broadcast sowing, but with more precision thanks to sowing in lines.

### **Focus on soy**

Soy deserves special mention, as it was an important component of N2Africa in that 1) soy was relatively new to the Ruzizi Plain, and 2) the introduction of inoculum was limited to soy, and was the first time inoculum was used anywhere in South Kivu (compare, for example, to CIALCA which had promoted soy in the territories surrounding Lake Kivu, but did not include inoculum).

In the western and northern axes, soy has been present for many years (people mention having grown it even 20 years ago) and it is easily available as flour—grown locally and processed in local mills. This is typically mixed with leaf vegetables or tea. Nonetheless, it was the first time most N2Africa beneficiaries had grown soy. For those farmers in the plain it was generally the first time they had the opportunity to observe soy in a field, let alone grow it themselves. There flour is available but not as readily as it was (re)introduced as a crop only recently through N2Africa, and there are no local mills that specialize in processing soy. The available flour seems to come from Rwanda and Burundi, or from areas around Lake Kivu. (Figure 5)

Farmers described soy to be highly nutritious—as learned from CIALCA and N2Africa trainings and from hospitals, and sometimes from their own observations of improved children's health with a diet including soy regularly. Its protein content is compared equally, or sometimes even favourably, to meat. This was the case even in the plain, despite the lower use of soy there and a lack of personal experience.

The main soy processing techniques taught to farmers were

- Grilling and grinding into flour (at a mill, or manually with mortar and pestle). The flour was most frequently cooked with leafy vegetables (*lengalenga*, cassava leaves, bean leaves), as is also done with groundnut flour. Few people made flour at home as the hardness of the gilled soy beans makes for very labourious pounding. Rather, they buy flour or take their beans to be ground at a local mill (when there are, such as in Kabare), or in rare cases in the plain, it is sent to Rwanda and back.

---

<sup>17</sup> Line sowing incurred more work in the sense one had to walk back and forth more times in a field in order to lay the cord.



- Crushing fresh beans with a hand-cranked grinder (or manually with mortar and pestle), then using a sieve to pass water through the beans to make soy milk. The spent, crushed beans were then usually added to leafy vegetable preparations. Women almost always described the milk being prepared for children, although they and their husbands did consume it, too.
- Making donuts by frying spent, crushed beans from milk-making mixed with sugar and wheat or soy flour. None of the interviewees said they had made these at home, the sugar and oil being expensive and the donuts, though found tasty during the trainings, came after other food priorities.

### Social of seed and info sharing

This section explores social aspects of seed and information diffusion: with whom people were most likely to share seed and information, the nature of these relationships, and the role played by local village institutions. It responds directly to the first and third research questions:

*(What were set up and conditions of the demo trial and participation?)*

*B. Who were the satellite farmers?*

*C. What are lead and satellite farmers' motivation to participate?*

*How does the social of relationships affect seed and information transfer behavior between and amongst lead and satellite farmers?*

*A. What are the social relationships between farmers who exchanged information and seed?*

*B. What were the social conditions of passing on the seeds and or information?*

*C. What role did intermediary community / village institutions play in this process?*

### Gender dynamics, roles and crop preferences

To place responses to the above questions in context, it is helpful to first describe the socio-cultural setting using key points about gender dynamics, crop preferences, and what is considered acceptable moral behaviour towards one's community.

In agricultural households, while men sometimes participate in agricultural activities, the women always do. Men are sometimes involved in other activities, such as teaching, holding administrative positions, working in masonry or in (other people's) fields, and mining, whereas women's off-farm activities were much less varied (they include working in (other people's) fields, production of alcohol, market and roadside selling of roasted maize or other produce from fields). However, more than once women described a man's function as just fulfilling the social role of "husband"—in other words, a sort of ineffectual placeholder in the required social configuration of marriage. Women's criticism of men who spent their time drinking alcohol, consuming time and money that could otherwise be put towards household matters, is noteworthy here only because it was overwhelmingly the first response to questions enquiring about men's roles in agriculture. Men insisted that this was not true, and that they spent equal energy on agricultural tasks. Theoretically, women and men share all agricultural tasks except for certain heavy tasks such as ploughing or cutting trees, which is typically done by men.

According to both men and women, though there are no interdictions or obligations regarding what crops each gender may grow, there were gendered crop preferences all the same. In general, men tend to focus on crops that bring cash. Which crops these are depend on the local farming environments (e.g. Water sources nearby?) and markets (e.g. Are there any local soy buyers? Is there a local soy mill?). In case studies conducted in Uvira, for instance, cash crops include rice, tomatoes and aubergine; in Walungu beans, maize and rice; and in Kabare they included soy, beans, tomatoes, aubergines, and other vegetables. Women tend to prioritize crops that can feed the household and bring in some cash for taking care of the children (e.g. school fees and uniforms). Women's crop preferences also varied depending on the region. While in Kabare

beans were consistently prioritized (they grow quickly, are nutritious, and are worth selling in the market or on the roadside), in Walungu women cited beans and cassava or sweet potatoes as priorities, and in Uvira, maize, cassava, beans, and groundnuts were deemed equally important. That the rich, volcanic soils and climate around Kavumu (Kabare territory) are conducive to growing beans, and that the hotter climate and unpredictable rains make prioritizing any one crop in the Ruzizi Plain (Uvira territory) more difficult may be a partial explanation of such preferences. Women frequently chose fast-growing crops such as beans and maize.

It should be emphasized that although men prioritized earning money, women also need access to cash (Figure 6). Aside from paying for school fees and uniforms, cash also allows them to purchase food for the household and seeds (for crops they will manage) for the field(s), invest in livestock (rabbits, guinea pigs, pigs, and goats), and household needs such as construction and repairs. This could be problematic in the cases where, because ownership of harvest is theoretically shared even if the women did the majority of the work (either because the man owns the field, or because husband and wife both contributed work, or because in conjugal unit where men are dominant), a husband keeps the money without sharing appropriately with the woman for the family's needs. Likewise, though a couple should ideally discuss what crops to sow together, each accommodating to the other's needs, women said the men usually had the final say.

Considering the gendered crop preferences, it then follows that women generally tend to share bean and maize seeds, cassava stems, and sweet potato vines amongst themselves far more frequently than men. (It was not clear how men typically acquired vegetable seeds, but it seemed that they frequently purchase seed in the market.) In theory, seed-sharing decisions should be made as a couple, as should decisions related to spending money from harvest sales. In reality, though recounted experiences illustrated a great deal of variation, while women seemed to have less say in spending money from sales of legumes, maize and cassava, they had more influence over the sharing of the seeds.

In such cases when a man would like to acquire seed from a female neighbour, it is considered most appropriate if he asks his wife to speak to the woman in question (i.e. it is inappropriate for him to approach the wife of another man if they have no publically-recognized, formal relationship such as close family, church membership, or association membership). Frequently, though, even within a family or family-in-law, these seeds tend to pass through women because they spend time together and offer support to each other. It should be said, however, that in some villages people did express that in the ideal, men and women can share seed or ask each other for information freely without anybody around them thinking badly of it. When we followed up on this idea, other interviewees (individual and in groups) said that was just the ideal and did not reflect reality.

### ***Expectations of a good member of the community***

It was consistently stated that farmers have a responsibility to diffuse a seed variety within their community in order to keep it alive. As summarized by one man during a focus group, "Even if you are the owner of those seeds, it doesn't belong to you; it belongs to the community". One never knows what might happen to their crop and field, so giving custody of the resource to other farmers reduces the risk of the variety disappearing from their community. This might be even more important when it is difficult or even impossible to find these varieties in the local markets (such as with the newly introduced varieties of N2Africa), or in contexts where it is difficult to earn cash in order to buy seed in the market. Therefore, in the ideal, one farmer can ask another for seed, and expect to receive it without exchanging something (directly and immediately) in return (explored in further detail below).



Interviewees frequently told stories of when they enacted this ideal. Two typical scenarios emerged:

- People gave to those who asked even if they had already been asked by several others and were left with much less seed than what they would like to have consumed or sold.
- People gave to others with whom they had little or no previous social exchange, and had no particular expectation to see the person again after sharing the seed (e.g. who came from another community seeking refuge from insecure conditions, who were visiting somebody in their village for a short time, a passer-by).

There were, however, socially acceptable situations, even if not ideal, in which one could refuse to give seed when somebody asked.

- If one would be left with too little (e.g. nothing to sow in the immediate, upcoming season)
- If they thought the asker did not deserve the seed (e.g. They had already asked a lot without offering anything in exchange over an extended period of time; they already have what was judged a sufficient quantity of the variety asked for; they just want to eat it rather than to sow it while pretending it is for seed; that they would be “negligent”, “lazy” or not “take care of the seed”).

It also became clear during individual interviews that some farmers, often single headed household (either men or women), despite having seed of a new variety were not asked. Though it proved difficult to explore this observation further, it may suggest that people try not to impose the request upon people who have fewer resources to share.

### **Role of local institutions**

Local institutions included churches, administrative hierarchy (i.e. chiefs), and farmer organisations. Farmer associations and CLDs (local development committees) were the institution of choice for the implementing NGOs. As described by agronomists and by interviewees, this was the most appropriate strategy amongst the possibilities (see also the related section above, *master-satellite farmer model*). This, mainly because it offered the possibility to reach many people, of a specific target (i.e. farmers), who were all welcome to join regardless of their social position. This perspective was given by parties who had reason to support this approach—namely the NGO staff and association members—but it also seemed to be supported by the handful of interviewed farmers who were not association or CLD members. Granted, though, they had received seed and technical advice through a member, so they may have felt it appropriate to give praise to the approach out of a sense of reciprocity. Nevertheless, some people were likely to have been excluded: those without a field but who do practice agriculture by preference (e.g. field renters who may not have found or been able to afford a field); those who did not have the time or money to join (one must pay and/or be an active member, meaning contributing time to meetings and joint activities such as working in a demonstration field); those who did not have the motivation, encouragement, or will to join. Additionally, in the Ruzizi Plain it was explained that the Banyamulenge ethnic group “kept to themselves” and lived in their own villages, therefore participating less (or not at all) in outside farmer associations. This was the only example of ethnic division regarding participation in associations or distribution of seeds and techniques. Throughout all interviews, including those with NGO staff, it was (unsurprisingly) said that nobody was discriminated against if they showed interest in joining.

When an association functioned well (meaning there was active collaboration between members, and leadership that fostered organisation, transparency, and sense of community) it seemed that members shared considerably amongst each other. For example, if one member didn’t receive the new variety maize seed as part of their input package, they asked and received from another member. Likewise, when one member harvested enough to give some to others, they frequently gave to association members over other neighbours. In such associations, members also actively recruited other members to join, with frequent

success. Indeed, numerous interviewees had joined the association after receiving seed from a member. The motivation seemed to be:

- Cultural inclusiveness, an interest in helping those around. Two quotes that illustrate this are, “who cultivates alone cultivates on Sunday”, and “many people live in obscurity [and should be helped]”)
- Seed can be given from the association, rather than an individual, shifting the responsibility and cost to a community-owned resource rather than household-owned. This was mentioned in cases where certain people ask repeatedly, or were in need of large quantities, or when the potential giver had limited resources.
- People expressed pleasure and pride at being part of an association with a large and united membership base.

Churches played a minor role in dissemination of seed and agricultural techniques. They might serve as a place to make an announcement about an upcoming training, and members of the same church might be inclined to share information or seed between themselves but it was not a strong theme. People said that the church was not an appropriate institution to share seed or techniques as the strong hierarchy could prevent those at the bottom from receiving, whereas in a well-run association everybody is, theoretically, equal.

Chiefs likewise played a minor role in the N2A dissemination of techniques and seeds, because they were bypassed by the associations. Sometimes they were members, themselves, but not always (recall that the associations working with N2Africa required members to be engaged in farming activities). Interviewees also said that chiefs are not the appropriate way to distribute new technologies due to potential unequal distribution caused by hierarchical relations and favouritism.

### ***Who was prioritized in sharing of seed and information?***

Information about new techniques, as well as cassava stems, sweet potato vines, and maize, beans, and soy seed were shared most often with family, field or house neighbours, and members of the same association (particularly when there was a collaborative spirit). When family was close-by, they were prioritized. However, when they were not then those geographically closest took family's place. As farmers explained, one is most likely to be helped by those around you, such as neighbours, so helping them benefits everybody in the longer term. Indeed, data from interviews shows that house neighbours often shared seed amongst each other, and it seemed that the closest house-neighbours were often asked first for seed. Explanations regarding families being far away were: 1) relocation of a family in search of work; 2) relocation of a family due to insecurity; and 3) patrilocal marriage patterns (or virilocal, when a woman gets married and moves to, or near, the residence of her family-in-law).

If a woman's biological family was not close-by, then she was expected to prioritise her family-in-law, the eldest female being most important (mother-in-law, or sister-in-law), because: 1) the field used by the couple is inherited from the husband's family; and 2) a woman should show that she has joined her husband's family and no longer puts her own first. This relationship may continue even in the case of widowhood. In one case study where virilocal marriage patterns did not put long distances between a woman and her biological family, she tended to share equally – if not more – with her mother or sisters.

### ***Additional aspects of seed sharing***

How to ask somebody for seed? One can ask for seed directly or indirectly. Some examples:

- One might ask directly by approaching a farmer with their hoe and asking if they might work in their fields in exchange for some seed at the harvest.
- Or they might see the crop growing in a field, or the grains drying at somebody's house and ask for a small quantity, explaining that they are a farmer and would like to try planting the seed.

- After asking, they may even offer to purchase the seed, and the giver may accept or just give without any monetary compensation.
- An example of indirect asking might be when a farmer, on the way to his or her own field, sees an unfamiliar bean variety growing nicely in a field near the path. He or she could engage the field owner, who happens to be harvesting some leaves for the evening meal, saying, “What type of bean is this? It grows so well, the leaves look big, there are lots of flowers and it seems that the harvest could be good. Where can one find such a variety? Oh, if only I could find some seed like this then I could enjoy growing it, too...”. The field owner could then offer to give some of the seeds at harvest time, so long as the crop continues to develop well.

When passing seed on to somebody, does one sell, ask for reimbursement, or give it away? These were three different scenarios that emerged throughout interviews. While in the majority of cases people said they gave it away, some women preferred to sell seed, or even ask for reimbursement in-kind, than just giving it away. They believed that when people were obliged to exchange something for the seed, they were more likely to “take care of it” (i.e. making the effort to plant and multiply it, rather than just eating it). Several women described refusing seed entirely to some people who asked, having judged them as “lazy” or “negligent” with seed and therefore it was not appropriate to share with them. Summarizing the different scenarios of seed transfers, it can be said that they related examples of indirect, delayed and immediate reciprocity. Indirect reciprocity refers to the practice of helping strangers to improve one’s reputation or receive returns from somebody else in the future. Delayed reciprocity describes expectation of a return (material or service) at some point in the future, but with no specific time frame (e.g. returning seeds next season, or after the next season that produces a decent harvest). Immediate reciprocity refers to situations where one worked in exchange for seed, or one gave other seeds in exchange.

People typically did not give seed unasked for several reasons:

- They had limited resources (especially those farmers who only had only one field, that may have been so small that they needed to work on other’s farms in order to meet household needs)
- The potential receiver may not want it or need it, or they may have their own particular variety preferences, therefore the offer could be refused or create an awkward moment
- That would just be strange, weird, and “crazy” to just try to hand out seeds to people randomly. In this context, “crazy” and “witchcraft” had a similar sense – something illogical and even suspicious
- While a variety may be new to one person, others may already have it through their own (different) connections
- It was also said that people tend to have pretty similar crops and varieties so it would be a wasted or useless offer

However, when it came to certain social networks amongst women, they did share seed unasked with regular frequency. This was given without any particular expectation of direct reciprocity (i.e. something or a service returned immediately), and without any obligation that it should serve as seed or food. Women related by family (between daughters(in-law), mothers(in-law), and sisters(in-law, both the sisters of one’s husband as well as the wives of one’s brothers)) had often established a habit of giving each other small quantities of seed after a harvest, unasked. Certain female house or field neighbours had also established these exchange relationships, especially, as mentioned above, when family was far away due to relocation. This giving and receiving of seeds was explained as a natural gesture, one that showed respect and solidarity. It could easily happen that one gave another seed that they already had, but it would be accepted all the same. These exchanges typically occurred after a harvest, during common activities or visits paid between houses.

People often gave or received seed in exchange for work in a field. It seems that this happened quite spontaneously, different to a field owner seeking people to work in their field in exchange for cash payment. For example, a farmer walking to their field on the harvest day might ask a few people they meet along the way to help out. After working together the helpers would typically be given some of the harvest – for them to decide whether it is for seed, to eat or to sell.

There did not appear to be any directional flow of seeds related to socio-economic status. In response to this possibility, interviewees and NGO agronomists explained that farmers in their communities tended to have more or less the same status, and that those who produce a larger harvest one year may not find themselves in the same situation the next (in other words, large harvests were not attributed to field size, but circumstances influencing crop production). That interviewees were members of farmer organisations, or were in the same social circles as members, may explain this lack of difference. There did seem to be a pattern, though, of those with a bigger production giving more frequently to those with less. This may have been in keeping with the social expectations and responsibility to help others (even if it was in exchange for some work in the fields).

### *Additional aspects of sharing information*

People were hesitant to give unsolicited information to others because:

- They might be perceived as thinking they are superior
- If they encourage somebody to try a new technique and there is a subsequent harvest failure or poor performance, then they would be partially to blame.

The moments when people were most likely to share information about new techniques amongst themselves (outside of formal or informal trainings by association-affiliated people who had a specific responsibility to do so), were when giving the new variety seed, and during visits of close family and house neighbours.

Field techniques were most likely to be shared with field neighbours (or with close family and neighbours along with the transfer of seed). Close proximity, seeing each other frequently, and performing the same activities around the same time facilitated this. For instance, a field neighbour who asked for seed might receive it along with a demonstration of how to sow in lines. Soy processing techniques, on the other hand, were most likely to be discussed or even demonstrated in the house with visitors, or when visiting somebody else.

The techniques interviewees most often reported sharing were line sowing, production and application of compost, and the nutritional benefits and processing techniques of soy. Some interviewees, who did not follow the training in the demonstration fields, said they had started sowing in lines after independently observing either the demo field and/or neighbours fields over a season or two.

There was occasional resistance to the introduced technique of sowing in lines. For instance, women line-sowing in a demonstration field were mocked by some passers-by. They said that in the face of such a challenge, it was a sort of victory when the plants developed well and produced a good harvest. Several women also described refusal by those close to them upon the advice to sow in lines, even though their suggestion was based on positive, personal experiences. One woman, for example, said she gave soy seeds to her daughters and field neighbours (also women) and spoke to all of them about line sowing, but they all rejected the idea saying that it would leave too much unused surface area in the field.

As N2Africa was the first time inoculum for any legume crop to be introduced in South Kivu, it is worth looking closer at the key moments that affected information transfer:

- From the implementing NGOs to facilitators and farmers (this through the demonstrations typically performed through the inter-associations). The NGOs generally perceived that farmers would not understand nitrogen availability as a result of a symbiotic relationship between different living organisms. It was therefore explained as “dawa”, or medicine, with the specific function of drawing atmospheric nitrogen, or more simply atmospheric fertilizer, into the soil. Most interviewees who had participated in such trainings repeated the description above, while saying they did not really understand it well enough yet.
- From farmers who participated in the inter-association trainings, to farmers who participated in the village-level association trainings, to so-called satellite farmers, there was very little transfer of inoculum-information. This seemed to be due to a lack of experience with and understanding of the technology. It was not uncommon for people to confuse it with other agrochemical products, or simply stating they were sure of what it did. Being a newly introduced technology, that only just started to become available in a couple of agro-dealer shops in Bukavu, it is a somewhat intangible product for farmers – unavailable and therefore not part of daily reality. Inoculum unavailability was not just due to lack of sales points, but also because during the intervention farmers frequently received input packages without inoculum. Therefore, their opportunity to observe inoculum was in the demonstration field, only. Overall, it was perceived as a powerful medicine that significantly improves the performance and harvest of soy – that remains yet unavailable but hoped for as soon as possible.

## 4. Key lessons

This section offers a summary of key lessons. It is organized per research question.

### Research question 1

**What were set up and conditions of the demo trial and participation?**

**A. What were conditions of the demo trial?**

**B. Who were the satellite farmers?**

**C. What are lead and satellite farmers' motivation to participate?**

### *Set up of the demonstration fields, trainings, and input distribution*

Conditions varied depending on the NGO and local association, though the general format did include a practical training typically using a demonstration field accompanied by a distribution of inputs.

- Demonstration fields managed directly by NGO staff tended to follow the experimental plan proposed by IITA. Field rent and labour were typically paid for by the NGO. Demonstration fields run by village or inter-village associations or CLDs varied in their layouts. Fields were owned by members, and were either rented with membership fees or by offering free inputs and right to keep what was harvested. Labour was performed together or sometime paid for by the NGO.
- The trainings were usually conducted in a room (theory) followed by several days in the demonstration field (practical) and addressed: soy inoculum, line sowing (with appropriate spacing between seed pockets), crop associations, use of mineral and organic fertilizers, plants to combat erosion (legumes and cereals), soy processing, variety selection, management of harvest and conservation of seed, and field days. N2Africa may have been the first time inoculum and line sowing were introduced in South Kivu. Following the harvest, a soy processing training highlighted the nutritional benefits of soy, and how to make milk, flour and donuts.
- “N2Africa” input packages contained smaller quantities of inputs, were distributed at no cost, reached many households, and were limited to existing organisations, whereas the “DFID” packages consisted of larger input quantities, were usually distributed with a condition of reimbursement in-kind (or, more rarely, direct purchase), reached fewer households, and worked with existing organisations as well as local development committees (*comité locale de développement*, CLD) created expressly for the purpose. While NGOs may have distributed inputs according to the six different packages, farmers received different combinations that were sometimes according to their choice and sometimes not. Seeds were the main input distributed, followed by mineral fertilizer, followed by inoculum.

### *Master-satellite farmer model*

The six NGOs distributed inputs and techniques using the master-satellite farmer model (or a “train the trainer” approach), which though it had disadvantages, farmers and NGO staff seemed to generally approve of the dissemination method. The distinction between master and satellite farmer was not always apparent.

- The model was implemented through a chain of increasingly local organisations: the NGO gave trainings and distributed inputs to inter-associations (which united farmer representatives and facilitators from village-level associations); representatives from inter-associations were then responsible for replicating trainings and distributing inputs to members of their own village or inter-village organisations; those members were then either told they were responsible for distributing the information and seeds to others in their community, or they was no specific encouragement to do so.
- Advantages were that the model: facilitated a structured distribution and follow-up; enabled one NGO to reach more people; and encouraged men and women to work together. Disadvantages were that: there was some exclusion of individuals, specifically, those who didn't have a field, or the money or will to join an organisation; some people may have hoarded inputs rather than distributing, and could have used them as a way to hire field labour (in exchange for seed).

- While master farmers, or lead farmer, were typically those who successfully implemented new technologies, satellite farmers were those to whom they transferred seed and information about new techniques. Facilitators, who helped NGOs carry out activities, may have been master farmers, but they also spoke French, were literate, and were considered capable of communicating information throughout their community.
- It occurred that an individual may have been both a master and satellite farmer. For example, a farmer who participated in a training at the local-association level was a satellite farmer (because they were trained by a farmer who had participated in a training at the inter-association level), but also a master farmer as they may have then implemented the new techniques and shared them with others in their community.

### **Motivation to participate**

- Motivation to participate included a variety of factors: free inputs, access to inputs that aren't readily available (e.g. good quality seed), already being part of a training programme or an active member of a farmer's association, interest in new (improved) varieties, interest in new technologies and information, sense of in contact with channels of potentially useful information to improve quality of life.
- NGO agronomists and farmers alike supported the idea of encouraging accountability (during input distribution or seed sharing by requiring reimbursement in-kind) so that people were forced to engage with the new varieties and techniques. Amongst farmers there was a clear general disapproval of behaviour perceived as lazy or negligent.
- Some NGOs appeared to have more success at distributing both seed and information, which may have been partly due to their pedagogical, community-building approach where farmers were repeatedly encouraged to share with each other, support each other, and establish seed depots that could continue to distribute the new varieties to other farmers. This observation is based on both information shared by farmers (e.g. they reported sharing more seed with people, actively encouraged others to join the association), and an observation of the ambiance during interviews (e.g. farmers were clearly more comfortable expressing their opinions and recounting their experiences with the new seed, seemed habituated to communicating with each other regarding association activities).
- NGOs that had implemented women's empowerment activities (e.g. encouraging women to share their opinions and participate in community associations) appeared to have fostered more socially-cohesive associations (which had primarily female membership) where descriptions of seed and information sharing seemed more frequent and widespread, and also imparted an increased sense of agency on the part of women involved.

### **Research question 2**

***What did lead and satellite farmers learn from the demo-trials?***

- What was the influence on their on-farm decisions and their subsequent crop performance?***
- How do farmers explain soil fertility - in general/pre-demo and related to legumes and rhizobium?***
- Farmer perception of treatment performance?***

### **Farmer perception of treatment performance in demonstration fields**

Some field management techniques and crops received more general interest than others.

- Although there were some exceptions, farmers had generally observed that applications of inoculum, mineral fertilizer, and compost all improved crop performance—mineral fertilizer affecting the biggest difference. Likewise, they found that line sowing produced better crop development and yields than broadcast sowing.
- There appeared to be a general interest in the opportunity to observe soy cultivation. It was the first time for the vast majority of farmers in Uvira territory to have observed soy in a field, and the first time



for most farmers in the western and northern axes to have produced soy in their own fields even though the region is known for soy production. Crops of interest in the demonstration fields varied per person.

### ***Influence on their on-farm decisions and their subsequent crop performances***

Overall, farmers found that the introduced varieties performed better than those previously available, and continued to produce them after several seasons. Certain techniques seemed well appreciated, while others were not, perhaps due to a lack of practical experience.

- Farmers found improved varieties of maize (*ecavel*) and cassava (*sawa sawa*) to produce better yields. The distributed bean varieties changed across seasons and regions, and farmers had varied opinions as some beans did not appear to be appropriate for certain farming environments whereas others became very popular due to higher production than previously available varieties. As soy was relatively new to most farmers, they did not make variety comparisons, though the few who had produced soy in the past found the distributed varieties to produce higher yields.
- As long as farmers succeeded in harvesting, most people did tend to continue growing the newly introduced improved varieties. This was the case even if they might also have acquired another (locally available) variety, whether through their social network or purchased in the market.
- Of all the introduced techniques, line sowing and use of compost fertilizer were most frequently and consistently applied in farmers' fields. Crop associations had a mixed reception.
- There was relatively little transfer of inoculum and knowledge of inoculum, though those farmers who participated directly in association-trainings were more likely to have received either. Inoculum was not available for purchase in markets, though the IITA is currently developing production of local rhizobium strains with plans to distribute to local agro-dealers.

### ***Perceptions of soil fertility***

- Overall, farmers made very little mention of soil fertility benefits provided by legumes, whether beans or soy. Rainfall (or, conversely, "strong sun"), inherent soil fertility, and application of compost were the two factors described to most affect soil fertility. In general, people do not practice crop rotations as they continually produce the staple food crops of beans, maize, cassava, and sweet potatoes. Mineral fertilizer was applied to staple food crops only when it was distributed through a project.

## **Research Question 3**

***How does the social of relationships affect seed and information transfer behavior between and amongst lead and satellite farmers?***

- A. What are the social relationships between farmers who exchanged information and seed?***
- B. What were the social conditions of passing on the seeds and or information?***
- C. What role did intermediary community / village institutions play in this process?***

### ***Social and agricultural context***

Though there are no strict cultural rules governing gendered crop choices, men tend to focus on crops that earn money, while women focus on staple food crops that feed the household and offer the opportunity to earn some money. Stories of inter-household tensions over alcohol abuse, use of household income, and control of labour were frequent, and given their divisions along gendered divisions could be related to the strong patriarchal culture.

- Theoretically, men and women perform the same agricultural tasks and share household decisions regarding which crops to plant and how to use money from harvests. In practice, women seem to carry a heavier workload, and men typically have more power in making decisions, including those related to money.



- Women consistently described tension between the husband and wife (or wives) over control of financial resources. As caretakers of the household, women need access to money (for school fees, investments in house construction/maintenance, securing additional food needs through purchase of small livestock) in addition to staple food crops. In offering examples when this tension plays out, two types of stories emerged: 1) Theoretically, ownership of harvest is shared, and any sales are the property of the couple. In practice, though it was said that some men do contribute to supporting the household, they have almost absolute control over the money earned, even if it may have been the woman who sold a small amount of grain in the marketplace. 2) Once women started to develop agricultural activities of economic interest, the men started to exert their control over the benefits (e.g. money from crop sales), and potential resources (e.g. agricultural inputs from a project).
- Ideally, men and women can share seed or ask each other for information. In practice, women tend to distribute maize, cassava, and bean seed amongst themselves. Soy was of interest to both women and men due to cash-earning opportunities.
- It was consistently stated that farmers have a responsibility to diffuse a seed variety within their community in order to keep it alive. Therefore, one farmer can ask another for seed, and expect to receive it without exchanging something (directly and immediately) in return.

### *Social relationships between farmers who exchanged information and seed*

Relationships between those who transferred seed or information varied depending on distance to family, distance between house and fields, and social cohesiveness of the local association.

- Information about new techniques, as well as cassava stems, sweet potato vines, and maize, beans, and soy seed were shared most often with family, field or house neighbours, and members of the same association. If family were close-by they were prioritized, otherwise neighbours were considered most important. When an association functioned well, association members were a priority alongside family. Due to patrilocal marriage patterns, women frequently prioritized the eldest females in their family-in-law, or both the family-in-law and their biological family when they remained close-by.
- There did not appear to be any directional flow of seeds related to socio-economic status. This may have been because farmers tended to have a similar status, or at least, those who were interviewed and typically had access to association membership.

### *Social conditions of passing on seed and information*

Seed and information were typically given when requested, with varying expectations of reciprocity.

- Seed and information were typically given when (directly or indirectly) requested, seed being distributed more frequently than information. It was also common, however, that certain smaller networks of two to five women (related as field or house neighbours, or family) habitually shared seed and information amongst each other without needing to be asked.
- Seed could be given: without any expectation of an immediate, direct return in the form of material or service; in exchange for field labour; with the condition of reimbursement in-kind.
- Sharing information about field techniques frequently occurred with a transfer of seeds. This happened amongst family and neighbours (e.g. small networks of women mentioned above), and very often amongst field neighbours. In sites where fields were located far from villages (e.g. one to 3 hours walking distance), sharing between field neighbours may have had the opportunity to spread to villages that did not receive the N2Africa intervention.
- People were hesitant to give unsolicited information to others because they might be perceived as thinking they are superior, or they would be partially to blame if poor crop performance or harvest failure resulted after encouraging somebody to try a new technique.
- People were hesitant to give seed unasked (except for female social networks mentioned above) for several reasons: they have limited resources; they don't want to give to somebody who is perceived as

lazy or doesn't reciprocate; the potential receiver may not want the variety (e.g. they have their own preferences, they already have the variety).

### *Role of local institutions*

- Local, agricultural organisations run by farmers, purposefully selected by implementing NGOs, were the institutions responsible for interpreting and disseminate N2Africa-introduced information and inputs. Churches and village cultural or administrative governments (chiefs) played a minor role. This strategy was preferred by farmers and NGO staff due to the increased likelihood of reaching people from different social networks, rather than only those higher in a hierarchical structure.

### *Additional comments from NGO agronomists*

The agronomists expressed a unanimous wish for better communication between themselves and local research conducted by (inter)national staff. Specifically, they perceive a challenge in accessing information generated by such research. Coming out of discussions about N2Africa-distributed inputs and techniques, they are looking for information related to:

- How to store inoculum in typical farmer conditions
- Regarding soy production
  - When to plant (this is especially pertinent in the Ruzizi Plain, where rainfall is less predictable, and where they have less experience with soy)
  - Which varieties are most appropriate for local farming environments. Here the concern is that although the current varieties grow well (SB24, Imperial, PK6 – the first two being most appreciated), there is a need for new seed stock and new varieties after several generations.
  - Field management techniques to increase ratio of grain to leaf biomass
  - Appropriate crop associations (e.g. one agronomist working in the Ruzizi Plain has observed that soy performs better when it is not associated with other crops as there is less competition for light)
- Soil analysis and characterization throughout different regions. Amongst other things, this would help them better advise what combinations of (mineral) fertilizer are most appropriate for local soils. Related to this, they say that better knowledge about mineral fertilizers will encourage farmers' interest in using it.

## 5. Conclusions

The following conclusions come from six case studies, which aimed to describe the N2Africa intervention and nature of social relationships in those rural communities. They do not attempt to offer an analysis that can infer generalizations about the surrounding population. Though identifiable themes emerged, the case studies also revealed diverse contexts (e.g. social organisation, spatial kinship patterns, farming environments, market links), speaking to the heterogeneity of rural communities.

The improved varieties (maize, beans, soy, cassava) and field management techniques (line sowing, use of soy inoculum, fertilizer application) were typically diffused at two levels: first, through a two or three step chain of increasingly localized farmer-associations, which pre-existed or were created expressly for the intervention; and second, from individual farmers to family, field and house neighbours, or (new) association members. Though family were ideally prioritized, local factors determined which of these relationships were deemed most important; the distance to fields, family or neighbours seemed important. Seed and information exchanges were characterized by moral behaviour of distributing communally owned seed, and both delayed and immediate reciprocity. Seed seemed to be shared more easily than information about new techniques. Sharing of staple crop seed seemed to occur primarily amongst women, as they were responsible for producing food for the household. Men were also interested in obtaining seed and information, but primarily when they perceived opportunities to sell harvests.

Farmers generally gave positive assessments of the improved variety seeds, citing improved yields. This was evidenced by their feedback about the demonstration fields and their having continued to produce the varieties as long as they were able to harvest and save seed. Certain techniques (line sowing, use of mineral fertilizers, and production and use of compost) were of most interest to farmers, reportedly due to the tangible effect on increased yields, and were typically passed on with seed giving.

Associations that functioned better than others were characterized by transparency, accountability, regular discussion between members, mutual support and encouragement. This seems to have resulted in a wider seed and information distribution through more frequent sharing amongst members and non-members. Though dissemination of technologies through the association structure had disadvantages, most farmers reportedly believed it the best option (other choices being through institutions of chief or church).

## 6. References

- Almekinders C. J. M., Louwaars N. P., & Bruijn G. H. De., 1994. Local seed systems and their importance for an improved seed supply in developing countries. *Euphytica*, 78, 207–216.
- David S., 1996. “Local bean seed systems in Uganda: pre-liminary results from surveys in two districts,” in S. David (ed.), *Alternative Approaches to Bean Seed Production and Distribution in Eastern and Southern Africa: Proceedings of a Working Group Meeting, Kampala, Uganda, 10–13 October 1994*. Network on Bean Research in Africa, Workshop Series.
- David S. and Sperling L., 1999. Improving technology delivery mechanisms: Lessons from bean seed systems research in eastern and central Africa. *Agriculture and Human Values*, 16, 381–388.
- Delêtre M., Mckey D. B., and Hodkinson T. R., 2011. Marriage exchanges, seed exchanges, and the dynamics of manioc diversity. *PNAS*, 108(45).
- International Crisis Group, 2013. *Understanding Conflict in Eastern Congo (I): The Ruzizi Plain*. Africa Report N. 206, July.
- Lecoutere E., Vlassenroot K., and Raeymaekers T., 2009. Conflict, institutional changes and food insecurity in eastern D. R. Congo. *Afrika Focus*, 22, 41–63.
- Mcguire S. J., 2008. Securing Access to Seed: Social Relations and Sorghum Seed Exchange in Eastern Ethiopia. *Human Ecology*, 36, 217–229.
- Mushi F. M., 2012. Insecurity and Local Governance in Congo’s South Kivu. *Institute of Development Studies*, 74.
- Sperling L., and Loevinsohn M. E., 1993. The Dynamics of Adoption: Distribution and Mortality of Bean Varieties Among Small Farmers in Rwanda. *Agricultural Systems*, 41, 441–453.
- Sperling L., 2001. The effect of the civil war on Rwanda’s bean seed systems and unusual bean diversity. *Biodiversity and Conservation*, 10, 989–1009.
- United Nations World Food Program, 2009. *République Démocratique du Congo: Analyse globale de la sécurité alimentaire et de la vulnérabilité (CFSVA)*. Ministère du Plan et Institut National de la Statistique de la République Démocratique du Congo.
- United Nations World Food Program, Department of Food Security Analysis, 2014. *Comprehensive Food Security and Vulnerability Analysis (CFSVA): Democratic Republic of the Congo*.
- Vanlauwe B., and Giller K., 2006. Popular myths around soil fertility management in sub-Saharan Africa. *Agriculture, Ecosystems & Environment*, 116(1-2), 34–46.
- Vlassenroot K., and Huggins C., 2004. Land, migration and conflict in eastern DRC. In: Huggins C and Clover J (Eds.), *From the Ground Up: Land rights, conflict and peace in sub-Saharan Africa*.
- Woomer P. L., Huising J., Giller K. E. et al., 2014. *N2Africa Final Report of the First Phase 2009-2013*, [www.N2Africa.org](http://www.N2Africa.org), 138 pp.

## Appendices

### Appendix I: Sample of demonstration field instructions from IITA to implementing NGOs

#### INT- 4: Evaluation of soybean variety x inoculants x maize and cassava systems interactions in east DR Congo (Trial management in 2011 long rain season)

##### Objectives

1. To evaluate the contribution of early maturing and dual purpose soybean varieties to soil fertility improvement hence maize and cassava yields
2. To evaluate the alternative agronomic practices (varying maize, soybean and cassava planting arrangements) on maize, cassava and soybean yield.
3. To demonstrate the importance of use of inoculants on soybeans production in different soils of eastern DR Congo.
4. To demonstrate on the above interactions.

##### Sites

- We will use the same sites established during 2010 short rain season in Kalehe, Bughore, Murhesa, Birava, Bwirembe/Bushwira, Cagombe, Ikoma, Walungu, Mumosho, Nyangezi, Mulamba, Burhinyi and Mushinga. The demos will be established on a field owned by farmer organizations that will ensure that the demos are well managed.

##### Treatment structure in 2010 short rain season

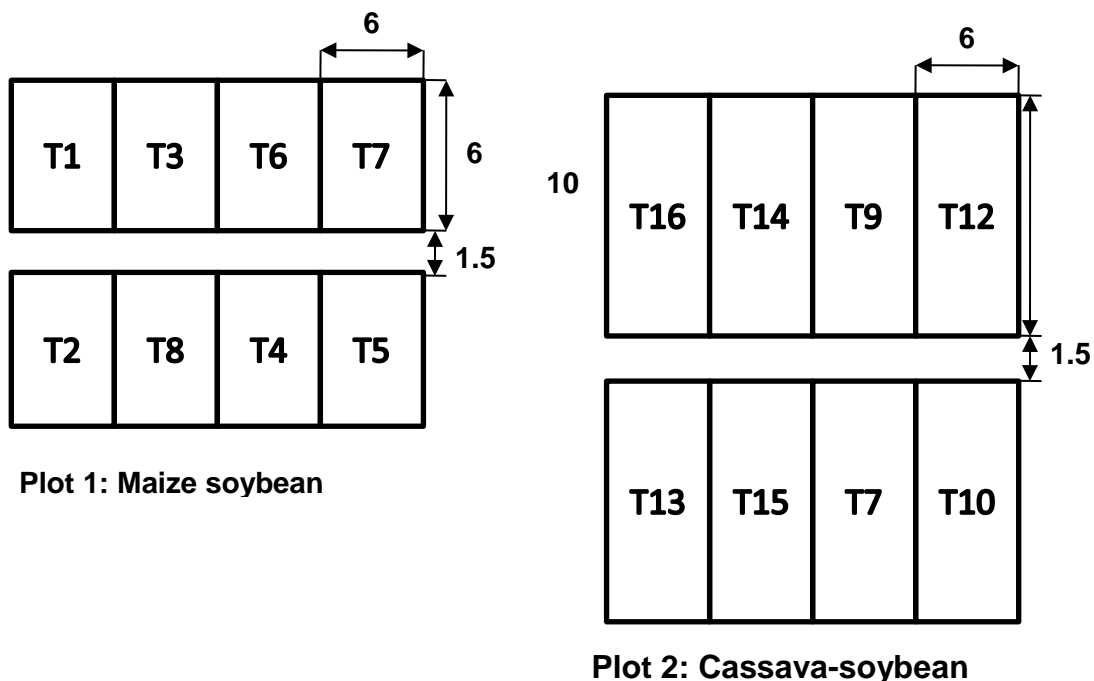
Five factors are considered (See details in Table 1).

- **Factor soybean variety:** Farmers usually use earliness as the main criteria for evaluating soybean varieties, but for soil fertility purpose, dual purpose varieties are better. We will compare the early maturing variety PK6 and with mid-maturing dual purpose soybean variety SB 24 on their impact on soil fertility and productivity of maize and cassava.
- **Factor inoculants:** Preliminary results in eastern DR Congo show positive response of soybean to rhizobia inoculation. We need to send this message across many more farmers. Treatments with and without inoculation will be compared. The soybean inoculant will be obtained from MEA Fertilizer Company based in Kenya.
- **Factor System:** Farmer's traditional methods of intercropping maize and cassava (random planting of maize or cassava and broadcasting legume seeds) will be compared with improved maize and cassava intercropping systems.  
On improved systems a known spacing is used with maize, cassava and soybean planted in lines.
- **Factor Organic matter:** All plots will receive organic matter (compost) at a rate of 5 t/ha.
- **Factor mineral fertilizer.** All plot will receive a basal application of fertilizers (NPK) at a rate of 17, 8, and 15 kg/ha N, P and K, respectively.

**Table 1. Detailed description of treatments**

| Tr | Soybean variety | Inoculants | System   | Organic matter | Mineral fertilizer |
|----|-----------------|------------|--|----------------|--------------------|
| 1  | PK 6            | Without    | Traditional intercropping system with maize          | Applied        | Applied            |
| 2  | PK6             | With       | Traditional intercropping system with maize          | Applied        | Applied            |
| 3  | PK6             | Without    | Improved-intercropping system with maize             | Applied        | Applied            |
| 4  | PK6             | With       | Improved intercropping system with maize             | Applied        | Applied            |
| 5  | SB 24           | Without    | Traditional intercropping system with maize          | Applied        | Applied            |
| 6  | SB 24           | With       | Traditional intercropping system with maize          | Applied        | Applied            |
| 7  | SB 24           | Without    | Improved intercropping system with maize             | Applied        | Applied            |
| 8  | SB 24           | With       | Improved intercropping system with maize             | Applied        | Applied            |
| 9  | PK 6            | Without    | Traditional cassava (1m x 1m cassava) –legume system | Applied        | Applied            |
| 10 | PK6             | With       | Traditional cassava (1m x 1m cassava) legume system  | Applied        | Applied            |
| 11 | PK6             | Without    | Improved cassava (2 m x 2 m)- legume system          | Applied        | Applied            |
| 12 | PK6             | With       | Improved cassava (2 m x 2 m)- legume system          | Applied        | Applied            |
| 13 | SB 24           | Without    | Traditional cassava (1m x 1m cassava) –legume system | Applied        | Applied            |
| 14 | SB 24           | With       | Traditional cassava (1m x 1m cassava) legume system  | Applied        | Applied            |
| 15 | SB 24           | Without    | Improved cassava (2 m x 2 m)- legume system          | Applied        | Applied            |
| 16 | SB 24           | With       | Improved cassava (2 m x 2 m)- legume system          | Applied        | Applied            |

- Plot size: 6 m broad x 6 m length = 36 m<sup>2</sup> per plot for maize and 6 m broad x 10 m length for cassava plot.



**Figure 1. Sketch of SOY-1 trial. Note that treatments were randomized for each site**

### Installation of treatments in 2011-long rain season

- On traditional maize-soybean intercropping plots, farmer’s plant maize and soybeans as usually practiced.
- On improved maize-soybean intercropping plots, maize will be rotated with soybean in a mbili system to evaluate the effect of soybean on a subsequent maize. In this system maize will be planted on lines in which was planted with soybean in 2010 short rain season and soybean on lines planted with maize. In this season maize is established at a spacing of 66 cm x 30 cm and soybean at a spacing of 50 cm 5 cm, with 33 cm clearance between maize and soybean lines (Figure 2).
- The line spacing in the intercrops will be established using a “Rayennour”.
- On tradition cassava-legume intercropping (cassava planted using a spacing of 1 m x 1m) we plant one line of soybean between cassava lines or not, depending on the canopy of cassava.
- On improved cassava-soybean intercropping system, (cassava planted at a spacing of 2 m x 0.5 m) we establish one or two lines of soybean depending on the canopy of cassava.
- For maize-soybean intercropping system, about 3 kg of soybean seeds and about 2.5 kg of maize seeds are required per trial.
- For cassava-soybean intercropping system, about 4 kg of soybean seeds are required.
- No any fertilizer is applied.

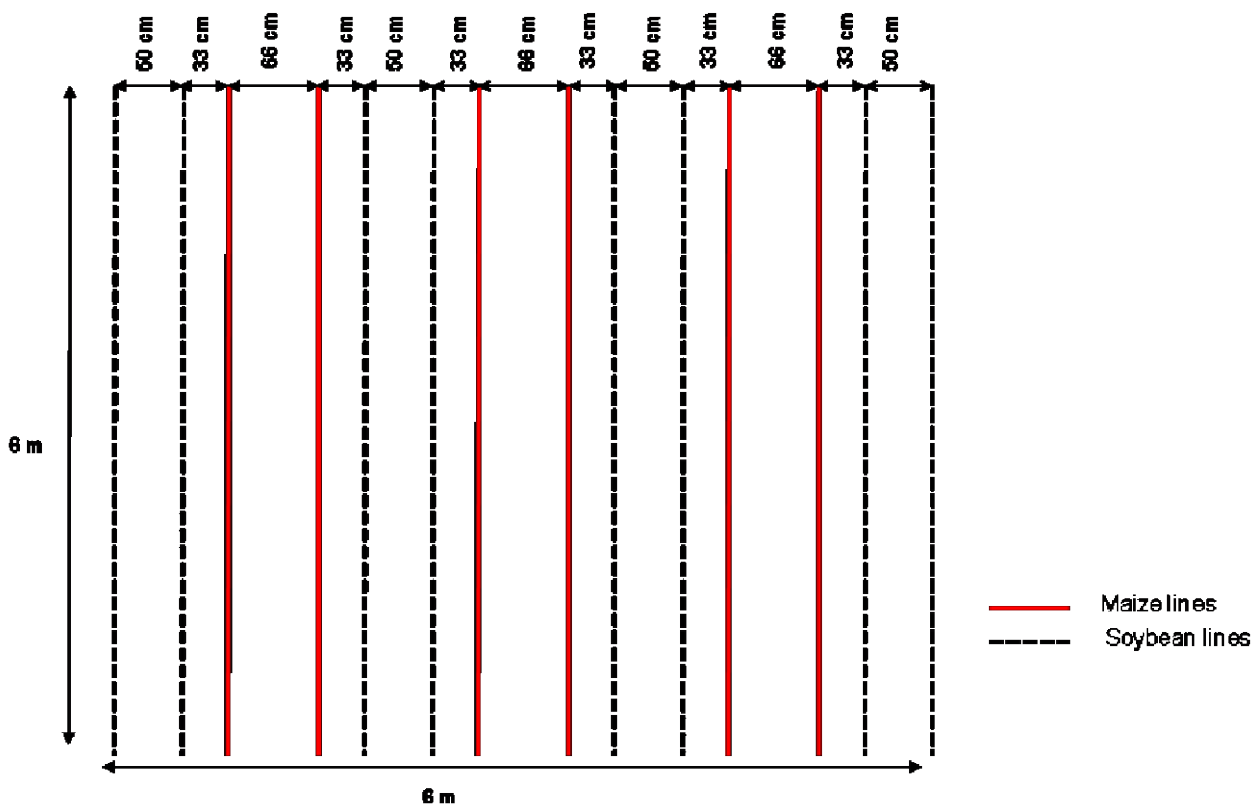


Figure 2. Planting arrangement of improved maize soybean intercrop in 2011 long rains season (mbili system). Note changed position of maize and soybean lines

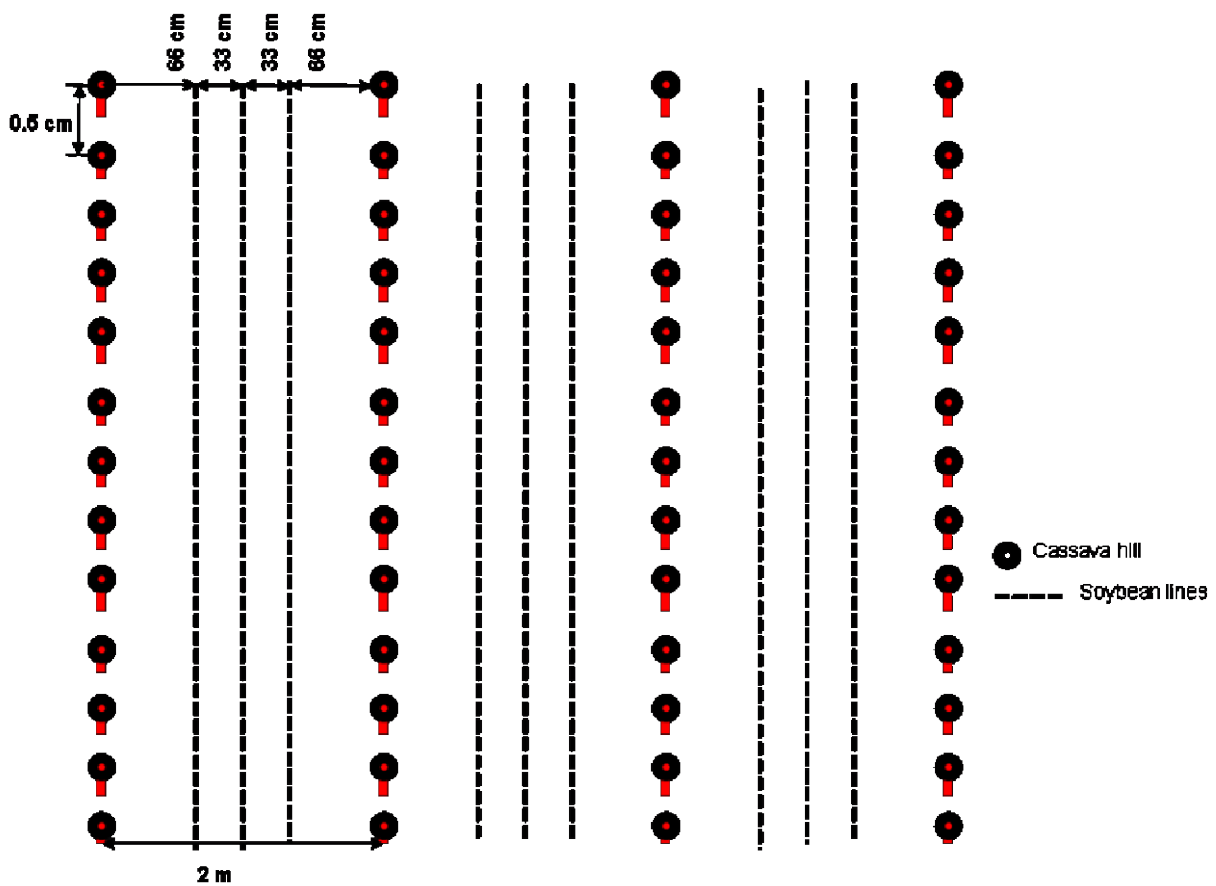


Figure 3. Sketch crop arrangement in improved cassava-soybean intercrop system in 2011 long rain season. The number of soybean lines could decrease to two depending on the canopy of cassava

### Observations

- Biomass sampling of soy beans from all plots at full pod (R4) and non legume weeds around the trial for BNF assessment.
- Yield of maize and soybeans.
- Labor for different treatments.
- Cassava biomass at harvest (tubers, stem yield) from the 2 middle lines.
- Participatory evaluation of trial treatments at full pod of soybean and at harvest of both soybean and cassava.



# Putting Nitrogen Fixation to Work for Smallholder Farmers in Africa (N2Africa)



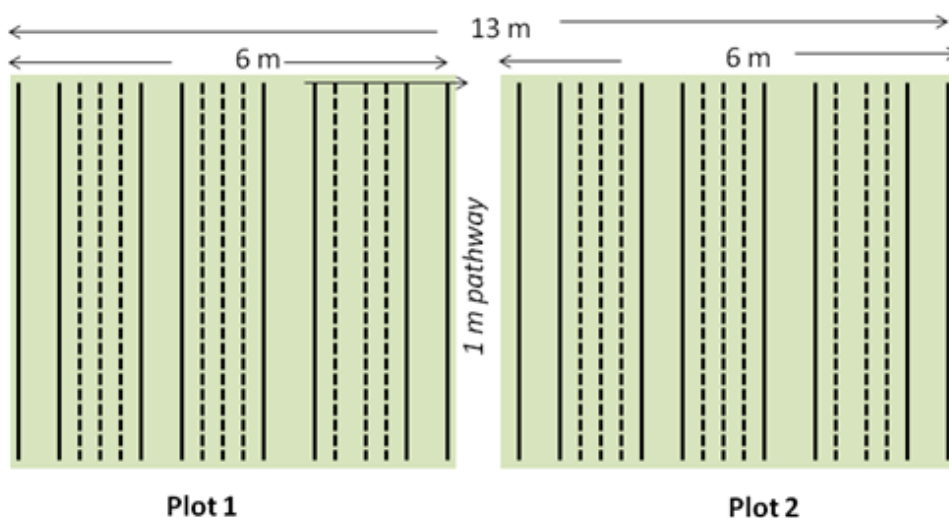
## PAQUET

## PROTOCOLE

### « Application de Rhizobium dans le système d'association soja - maïs »

#### A: Installation de paquet 1, 2 and 5

1. Prépare un terrain de 13 mètre x 6 mètre compose de 2 Parcelles de 6 m x 6 m sépare par un passage de 1 m de long ( voir schéma 1). Assurez vous que le terrain a été bien labouré jusqu'à 25 cm de profondeur et sans mauvaises herbes .



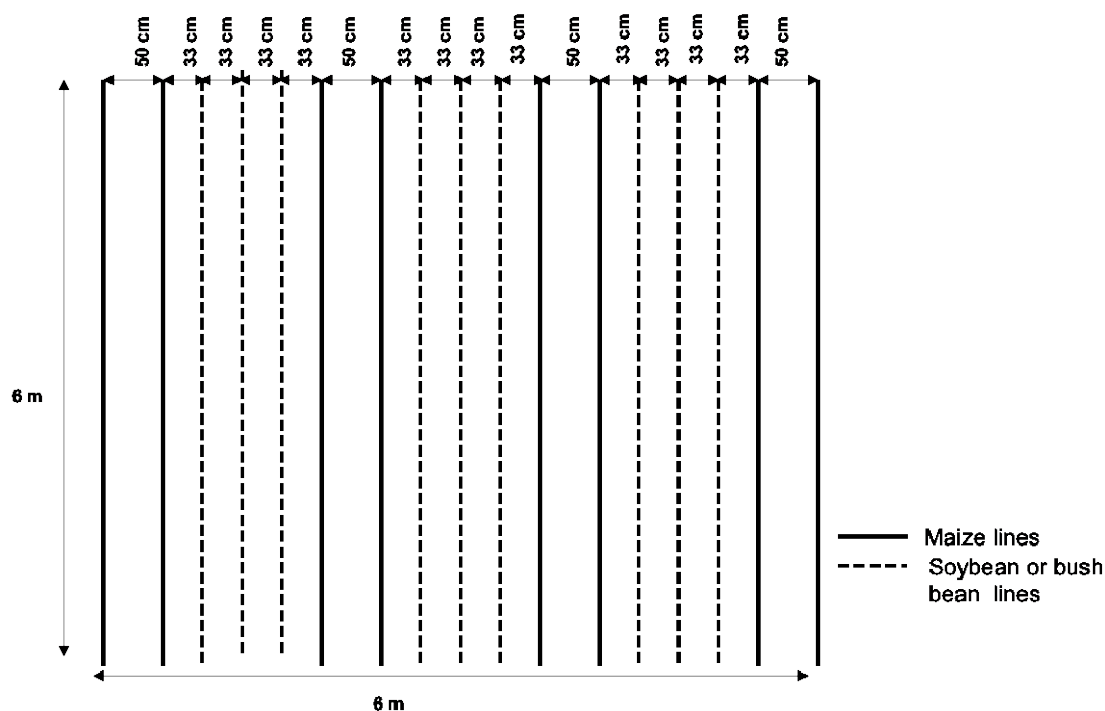
Drawing1. Plot design of packages 1, 2 or 5 indicating the input required per plot.

|                      | parcelle 1              | parcelle 2              |
|----------------------|-------------------------|-------------------------|
| Variete soja:        | Pk 6 300g               | Pk 6 300g               |
| Variete Mais         | OPV 150g                | OPV 150g                |
| intrants organiques: | Compost ou Fumier local | Compost ou Fumier local |
| Rhizobium            | Aucun                   | Rhizobium               |
| engrais chimiques:   | NPK 300 g               | NPK 300g                |

2. Pour chaque parcelle ,on doit appliquer la même quantité des matières organiques qui doivent être incorporer dans le sol pendant le labour

écarterments (voir schéma 2) et ouvre le poquet pour le semis de Mais à 2 cm de profondeur .

3. Entre les lignes de Mais ; marquer les lignes de semis de soja ou haricot nain et ouvre les poquets suivant les écartements voir croquis 2



*Croquis 2. Arrangement de semis de Mais et Soja et Haricot nain; ; les écartements de Mais 50 m x 30 cm, soja a 33 cm x 10 cm et Haricot nain 33 cm x 20 cm*

1 Application de 600 g de l'engrais mineral NPK don't 300 g de NPK pour chaque parcelle entre le mais et soja et haricot nain

2 Semer 2 graines de Mais par poquet et le soja 1 graine dans le sillons en ligne suivant les écartements de 10 cm dans la ligne ; 33 cm entre les lignes ; à une profondeur de 5cm et couvre directemet avec le sol après le semis

3 Mettre les etiquettes pour differencier les 2 parcelles.

4. Les entretiens doivent etre regulier dont le sarclage et autresManage crops to usual farm practice including periodic weeding.
5. Noter toutes les opérations et les données dans le carnet de champs de ménage

## **ACTE D'ENGAGEMENT ENTRE L'AGRICULTEUR ET N2 AFRICA**

- L'Agriculteur implémentera l'essai d'adaptation comme décrit dans cette brochure.
- L'Agriculteur performera toutes les opérations de champ.
- L'Agriculteur remplira le carnet de champ, inclu dans le paquet, ce qui demande à spécifier les détails sur les pratiques culturales et la gestion de l'essai.
- En cas que l'Agriculteur choisit d'appliquer le composte ou le fumier, il préservera un échantillon dans le sachet en papier, inclu dans ce paquet.

- L'Agriculteur informera **N2 AFRICA** avant de récolter et permettra que la récolte soit pesée.
- La récolte même appartiendra à l'Agriculteur.
- **N2 AFRICA** fournira tous les matériels de plantation (semence et boutures) et les engrais chimiques gratuitement.
- **N2 AFRICA** visitera les champs à prendre des observations.

## Appendix II. Sample question guide used during individual and focus group interviews

- Name
- Sub-village / village
- Gender, age
- Household head
- Family situation (children, married)
- Own or rent a field?
- Ethnic group
  
- Association membership? Conditions of membership?
- Participated in training? If YES
  - Which year?
  - What happened?
  - Motivation to participate?
- Previous experience with inoculum?
- Where to buy inoculum?
  
- Crop performance observations from demo field?
- Participation in demonstration fields?

### First generation seed

#### *FIRST TIME*

- Inputs received (crops, variety names, fertilizer) and date?
- Conditions of receiving inputs? (Reimbursement, membership...)
- Crop performance observations from their own fields, or fields of others?
- What was done with the harvest? (household consumption, sale, reimbursement, kept for seed...)
- Gave seed? If YES
  - Name, gender, production, family/friend/neighbour, association or religious ties, distance (name of village), did they ask directly/indirectly.
  - Any information passed along with it (e.g. rhizobium, sowing in lines, crop associations?)
  
- *SECOND TIME* – why received it again? What was received and what was done with harvest?

### Second generation seed

- Inputs received (crops, variety names) and date?
- How did receiving the seed come about? (e.g. Observed fields? Heard people talking? Asked, was given automatically?)
- Crop performance observations from their own fields, or fields of others?
- What was done with the harvest? (household consumption, sale, reimbursement, kept for seed)
- Gave seed? If YES
  - Name, gender, production, family/friend/neighbour, association or religious ties, distance (name of village), did they ask directly/indirectly.

### GENERAL / FOCUS GROUP QUESTIONS

- Comprehension of the farmer organisation / association
  - Since when, and how, have you been in contact with the NGO?
  - Was there anybody who played a particular role in your participation with the NGO?
  - What have you learned/gained after the activities of the programme?
  - Can you describe the services / activities that were provided during the activities of N2Africa?

- Training / demo field
  - Who owns the field? What were the conditions of using it?
  - Who maintains the field / responsible for crops?
  - Where is it located? Accessibility?
  - What information was learned, when, how?
  
- Soy
  - Since when has soy been in the region?
  - Supply chain (e.g. sell in large quantities to... ? sell in small quantities locally?)
  - Have people started to sell or make milk and beignets at home or to sell?
  - Knowing that it is nutritious – this comes from observations of your own experience or just trainings / hospitals?
  
- Seed and info sharing
  - What are typical patterns of sharing between men and women? (e.g. Do men typically share between men? Women between women? What occasions?)
  - What occasions /relationships allow men and women to exchange easily between genders?
  - Social / moral obligations of seed giving?
  - How does social status affect seed giving / receiving? Is there a unidirectional flow of seed and info regarding social status hierarchy?
  - Who is the priority (e.g. family, neighbours...) for seed AND techniques
  
- Role of ethnicity and church? Other structures?
  
- Family networks and movements (marriage, displacement due to insecurity, how are outsiders received)?
  
- What are typical farming practices (number of fields, crops, rotations, type fertilizer used gendered work and roles)
  
- Crop preferences and strategies?
  - Crop variety preferences (between improved, between local...)
  - Nutrition preferences
  - Crops prioritized for cash
  
- Soil fertility
  - Inoculum – what is it, where to buy it, heard of it before, how to explain it, nodules, if soya beans are passed on will they work even without inoculum
  - Properties/effects of legumes and other crops on soil fertility, rotations
  - Talking about soil fertility, how can you describe the characteristics of different types of soils that you cultivate

## Appendix III. Workshop minutes 12 December.

### Meeting minutes from workshop with agronomists from 6 N2Africa partner NGOs

*Includes question guides*

**Date:** 12 December

**Place:** Av Munzehirwa 38, Bukavu, South Kivu DRC

**Organised by:** Jennifer Kendzior and Jean-Paul Zibika



#### Present:

| Name                  | Organisation          |
|-----------------------|-----------------------|
| Jennifer Kendzior     | Wageningen University |
| Jean-Paul Zibika      | Wageningen University |
| Jean Chizungu         | Diobass               |
| Etienne Bitonwalunyil | SARCAF                |
| Safari Kwinanika      | IPLCI                 |
| Jean Matabishi        | Women for Women       |
| Freddy Bashilwango    | Women for Women       |
| Moise Masumbuko       | CDC Kiringe           |
| <i>Sylvie Citera*</i> | <i>PAD</i>            |

*\*Invited but did not attend*

#### Programme:

|               |  |
|---------------|--|
| 8.30 – 9.00   | Introduction of all participants<br>Presentation research project, objectives and methodology.<br>Presentation objectives of workshop            |
| 9.00 – 10.30  | Discussion:**<br>- Questions directly related to N2Africa implementation<br>- Understanding the general context of N2Africa implementation areas |
| 10.30 – 11.50 | Discussion / reaction to some general conclusions<br>Written responses to questions pertaining to each NGO***                                    |
| 12.00         | Refreshments / lunch informal discussion   |

**\*\*** *Question guide attached*

**\*\*\*** *Summary of written responses also included in minutes*

### From discussion

- Challenges to growing soy in the Ruzizi Plain: lack of experience with the crop, climate challenges (rainfall is unpredictable, often starts late or stops early), and in the case of some N2Africa interventions the seed arrived too late in the season
- Data from the demo fields was indeed sent back to IITA, and was recorded by the field owner in a notebook distributed expressly for the purpose. There were also some opportunities for agronomists to give some feedback to IITA.
- In the plain groundnuts used to grow well, but there is a need for renewed seed stock or new varieties as the production quality has diminished. They grow well with sandy-clay soils with sunny climate. Cowpea (*niébé*) was introduced some time ago and people do grow it but in small, irregular quantities. Although it is a legume that grows well in certain areas, people aren't used to eating it as part of their staple diet so the quantity produced remains small.
- People were encouraged to share seed in their community during the *journées champêtres*, which were field visit days attended by NGO and IITA staff, representative/master farmers from different villages associated with one site, and local farmers. There was a sort of seed exhibition, where all farmers present were welcome to purchase seed.
- Accuracy, advantages and disadvantages of the master-satellite farmer model
  - N2A distribution remained limited to associations, where as DFID saw the creation of CLDs, which opened the opportunity to different people
  - Advantages: 1) it facilitated the structure of distribution and follow-up; 2) allowed reaching more people (by training some who were supposed to then train others); encouraged men and women to work together
  - Disadvantages: 1) there was some exclusion due to social networks (who? Those who don't have a field, money to join the association, or the will to join the association); 2) there was the possibility that some people would hoard seed rather than distributing, and could use that resource as a way to hire field labour in exchange for seed.
- Related to seed sharing:
  - In the Ruzizi Plain (southern axe) both men and women tend to do agricultural work, where as in the northern and western axes it is primarily women as men often do work related to mining
  - Role of the church in distributing information: It plays primarily a communication role (e.g. an announcement of an upcoming project or meeting can be made during church), so it's involvement as a local authority is indirect. It is possible that people of the same church could be prioritized when it comes to sharing seed or information between individuals, but this isn't a particularly strong or noted observation. Churches are often partners of NGOs and development programmes.
  - Reasons people may choose not to share seed with another individual: jealousy, too small of a quantity, perceive that the receiver is lazy
- The best way to introduce new seeds and agro-techniques to a rural community (with the aim of continuity even after the project implementation) is to pass through an association or specifically created CLD. If distributed to the chief, it is likely to be distributed unevenly, favouring those closest to the chief. It could also wrongly give the impression that the new technology comes from the chief.

- What did the NGOs transfer to farmers that agronomists considered helpful: new seed varieties, soy technology (field production and post-harvest processing), use of organic compost
- What techniques did N2A introduce?
  - inoculum for soya (this was the focus)
  - sowing in lines
  - crop associations
  - mineral and organic (compost) fertilizers
  - plants to help with anti-erosion (leguminous and gramineae)
  - transformation of soya
  - variety selection (e.g using stakes with climbing beans)
  - management of harvest and conservation of seed
  - journées champêtres

The agronomists expressed a unanimous wish for better communication between themselves and local research efforts. Specifically, they perceive a problem in accessing information generated by such research. They are aware of some projects in the past, or that are on-going, and are disappointed that the results are not easily accessible as they would like to make use of such knowledge. Specifically, they are looking for information related to:

1. How to store inoculum in typical farmer conditions
2. Regarding soy production
  - When to plant (this is especially pertinent in the Ruzizi Plain, where rainfall is less predictable, and where they have less experience with soy)
  - Which varieties are most appropriate for local farming environments. Here the concern is that although the current varieties grow well (SB24, Imperial, PK6 – the first two being most appreciated), there is a need for new seed stock and new varieties after several generations.
  - Field management techniques to increase ratio of grain to leaf biomass
  - Appropriate crop associations (e.g. one agronomist working in the Ruzizi Plain has observed that soy performs better when it is not associated with other crops as there is less competition for light)
3. Soil analysis / characterization throughout different regions. Amongst other things, this would help them better advise what combinations of (mineral) fertilizer are most appropriate for local soils. Related to this, they say that better knowledge about mineral fertilizers will encourage farmers’ interest in using it.

*Summary of written responses*

- 1) The NGOs all operated assuming the master-satellite farmer model (i.e. distribution to one group of farmers who were supposed to then pass on the seed to the “second generation” of beneficiaries; or direct and indirect beneficiaries). It seems that two organizations specifically encouraged farmers to share amongst themselves, emphasizing the idea of community and social responsibility to help each other. It is not clear if the other NGOs did likewise, but the agronomists did not describe any such specific encouragement, rather they described the theoretical model of master-satellite farmer.
- 2) Techniques disseminated related to soy.

| Organisation    | Field   | Post-harvest   |
|-----------------|---|--|
| Women for Women | Sowing in line, spacing between seed pockets, crop associations, inoculum, mineral and organic fertilizer | -Separation of biomass (grain and rest)<br>-soy processing using electronic or manual food processor, local mortar and pestle, <a href="#">vitagoat</a> (wood powered) and <a href="#">soycow</a> (electric) |
| SARCAF          |   | Used local materials, not machines as they would be too expensive for people   |



|                 |  |   |
|-----------------|--|---|
|                 |  | to access in the future. Local materials not specified.                               |
| Diobass         | Sowing in line, spacing between seed pockets, inoculum, seed storage   | Local mortar and pestle, sieve and filtre.  |
| IPLCI           |  | Flour, donuts, milk. Nothing specified written regarding machines.                    |
| CDC Kiringe     | Inoculum, line sowing, spacing between seed pockets, general field techniques  | Flour, donuts, bread and milk.<br>- moulinex and <i>malayeur</i> (?)                  |
| Women for Women | -field techniques (e.g. field choice, ploughing, line sowing vs broadcast, spacing between seed pockets, weeding, fertility management)<br>- harvest and seed conservation | Biscuits, milk, tofu, donuts.<br>The type of machinery depended on the local context. |

3) What role do the partner NGOs play in linking farmers to markets (i.e. helping them find sales outlets for harvests) ?

| Organisation    |   |
|-----------------|---|
| Women for Women | In general, they purchase seeds and distribute to women in their programmes. Their role is to search for suppliers who can provide seeds coming from nationally certified seed.   |
| SARCAF          | They help to put buyers in touch with the farmers they work with. Generally, they purchase seeds for distribution in conjunction with specific projects.  |
| Diobass         | They purchase seed / harvests from farmers with whom they work, and who are organised into cooperatives. They encourage farmers to sell in groups/cooperatives.   |
| IPLCI           | They put the farmers they work with in touch with market outlets for their harvests. They do not purchase produce themselves, but rather put farmers in touch with buyers (who are aware of this relationship) who enquire at their office.   |
| CDC Kiringe     | They do purchase seeds from farmers – specifically, groundnuts, to make oil. With this production, they can then give some groundnut seeds to other farmers to promote the crop. As soy is produced in small quantities, they cannot give it away for free, but rather do so with a condition of reimbursement. |
| Women for Women | They do not purchase produce directly, but rather facilitate relationships with large buyers. Related to N2Africa, however, there were no sales as the harvests were too small (soy, beans, maize).   |

### QUESTION GUIDE FOR WORKSHOP WITH AGRONOMISTS FROM IMPLEMENTING NGOS, 12 DECEMBER, BUKAVU.

*The questions served as a discussion guide, and were translated into French during the meeting. Those in italics were not asked due to time limitations.*

#### Directly related to N2Africa implementation

- What were the components of the training that all the agronomists from the 6 partner NGOs learned from IITA?
- What technical skills and knowledge were supposed to be transferred to farmers?
- Soy: what are the biggest challenges to growing soy in the Ruzizi Plain (Uvira)?
- Was data from demo fields communicated to IITA? What was the relationship like with IITA regarding information flow – ie did you have the opportunity to give feedback about your experiences?

- In some areas, seeds were introduced in season A, and then in season B in other areas; what was the involvement of NGOs regarding redistributing seed produced in season A for others to use in season B?
- *Do you think there are any other soy processing techniques that could have been of interest to the producers? That are less labour intensive?*

### **Understanding the general context of N2Africa implementation areas**

- Where, and why, haven't groundnuts and cowpea (niebé) worked very well? *Were there other varieties or crops introduced that haven't worked very well?*
- *Are harvest thefts common in villages*
- What were the NGO ideas regarding continual program inputs in the communities they worked with? What are your thoughts regarding encouraging the community on ownership of the technology? Given that N2A implementation was performed in collaboration with local associations, were there any mechanisms that sought to reach non-members of these associations (i.e. to spread seed and techniques beyond association members)?
- What is the accuracy, advantages and disadvantages of the master-satellite farmer model that was used with N2 Africa?
- *How can we generalize the roles of men and women in the different project axes regarding market / cash access*
- Prior to any information about inoculum or N2Africa, what were people's awareness of benefits of crop rotations, specifically, beans and soil fertility? Soy and soil fertility?
- *How has displacement due to insecurity affected people's access to and use of land?*

### **Discussion / reaction to some general conclusions**

- How did you imagine that the seed and information would be transferred? Where are the possible challenges?
- What is the best way to introduce new seeds and techniques into a village if they are to continue it afterwards?
- *What do you consider helpful that your NGO transferred to the community-beneficiaries?*
- *Crop preferences. Can we list for each territory (Kabare, Walungu, Uvira) which are the crop preferences preferred by women and men / for cash or household consumption, and why?*
- Techniques spread through N2Africa. Line sowing and organic fertilizer were the techniques most successfully spread. Why? Are there other techniques that you have worked with in the past that were well appreciated?
- Rhizobium
  - Do you think that the understanding of inoculum by farmers is sufficient for them to be interested, and use it even without being part of a programme (ie. To buy it themselves if it becomes available through agrodealer kiosks, at 1 usd / 10 g)?
  - Have you noticed that inoculum did / not have a significant effect?
- Seed sharing
  - Can we list crops grown and say whether they tend to be shared more amongst men or women? Any differences between territories?
  - Regarding legumes, women tend to share amongst themselves.
  - Regarding other crops such as rice, or cash-focused crops, men tend to share amongst themselves.
  - Sometimes men and women shared seeds amongst themselves – why was this considered appropriate? It seems that they were either of the same family or of an association (i.e. formally recognized relationship)

- Regarding legumes: Family is prioritized, when they are close-by, either the biological family of the woman or the family-in-law of the woman. Is there tension sometimes between which part of the family people should share with?
- If family is not close by, then neighbours are the next priority, or association members (if there is a good relationship)
- What role can the church play in seed and agricultural information sharing? Other local institutions?
- People give when asked (as long as they can) because the idea is for the community to own the seed, and that one never knows when one will help the other. Is this the reality? When does this not happen?

#### **WRITTEN QUESTIONS GIVEN TO INDIVIDUAL AGRONOMISTS**

Cher participant, nous vous prions de remplir vos propres OPINIONS à ces trois questions juste pour nous donner votre compréhension générale compte tenu de la limite de temps que nous avons.

- Etait-il planifié au début du programme N2AFRICA que les ONG devraient encourager les agriculteurs à partager les semences ? Comment cela était communiqué?
- Quelles sont les techniques que votre organisation a enseigné a la communauté ayant trait au processus du Soja? (culture et transformation). Pouvez-vous s'il vous plait, spécifier le type de machinerie proposée aux gens?
- Achetez vous des semences/ produits agricoles auprès des agriculteurs? Ou, jouez vous un certain rôle dans la liaison des agriculteurs avec le marché ? (quels rôles ?)