N2Africa Early Impact Survey Rwanda

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N2Africa

Putting nitrogen fixation to work for smallholder farmers in Africa

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Summary

N2Africa aims to contribute to increasing biological nitrogen fixation (BNF) and the productivity of grain legumes among African smallholder farmers; in turn this helps to enhance soil fertility, improve household nutrition, and increase the income of smallholder farmers. Today, the project is implemented in five Core countries (Ghana, Nigeria, Tanzania, Uganda, and Ethiopia) and six Tier-1 countries (DR Congo, Malawi, Rwanda, Mozambique, Kenya, and Zimbabwe).

This report is meant to provide a comparison among farmers in the Eastern/Southern and Northern provinces in Rwanda, that were involved in legume cultivation. The results of the baseline survey (2010) and the early impact survey (2013) are both used to compare farmers practices and to assess the impact of input packages delivered to N2Africa farmers. The households that were involved in the baseline survey were randomly sampled. According to the design of the baseline survey, a total of 400 households per country were to be interviewed. All households that were interviewed for the early impact survey (300 households) had participated in N2Africa dissemination trials. Through these trials and the provision of legume input packages and/or training, farmers became familiar with legume technologies.

This means we cannot draw conclusions on the impact of N2Africa on the population in the target areas. In some cases, the sites where the baseline survey and early impact surveys were carried out also differed. The impact survey was meant to look at the impact of N2Africa on farmers who participated in the project. This is also why it was called the 'early' impact survey – real project impact will be established a few years after the project has finished. To establish the early impact, we asked farmers questions on how they cultivated legumes four years ago, and how they currently cultivate legumes. These comparisons are used to determine the early impact. The baseline survey is used to compare farmers that participated in the project with a wider population sample.

In the analyses in this report, we first compare the results of the baseline survey with the results of what farmers reported to cultivate four years ago in the early impact survey (before households received an input package and/or training). These comparisons generate insights among farmers in different action sites in a particular region. Secondly, we compare results of the early impact survey before households received an input package with the results of the early impact survey: how did farmers cultivate legumes before and after they received an legume input package. These comparisons provide insights in what has changed and the impact of N2Africa activities, reported by farmers who received input packages. The input package contained legume seed (common bean, cowpea, soyabean, groundnut), mineral P-fertilizer and/or inoculants. The analysis is used to evaluate N2Africa's impact, to draw lessons learned and to provide recommendations for future improvement.

Results

N2Africa seems to have had a positive impact on the number of farmers who cultivated soyabean, the use of inputs in soyabean and bean and the use of improved varieties of mainly soyabean. The influence of N2Africa on legume area was less clear, but pointing towards a (small) increase in either soyabean or bean area. Overall, farmers reported increased legume yields compared to what they recalled from four years ago.

Analysing the data of baseline and early impact survey resulted in the following major findings:

1. Socio-economics values
    - Lead farmers cultivated bean and soyabean slightly more often than Satellite farmers and also used inputs more often. There were no differences in use of technologies between male and female farmers. However, male headed cultivated soyabean slightly more often than female headed households and used P-fertilizer more often, both in bean and in soyabean. On the other hand, female headed household used inoculants more often than male headed households.

- Farmers recalled to have received training mainly on planting in rows and fertilizer (both organic and inorganic) application to legumes. 16 out of 300 farmers thought they had not received sufficient training from N2Africa. The reason behind this can be that farmers believe that if they say they have received enough training, they will not be trained anymore.
- Legume seed and P-fertilizers were for about 60% and 80% respectively obtained from agro-dealers.
- Inoculants used in the 2013A season were supplied by N2Africa.

2. Use of legume input packages
   - In the Eastern/Southern province, 61% of the farmers who had received a soyabean input package cultivated soyabean in the survey season. Only 27% of the farmers that had not received a soyabean input package, cultivated soyabean.
   - Input use (P-fertilizer, inoculation or a combination of both) was more than twice as high in the group that had received a soyabean input package.
   - The number of farmers that used the improved soyabean varieties PK6 and SB24 (which were disseminated by N2Africa) was higher in the group that had received a soyabean package.
   - N2Africa did not have a positive impact on the number of farmers cultivating beans, as common bean is a traditional crop grown by every farmer country wide. Consequently, the number of farmers cultivating bean was already high before the input packages were distributed. Therefore, the positive impact can only be in improved varieties against local varieties.
   - However, P-fertilizer use on beans in the 2013A season has almost tripled in the group of farmers who had received a bean input package. In addition, farmers who had not received a bean input package cultivated mainly local varieties. Whereas farmers who had received a bean package cultivated more improved/different varieties.

3. Changes in legume area and use of inputs (comparing season 2010B and season 2013A)
   - The average soyabean area of a soyabean growing farm has increased with 0.04 ha (from 0.08 to 0.12ha).
   - The average area of beans per farm did not change substantially.
   - Use of P-fertilizer in bean fields has increased from 2-11% to 29%.
   - Use of P-fertilizer in soyabean fields has increased from 6% to 34%.
   - About a quarter of the soyabean fields was planted with inoculated seeds.

4. Changes in legume area, yields and amount of produce sold (comparing 2013A season with ‘four years ago’)
   - Changes in legume areas were small, with an increase of 0.04 ha in climbing bean being the largest overall change.
   - Yields of beans, climbing beans and soyabean have been reported to have increased with on average 826, 731 and 427 kg ha^{-1} respectively.
   - Sales of climbing bean have generally increased, with 79% of farmers mentioning an increase in sales of climbing bean, with an overall increase of sales of 59 kg.

Keywords

N2Africa Phase I, Early impact survey, Baseline survey, performance evaluation, legumes, Rwanda

1 Introduction

This report is meant to provide a comparison among farmers in the Eastern/Southern and Northern province in Rwanda, that were involved in legume cultivation. The results of the baseline survey (2010B season) and the early impact survey (2013A season) are both used to compare farmers practices and to assess the impact of input packages delivered to N2Africa farmers. The households that were involved in the baseline survey were randomly sampled. According to the design of the baseline survey, a total of 400 households per country were to be interviewed. All households that were interviewed for the early impact survey (300 households) had participated in N2Africa dissemination trials. Through these trials and the provision of legume input packages and/or training, farmers became familiar with legume technologies.

Generally, this means we cannot draw conclusions on the impact of N2Africa on the population in the target areas. In some cases, the sites where the baseline survey and early impact surveys were carried out also differed. The impact survey was meant to look at the impact of N2Africa on farmers who participated in the project. This is also why it was called the 'early' impact survey – real project impact will be established a few years after the project has finished. To establish the early impact, we asked farmers questions on how they cultivated legumes four years ago, and how they currently cultivate legumes. These comparisons are used to determine the early impact. The baseline survey is used to compare farmers that participated in the project with a wider population sample.

In the analyses in this report, we compare results of the early impact survey before households received an input package with the results of the early impact survey: how did farmers cultivate legumes before and after they received an legume input package. These comparisons provide insights in what has changed and the impact of N2Africa activities, reported by farmers who received input packages. The analysis is used to evaluate N2Africa's impact, to draw lessons learned and to provide recommendations for future improvement.

1.1 Baseline survey

The N2Africa baseline survey was conducted in the 2010B season. The aim was to establish the current status of livelihoods, through the assessment of household characteristics (education, occupations, sources of income, amongst others). The N2Africa baseline report provides a detailed description of Rwanda with its specific regions (Franke and de Wolf, 2011). This description will be used to facilitate monitoring progress over time and to assess the impact at the end of the project.

The questionnaire consisted of nine sections (Appendix I):

A. Demographic information: composition of household, affiliation to (community) organisations, education, involvement in on- and off-farm activities
B. Income: source of income, importance of farming
C. Labour: hiring of labour, for which crops, cost
D. Household assets and resources (wealth indicators)
E. Livestock ownership
F. Land holding and crops cultivated
G. Production activities: cultivation of legumes and to a lesser extent of other crops
H. Nutrition and legume utilization: consumption in general and of legumes, used of haulms
I. Markets: availability, distance, frequency, distance

1.2 **Early impact survey**

The early impact survey was conducted in 2013A season. Its main aim was to establish progress made towards achieving the Vision of Success. N2Africa defined its Vision of Success for Phase I as follows:

> To raise average grain legumes yields by 954 kg ha^{-1} in four legumes (groundnut, cowpea, soyabean, and common bean), increase average biological nitrogen fixation (BNF) by 46 kg ha^{-1}, and increase average household income by $465, directly benefiting 225,000 households (1,800,000 individuals) in eight countries in sub-Saharan Africa (DR Congo, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Zimbabwe).

The second goal of the early impact survey was to collect information about factors determining success or failure to use of the promoted legume technologies. Consequently, the early impact survey has been built upon the following three main questions:

1. What is the impact of the N2Africa project on agricultural practices? Do farmers still use N2Africa technologies?
2. Have they changed their crop practices?
3. Why do certain farmers adopt the N2Africa technologies and others do not, as well as to measure and quantify the impact of the N2Africa project?

The survey was carried out amongst households who received input package(s) and/or training from N2Africa (Huising and Franke, 2013). The provided type of input packages for legume cultivation differed among the farmers. In Rwanda, the input package contained legume seed (common bean and soyabean), mineral fertilizer and/or inoculants. Cowpea and groundnut were not part of the research. All farmers participated in N2Africa dissemination trials between 2009/2010 and 2012. Farmers who received inputs and/or training in 2013 were excluded from the analyses. As the interviewed farmers were a sample of farmers who participated in N2Africa, they do not represent a random sample of farmers in the different action sites. In the analyses some cases had to be dropped due to missing data. Consequently, the reported sample sizes differ per table.

The early impact questionnaire was developed with participation of project staff. It was agreed to use a relatively brief instrument, focussing on the key indicators for the project to ensure reliable data collection and avoid interviewee fatigue. The household survey was conducted 1-2 month after harvest and consisted of six sections (Appendix II):

A. General information: composition of household, education, source of income, importance of farming, livestock ownership
B. Inputs and training received from N2Africa
C. Land holding and current crop management
D. Crop production and use
E. Changes in crop production and use: farming practices, yield, crop areas, crop use
F. Nutrition: legume consumption, dietary diversity

1.3 **Reading guidelines**

In the first part of this report specific sites and socio-economic characteristics of EIS-households are described. In the second part we examine changes in legume cultivation, as reported by the farmers interviewed for the early impact survey. Farmers indicated if and how areas under legumes, yields of legumes and quantities sold changed, as compared to four years before the impact survey was carried out. In the fourth chapter we look at legume cultivation and input use. We discuss how farmers obtained which inputs and from which source. Subsequently, we show input use for the different legumes. In the final part of this report we segregate results by type of input package. We assess whether use of legume technology has changed after having received a certain package.

2 General information

2.1 Sites

The actions sites in Rwanda targeted by N2Africa are located in Burera and Gakenke district (Northern province), Kamonyi district (Southern province) and Kayonza and Bugesera districts (Eastern province).

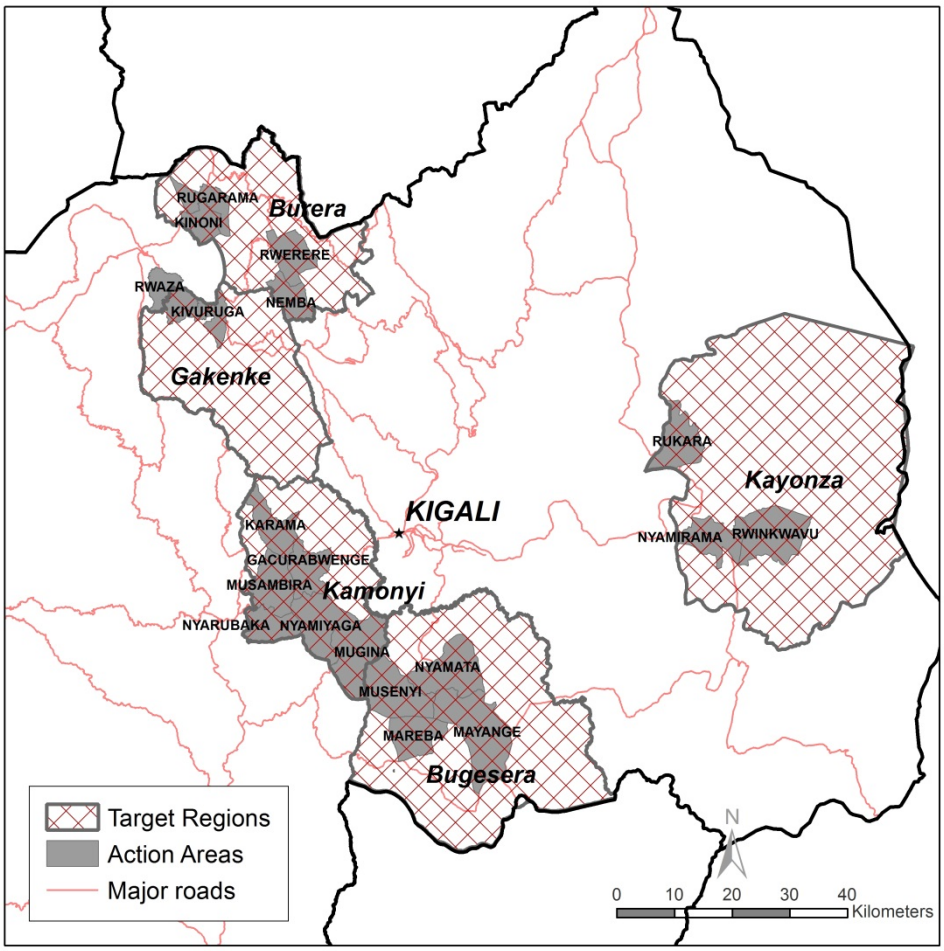


Figure 2.1: Map of Africa depicting Rwanda and the approximate locations of action sites where N2Africa conducts activities (Farrow, 2016).

2.2 Households interviewed

In total, 300 farmers were interviewed for the early impact survey (EIS) in April, May and August 2013. All households that were interviewed for the early impact survey had participated in N2Africa dissemination trials. Through demonstrations on farmers' fields (demonstration trials) and the provision of legume input packages to test on their own fields (adaptation trials), farmers became familiar with legume technologies. The majority of these farmers, both male and female, had been Satellite farmers in the N2Africa project (Table 2.1 and 2.2).

Table 2.1: Previous role in N2Africa from interviewed farmers, segregated by province.

Previous role farmer	Eastern /Southern province (n=180)	Northern province (n=120)
Advisor	0%	2%
Lead farmer	8%	8%
Satellite farmer	91%	91%

Table 2.2: Previous role in N2Africa from interviewed farmers, segregated by gender of the N2Africa farmer.

Previous role farmer	Female farmer (n=150)	Male farmer (n=150)
Advisor	1%	0%
Lead farmer	10%	6%
Satellite farmer	88%	93%

2.3 Socio-economic characteristics of interviewed households

Table 2.3 provides an overview of socio-economic characteristics of the households participating in the early impact survey. It shows that the average farm and household sizes were larger in the Eastern/Southern province than in the Northern province. In addition, households in the Eastern/Southern province had higher education scores than households in the Northern province. Overall, 78-80% of farmers mentioned crop farming as their main source of income, accounting for 50% or more from the total income. Casual labour was the main source of income for 10% of farmers in the Eastern/Southern province. Livestock was more often the main source of income in the North than in the South-East. Very few farmers relied on salaried jobs as their main source of income (Table 2.3). Livestock farming was most often mentioned as the second source of income, followed by casual labour (data not shown).

Table 2.3: Overview of socio-economic values per province.

Socio-economic values	Eastern/Southern province	Northern province
Number of households	180	120
Average Tropical Livestock Unit (TLU)	0.81	0.80
Average Farm size (ha)	1.11	0.43
Average Household size (AE)[1]	4.42	3.93
Average Highest education Household[2]	1.52	1.38
Average Highest education Household head[2]	0.99	0.90
Hiring labour outside farm	58%	44%
Working on other people's field	42%	53%
Having cropping as first source of income	78%	80%
Having casual labour as first source of income	10%	4%
Having livestock as first source of income	5%	11%
Having a salaried Job as first source of income	2%	1%
Having other off-farm source as first source of income	6%	4%

[1] AE = adult equivalent, children < 17 are counted 0.5

[2] Education scores are calculated as the average of a district with 0=no education/illiterate, 1=primary education, 2=secondary education, 3=post-secondary education/vocational, 4=university

Female N2Africa farmers had on average larger farm sizes than male N2Africa farmers, but were otherwise more or less equal in terms of socio-economic characteristics. However, female headed households seemed to be poorer resource endowed than male headed households. Lead farmers had on average more land and hired out less labour than Satellite farmers. Satellite farmers, however, owned more TLU than Lead farmers (Table 2.4).

Table 2.4: Socio-economic characteristics of male versus female farmers, male versus female headed households and Lead versus Satellite farmers.

Farmer type	Gender	n	TLU	Farm size (ha)	Hiring labour (%)	Hiring out labour (%)
Farmer	Female	150	0.79	0.94	53%	51%
	Male	150	0.82	0.73	53%	43%
HH head	Female	78	0.71	0.65	46%	54%
	Male	221	0.84	0.90	55%	44%
Role farmer	Lead	24	1.09	0.77	67%	25%
	Satellite	272	0.79	0.84	51%	49%

2.4 Legume yield per farm

Table 2.5 provides an overview of the mean and average legume yield per farm. It compares the reported data of what EIS-farmers reported as a typical yield four years ago with the current yield (kg ha^{-1}). The average yield of common yield increased from 1,294 kg ha^{-1} to 1,576 kg ha^{-1}. Up to 50% of the common bean farmers produced 1,140 kg ha^{-1} in 2013. Overall, the yield of groundnut remained quite stable over the last four years. Finally, soyabean farmers reported an increase in farm production; the average yield increased from 444 kg ha^{-1} to 727 kg ha^{-1}. In 2013, about 50% of the soyabean farmers realised an yield of 600 kg ha^{-1}. Table 3.4 provides more detailed information about the decrease, increase or no difference in legume yields, and the average difference in yields comparing 2013A to 4 years before (% and kg).

Table 2.5: Median and average farm yield reported by farmers participating in the early impact survey (kg ha^{-1}).

Legume	Farm yield '4 years ago'		Farm yield 2013A	
	Median (kg ha^{-1})	Average (kg ha^{-1})	Median (kg ha^{-1})	Average (kg ha^{-1})
Common bean	700	1,294	1,140	1,576
Groundnut	333	523	325	516
Soyabean	266	444	600	727

3 Legume cultivation and use

3.1 Households cultivating legumes

In the 2013A season and the 2010B season, bean was the main legume in both provinces. Soyabean and groundnut were mainly cultivated in the Eastern and Southern provinces. Overall, the percentage of farmers that cultivated a particular legume in 2013A did not drastically change compared to 2010B. The percentage farmers cultivating bean, however, has declined with 15% in the Northern province, and the percentage farmers cultivating groundnut has declined with 10% in the Eastern and Southern provinces (Table 3.1).

Table 3.1: Percentage of farmers growing bean, soyabean or groundnut in the 2013A season and in the 2010B season.

Legume	Farmers growing the legume in the 2010B season (%)		Farmers growing the legume in the 2013A season (%)	
	Northern Province	Eastern & Southern Province	Northern Province	Eastern & Southern Province
Bean	95%	93%	80%	93%
Soyabean	4%	37%	3%	44%
Groundnut	0%	43%	0%	33%

Table 3.2 shows that the average area per farm household growing beans was 0.21 ha (2013A season). Farmers growing soyabean had on average 0.12 ha of soyabean and farmers with groundnut had 0.12 ha of groundnut (Table 3.2). Compared to the 2010B season, the average soyabean area of a soyabean growing farm has increased with 0.04 ha.

Table 3.2: Average area per farm household growing the particular legume in the 2010B season and 2013A season.

Legume	Average area per farm (ha)	
	2010B season	2013A season
Bean	0.17 (climbing bean) 0.22 (common bean)	0.21
Soyabean	0.08	0.12
Groundnut	0.11	0.12

3.2 Cultivated legume species

Farmers cultivated a range of bean varieties, of which local varieties were cultivated on the largest proportion of the fields (Table 3.3). Some farmers cultivated a mix of bean varieties in one field. For soyabean, PK6 was the most widely cultivated variety. Although Gasilida was the most widely distributed bean variety, only 6% of the fields were planted with Gasilida in the 2013A season.

Table 3.3: Bean and soyabean varieties cultivated by farmers in the 2013A season.

2013A season			
Bean variety	**Grown in fields (%)**	**Soyabean variety**	**Grown in fields (%)**
Gasilida	3%	Local	23%
Gasilida and other	3%	Mix	1%
Kinigi (local)	2%	Other	5%
Local	24%	PK6	48%
Mix (local)	7%	PK6 and other	6%
Mwikokore (local)	2%	SB24	13%
Nyiragasenyi (local)	14%	SB24 and other	2%
Nyiragateja (RWV1348)	2%	Unknown	2%
Other	13%		
RWR1668	3%		
RWR1668 and other	2%		
RWR2245	14%		
RWR2245 and other	9%		
Unknown	1%		

3.3 Use of inputs in legumes

The majority of bean and soyabean fields received organic inputs, but only about one third of these fields received P-fertilizer (Table 3.4). When P-fertilizer was applied in bean fields, quantities were larger than when it was applied in soyabean fields. About a quarter of the soyabean fields were planted with inoculated seeds. Organic inputs were used less often on groundnut than on soyabean and bean fields. Fertilizer application to groundnut fields was rare and the groundnut fields that were indicated to be inoculated are probably data errors, because there is no inoculation on groundnut (Table 3.4). Compared to the 2010B season, use of P-fertilizer in bean and soyabean fields has increased.

Table 3.4: Use of inputs on bean, soyabean and groundnut fields in the 2010B season and 2013A season.

Legume	2010B season		2013A season				
	Fields with P- fertilizer (%)	**Fields with organic inputs (%)**	**Number of fields**	**Fields with P-fertilizer (%)**	**Amount of fertilizer (kg/ha)**	**Fields with organic inputs (%)**	**Fields with inoculate seeds (%)**
Bean	11%, 2%[1]	81%, 71%[2]	352	29%	125	84%	2%
Soyabean	6%	78%	86	34%	74	80%	26%
Groundnut	1%	41%	61	2%	29	46%	2%

[1,2] For climbing bean and common bean respectively.

3.4 **Use of legume and input types**

Lead farmers cultivated bean and soyabean slightly more often than Satellite farmers and also used P-fertilizer and inoculants more often (Figure 3.1). There were no differences in use of technologies between male and female farmers. However, male headed cultivated soyabean slightly more often than female headed households and used P-fertilizer more often, both in bean and in soyabean. On the other hand, female headed household used inoculants more often than male headed households. The reason behind this might be that the project targeted more female beneficiaries (around 60%) and inoculants were distributed by the project.

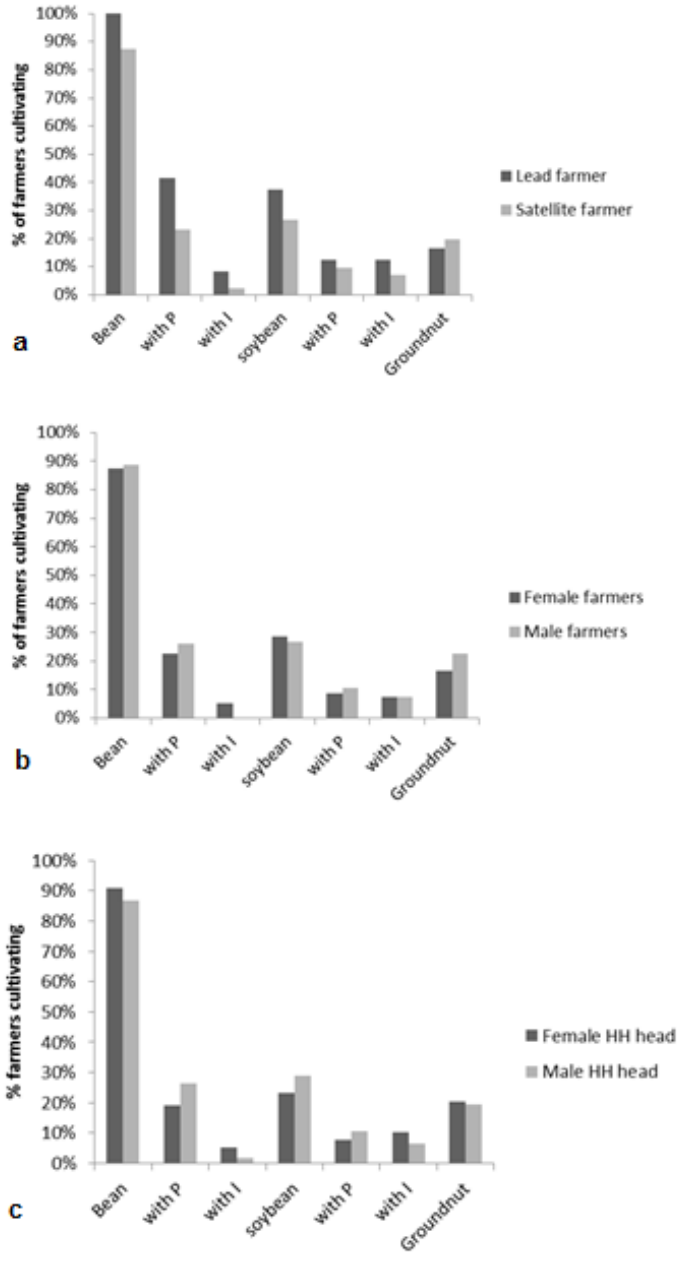


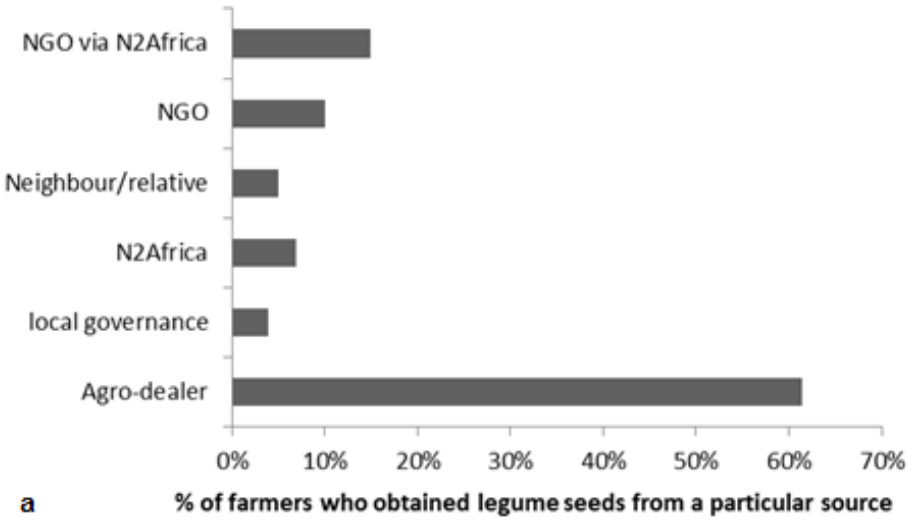
Figure 3.1: Use of legume and input type separated by a) role of the farmer, b) gender of the farmer and c) gender of the household head.

3.5 Sources of inputs

Slightly more than one third of the farmers obtained legume seed, non-legume seed and/or P-fertilizer for the 2013A season (Table 3.5). Furthermore, Figure 4.2 shows that legume seed and P-fertilizer were commonly bought from agro-dealers. About 40% of the legume seed and 20% of the P-fertilizer were obtained through other sources, such as NGOs/N2Africa, government support systems, neighbours or relatives (Figure 3.2a and 3.2b). Inoculant was obtained by only 5% and was always obtained through N2Africa, as inoculants were not sold by agro-dealers at that time (data not shown).

Table 3.5: Farmers who obtained certain inputs at the beginning of the 2013A season (%).

Farmers who obtained (%)	Legume seed	Non-legume seed	P-based fertilizer	Other fertilizer	Inoculant
	34%	36%	37%	14%	5%



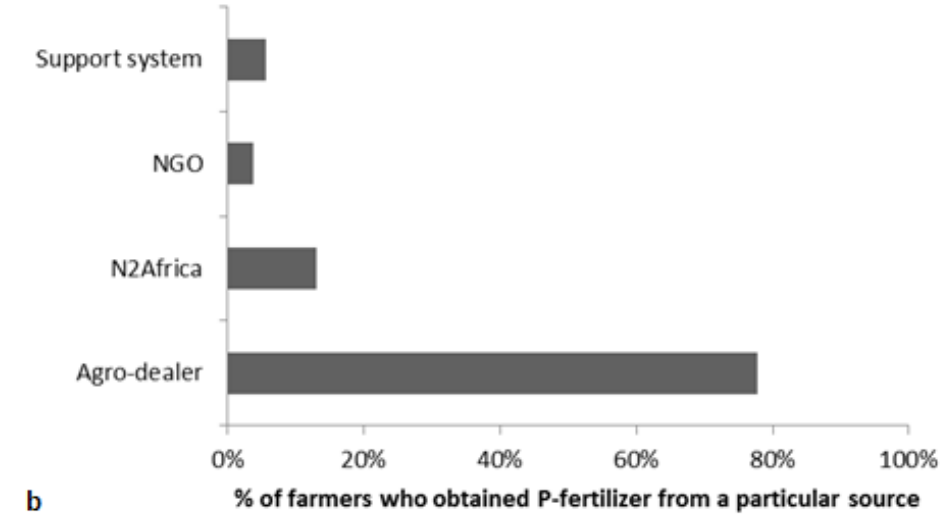


Figure 3.2: Sources of (a) legumes seeds and (b) P-fertilizer.

4 Changes in legume area, yield, production and amount sold

Households that participated in the early impact survey were asked to describe changes over the last four years in legume production, in terms of area, yield (kg ha^{-1}) and amount of produce used for sale. Table 4.1 shows how farmers recalled changes in their cultivated legume area over the past four years. The changes reflect the results of the early impact survey before households received an input package and compare it with results of the early impact survey after households received an input package.

The majority of farmers did not mention a change in cultivated area during the past four years (68%) (Table 4.1). 21% of the farmers mentioned an increase in cultivated area and 11% of the farmers mentioned a decrease. Yet, many farmers mentioned changes in the area allocated to specific crops, mainly bean, cassava, climbing bean, maize, sorghum, groundnut, soyabean, and sweet potato (Table 4.2). Except for groundnut, sweet potato and sorghum, these changes in area comprised mainly increases.

Table 4.1: Changes in cultivated area, comparing season 2013A with the situation four years ago (% and ha).

Change in cultivated area	Farmers mentioning change (%)	Difference (ha)
Decrease	11%	-0.61
Increase	21%	0.45
No difference	68%	0.00

Table 4.2: Percentage of farmers mentioning a change in area for several crops, and the percentage farmers who mentioned a decrease or increase.

Crop	Farmers mentioning change (%)	Farmers mentioning a decrease (%)	Farmers mentioning an increase (%)
Banana	5%	53%	47%
Bean	48%	17%	83%
Cabbage	1%	100%	0%
Cassava	24%	24%	76%
Climbing bean	14%	2%	98%
Cocoyam	2%	100%	0%
Coffee	1%	33%	67%
Eggplant	2%	75%	25%
Groundnut	17%	62%	38%
Irish potato	6%	71%	29%
Maize	37%	10%	91%
Onion	1%	0%	100%
Peas	4%	100%	0%
Potato	3%	55%	45%
Sorghum	22%	66%	34%
Soyabean	14%	54%	48%
Spinach	1%	67%	33%
Squash	1%	100%	0%
Sugar cane	0%	100%	0%

Crop	Farmers mentioning change (%)	Farmers mentioning a decrease (%)	Farmers mentioning an increase (%)
Sweet potato	28%	56%	44%
Tomato	3%	92%	8%
Vegetables	1%	20%	80%
Wheat	2%	100%	0%

The overall legume area has remained rather stable, as compared to the legume area four years ago. Except for groundnut, slightly more farmers mentioned an increasing cultivated legume area than a decreasing area. Overall, changes in area were small, with an increase of 0.04 ha in climbing bean being the largest overall change (Table 4.3).

Table 4.3: Farmers mentioning a decrease, increase or no difference in legume areas and the average difference in area comparing 2013A to 4 years before (% and ha).

Legume	n	Farmers reporting a decrease legume area (%)	Average difference (ha)	Farmers reporting an increase legume area (%)	Average difference (ha)	Farmers reporting no difference legume area (%)	Overall difference (ha)
Bean	230	20%	-0.34	24%	0.22	56%	-0.01
Climbing bean	67	7%	-0.18	31%	0.18	61%	0.04
Groundnut	103	19%	-0.06	18%	0.11	59%	0.02
Soyabean	115	8%	0.00	38%	0.03	50%	0.00

Reported yields show an increase in yield of beans, climbing beans and soyabean, since the beginning of the project (73%, 94%, 74%, respectively) (Table 4.4). The majority of the farmers mentioned an increase in yields, with an average increase of 826, 731 and 427 kg for beans, climbing beans and soyabean, respectively. The percentage farmers reporting decreasing, increasing or stable yields for groundnut were approximately equal.

Table 4.4: Farmers mentioning a decrease, increase or no difference in legume yields, and the average difference in yields comparing 2013A to 4 years before (% and kg).

Legume	n	Farmers reporting a decrease legume yield (%)	Average difference (kg)	Farmers reporting an increase legume yield (%)	Average difference (kg)	Farmers reporting no difference legume yield (%)	Overall difference (kg)
Bean	230	21%	-2,093	73%	826	6%	168
Climbing bean	67	3%	-250	94%	731	3%	680
Groundnut	103	31%	-284	37%	237	30%	3
Soyabean	115	17%	-208	74%	427	4%	292

Relatively large parts of the groundnut, soyabean and bean farmers mentioned no difference in amounts of produce sold. However, climbing bean farmers did report larger amounts of produce being sold (73%), with an overall sales increase of 83 kg. At the same time, the overall difference in bean sales decreased with 50 kg. However, this average might be influenced by a few farmers selling much less than before (Table 4.5).

Table 4.5: Farmers mentioning a decrease or increase in legume sales, and the average difference in sales comparing 2013A to 4 years before (% and kg).

Legume	n	Farmers mentioning a decrease in legume sales (%)	Average difference (kg)	Farmers mentioning an increase in legume sales (%)	Average difference (kg)	Farmers mentioning no difference in legume sales (%)	Overall difference (kg)
Bean	230	19%	-964	36%	378	43%	-50
Climbing bean	67	4%	-43	73%	83	22%	59
Groundnut	103	18%	-84	22%	49	52%	-4
Soyabean	115	10%	-7	41%	54	45%	21

5 Use of legume input packages

5.1 Legume input packages received

Participating farmers had received a N2africa legume input package in one of the seasons between 2010B and 2013B (Table 5.1). The majority of the households had received the legume input package during the 2011A season. N2Africa purposely sampled this season to measure the impact after at least 2 years or 4 cropping seasons and to see if farmers had continued to use the technologies they tested. A few farmers received a legume input package twice, and in a few cases a farmer received both a soyabean input package and a bean input package in one season. In total, 230 farmers had received a common bean package and 84 farmers had received a soyabean package (Table 5.2). The majority of farmers indicated that both bean and soyabean packages included P-fertilizer. Only 10% indicated that the bean input packages included inoculants. The majority of farmers also received maize or cassava. Maize was cultivated in rotation with soyabean or climbing bean, and cassava was intercropped with bush bean. Gasilida was the mostly disseminated climbing bean variety, followed by the bush bean varieties RWR2245 and RWR1668. The latter two varieties were selected by farmers from agronomic trials. In the soyabean input packages, most often PK6 was included (Table 5.3).

Table 5.1: Number of legume input packages received by farmers participating in the early impact survey.

Year	Season	Number of farmers who received a legume input package 1st time	Number of farmers who received a legume input package 2nd time
2010	2010B	1	0
	2010B	35	0
2011	2011A	122	0
	2011B	63	6
2012	2012A	51	3
	2012B	10	2
2013	2013A	4	1
	2013B	2	2
	(blank)	12	0
Total		**300**	**14**

Table 5.2: Number of farmers received bean and soyabean input packages and percentages of input packages that also contained P-fertilizer or inoculants.

Legume	n	Package with P-fertilizer[1] (%)	Package with inoculants (%)
Bean	230	74%	10%
Soyabean	84	90%	87%

[1] Mainly DAP or NPK (17:17:17). Six farmers mentioned recipient of urea.

Table 5.3: Bean and soyabean varieties disseminated to farmers.

Bean varieties received	Number of farmers	Soyabean varieties received	Number of farmers
Gasilida	87	PK6	62
RWR1668	36	SB24	12
RWR2245	65	several varieties[1]	4
RWV2070	10	unknown	6
RWR3316	1		
RWV3006	1		
Kaki	3		
Nyiragisenyi	1		
Several varieties	19		
Unknown	7		
Total	**230**		**84**

Farmers recalled to have received training mainly on planting in rows and fertilizer (both organic and inorganic) application to legumes (Table 5.4). A number of farmers mentioned the method the information was shared, which was either through a demonstration plot or training by a Lead farmer or agronomist. A field book containing technical message was given to each beneficiary and the Lead farmer supervised the use of this book. Some farmers thought they had not received sufficient training from N2Africa (5%) (data not shown).

Table 5.4: Topics on which farmers received training. Farmers could mention multiple topics.

Training topic	Times mentioned
Row planting	173
Fertilizer application	160
Crop management/legume cultivation	30
Demonstration on field	26
Post harvest management	21
Intercropping	20
Inoculation	18
BNF	12
Seed multiplication	12
Pest & Disease management	11
Crop rotation	10
Harvesting	10
Trained by Lead farmer/agronomist	9
Legume processing for food	7
Crop intensification	5
Improved seed/varieties	4
Land conservation topics	4
Nutritional value of legumes/soyabean	4
Using legume haulms	4

[1] New varieties were released only in 2013, in the demo plots led by lead farmers.

Other (accounting, management)	3
Other (family planning, women empowerment)	2

5.2 Cultivated legume types

Table 5.5 shows the number of early impact farmers who received an input package followed by the percentage of farmers that already cultivated this legume before and after they received the input package. The data suggests that farmers more often started cultivating soyabean, after they received an input package (increase from 50% to 59%). The percentage of farmers cultivating beans declined after they received an input package (decrease from 97% to 85%). Cowpea and groundnut packages were not distributed, as cowpea is not grown in Rwanda and groundnut was not part of research.

Table 5.5: Number of early impact farmers who received an input package followed by the percentage of farmers that already cultivated this legume before they received the package and the percentage of farmers that cultivated this legume after they received an input package per legume.

Country	Bean package			Cowpea package			Groundnut package			Soyabean package		
	n	Before (%)	After (%)	n	Before (%)	After (%)	n	Before (%)	After (%)	n	Before (%)	After (%)
Rwanda	230	97%	85%	0	0%	0%	0	0%	0%	84	50%	59%

5.3 Use of N2Africa packages

From the 230 farmers who had received a bean input package, 87% cultivated common bean in the survey season (Table 5.6). From the group of farmers who had not received a common bean package, 91% cultivated beans. However, P-fertilizer use on beans has almost tripled in the group of farmers who had received a bean package. Use of inoculants in bean was low, since inoculants for bean were not part of the dissemination package. Inoculants for beans were only tested in agronomic trials and demo plots. Local varieties were more often used by farmers who had not received an N2Africa bean package (Figure 5.1).

Table 5.6: Composition of bean packages distributed and the % of farmers using N2Africa bean input packages in 2013A.

Farmers using bean input package with:	Composition bean input package	Bean package received from N2Africa (n=230)	No bean package received from N2Africa (n=70)
	P-fertilizer only (%)	69%	n.a.
	Inoculant only (%)	1%	n.a.
	P-fertilizer + Inoculant (%)	9%	n.a.
	No inputs (%)	21%	n.a.
Farmers cultivating bean in 2013A (%)		87%	91%
Farmers cultivating bean in 2013A with:	P-fertilizer only (%)	33%	12%
	Inoculant only (%)	3%	3%
	P-fertilizer + Inoculant (%)	1%	0%
	No inputs (%)	64%	85%

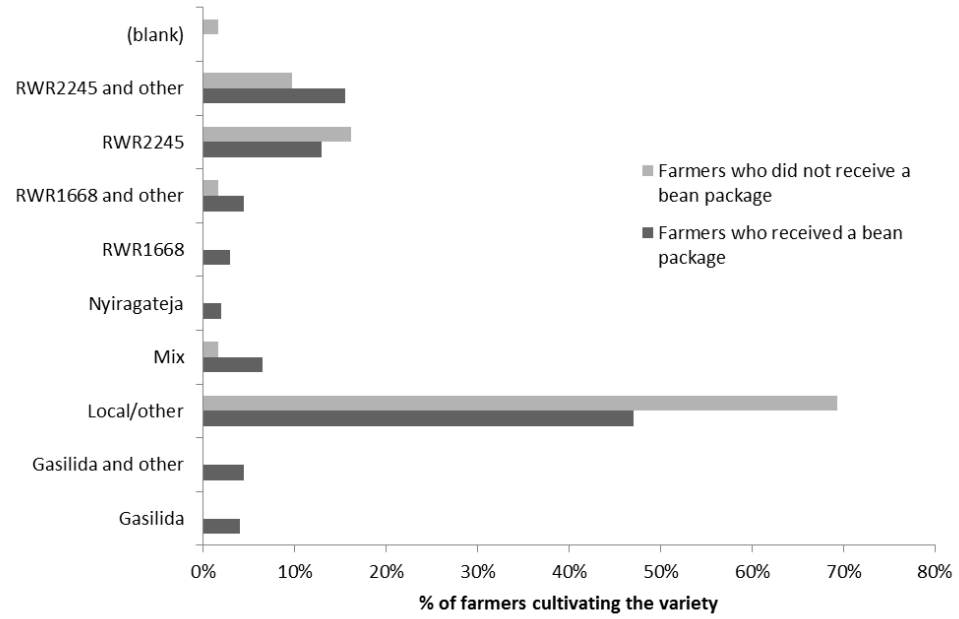


Figure 5.1: Bean varieties cultivated by farmers who had received an N2Africa bean input package and by farmers who had not. Note that Nyiragateja is improved variety RWV1348.

From the farmers who had received a soyabean input package in the Eastern/Southern province, 61% cultivated soyabean in the 2013A season (Table 5.7). More than half of these farmers used inputs, either P-fertilizer, inoculant, or a combination of both. Among farmers who had not received a soyabean package, only 27% cultivated soyabean in 2013A season, and only 20% of those farmers used inputs. The improved varieties PK6 and SB24 that were disseminated by N2Africa were used more often by the farmers who had received a soyabean input package than by the ones who had not (Figure 5.2). N2Africa seems to have had a positive impact on the number of farmers who cultivate soyabean, the use of inputs in soyabean and the adoption of improved soyabean varieties.

Table 5.7: Composition of soyabean packages distributed and the % of farmers using the soyabean inputs during the 2013A season, in the Eastern/Southern province

Farmers using soyabean input package with:	**Composition soyabean input package**	**Soyabean package received from N2Africa (n=84)**	**No soyabean package received from N2Africa (n=91)**
	P-fertilizer only (%)	11%	n.a.
	Inoculant only (%)	7%	n.a.
	P-fertilizer + Inoculant (%)	80%	n.a.
	No inputs (%)	2%	n.a.
Farmers cultivating soyabean in 2013A (%)		61%	27%
Farmers cultivating soyabean in 2013A with:	P-fertilizer only (%)	18%	8%
	Inoculant only (%)	16%	0%
	P-fertilizer + Inoculant (%)	20%	12%
	No inputs (%)	47%	80%

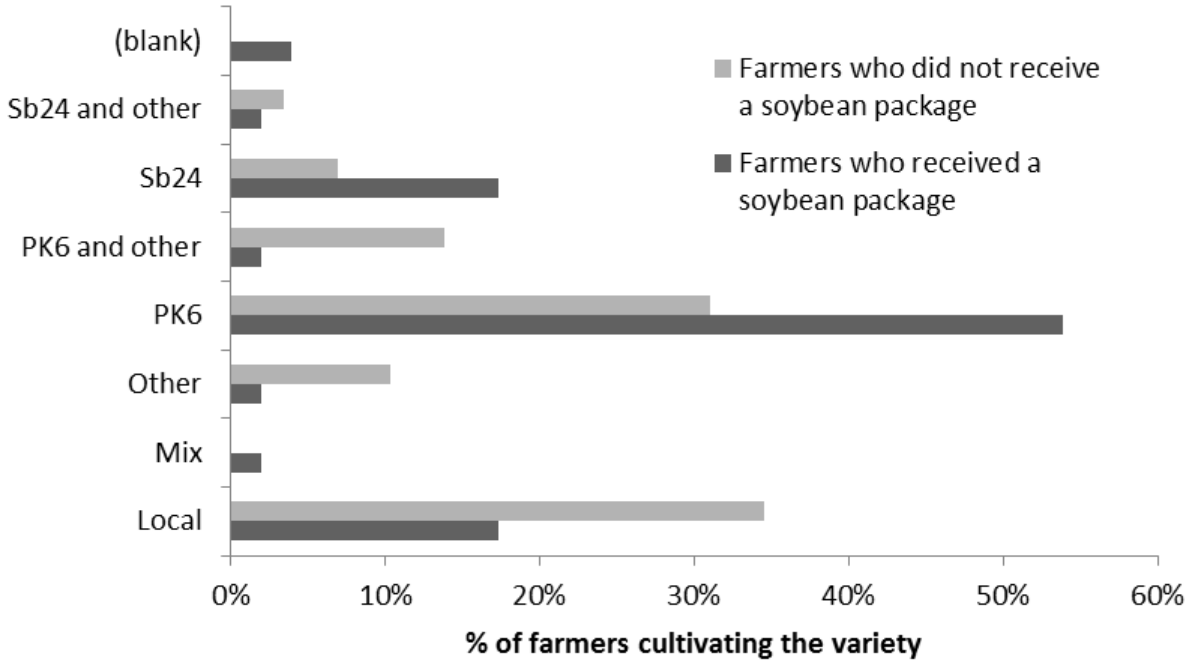


Figure 5.2: Soyabean varieties cultivated by farmers who had received an N2Africa soyabean package and who had not.

6 Literature

Farrow, A. (2016). Map Rwanda. www.N2Africa.ccom

Franke, A.C. and de Wolf, J.J. (2011). N2Africa Baseline Report. Report N2Africa project, www.N2Africa.org, 127pp.

Franke, L., Rufino. M.C. and Farrow, A. (2011). Characterisation of the impact zones and mandate areas in the N2Africa project. Report N2Africa project, www.N2Africa.org, 50pp.

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Appendix I Early impact survey N2Africa project

Name of the interviewer:_____

Date of interview: _____/_____/2013

Country: _____ Sector / State:_____

Action site (District/County/LGA/…): _____

Village: _____

GPS coordinates homestead (decimal degrees) North/South:_____
East/West: _____ Altitude: _____(meter)

Part A: General information

A.1. Name of the N2Africa farmer: _____

A.2. Sex of farmer: Male ___ /Female ___ Age: _____

A.3. Is farmer head of the household: Yes ___ / No ___

A.4. If no, head of household is Male ___ /Female ___ and Age _____ years

A.5. Members of the household

Total number of people in the household:_____

Age	**No. of all children**	
0 – 16 years		
	No. of females	**No. of males**
17 – 35 years		
35-60 years		
Over 60 years		

A.6. Highest education level completed in the household: _____

A.7. Highest education level completed by the household head: _____

A.8. Role of farmer in the N2Africa project (please tick):
Lead Farmer ____
Satellite farmer ____
Other role (Specify): _____
No role at all in N2Africa_____

A.9. Importance of agriculture in the household

	What are the main sources of cash income in the household? (please tick)	Estimated proportion of total income (in %, make sure the total equals 100%)
Cropping		
Livestock		
Casual labour		
Trade		
Other business		
Salaried job		
Pension		
Remittances		
Other_____		

A.10. What are the three most valuable goods in your household?

1._____

2._____

3._____

A.11. Number of valuable livestock species owned of by the household

Cattle (no.):_____ Sheep (no.):_____ Goats (no.):_____

Pigs (no.):_____

Other valuable livestock, type: _____ no: _____

type: _____ no: _____

A.12. Do you hire labour from outside the household to work in your fields? Yes___/No____

A.13. Do you or your household members work on other people's fields for food or cash (as hired labour)? Yes___/No____

Part B. Inputs / training received from N2Africa

B.1 Did you receive inputs and/or training from N2Africa in the past?

1. Yes:____ 2. No:_____ If yes, proceed with B.2. If no, continue with B.4.

B.2. Please give the name of the organisation that disseminated N2Africa technologies:

_____

B.3. If you did receive inputs and/or training **from N2Africa**, please specify what you received and in which year/season. If inputs or training were received over more than one season, please split the column.

	Specify the type of input received, leave blank if not received
Season(s) in which you received the inputs	
Legume crop & Variety/ies	
Legume crop & Variety/ies	
Seed / planting material from non-legume crops	
Mineral Fertiliser	
Organic inputs	
Inoculants	
Biocides	
Training 1 (specify areas of training provided)	
Training 2	
Other	

B.4. Did you receive inputs or training for **legume cultivation** from sources **other than N2Africa** (such as other projects, government extension, NGOs, etc.) in the last four years?

Yes: _____ No: _____

If Yes, Specify type of inputs/training, source and timing

Type of input/training	**Source**	**Which season was it received?**
1.		
2.		
3.		
4.		
5.		
6.		

Part C. Land holding and current crop management

C.1. How much arable land do you have available for crop farming (incl. fallow land)? _____ha or ____acres

C.2. Can you describe the most common crop rotation(s) on your farm?

	Crop rotation 1	Crop rotation 2
Season 1		
Season 2		
Season 3		
Season 4		

C.3. Do you leave land fallow during the cropping season?

1) Yes:____ 2) No:_____

If yes, how long is a field typically left fallow between crops (seasons): _____

C.4. In the last cropping season, which of the following inputs did you acquire (i.e. not saved from last season)?

	Tick if obtained	If yes, please specify	If yes, specify from who you obtained it (e.g. agro-dealer, NGO, relative, government)
Legume seed			
Non-legume seed / planting material			
P-based fertiliser			
Other mineral fertiliser			
Inoculant			

C.5. *Crop management.* Fill in the table below for each field (or the 7 main fields) cropped in the last season. Please pay attention to units.

Field	Size (indicate ha, ac or m^2)	Crop(s) grown (if intercropped, mention all crops and indicate relative shares, e.g. 80% maize / 20% beans)	Indicate variety/ies (ensure variety names for all legumes are noted)	Mineral fertiliser applied? (If yes, specify type and amount If none, leave blank) Type:	Amount+unit	Organic inputs applied? (Tick if yes)	Inoculant applied? (Tick if yes)	Total harvest from this field (give unit, e.g. in kg or 50 kg bags)
1.								
2.								
3.								
4.								
5.								
6.								
7.								

D. Crop production and use

D.1 Indicate for each crop the total production from last season for the entire farm and the amounts for sale, kept in the household for food, for payment / food of hired labour, and the amount for seed. The table refers to the division of crop production directly after harvest. Make sure that the sum of the amounts for sale and kept within the household for food, payment of labour, or seed equals total production.

Crop	Total production at the farm Indicate units, e.g. kg, 50 kg bags. Total production should correspond with the yields given in the last column of C.5.	Amount for sale	Amount for food in the household	Amount used as payment / food for hired labour	Amount kept as seed / planting material

E. Changes in crop production and use

E.1. In the last 4 years, did the total amount of cultivated land in the household (Tick): 1. Increase_____ 2. Decrease_____ 3. Stay the same_____

If the area changed, can you indicate how much it changed and why it changed:

from_____ ha or ____acres 4 years ago to _____ha or _____acres now.

Why: _____

_____

E.2. Which crops *increased* in area on your farm in the last 4 years?

1._____ 2._____ 3._____

E.3. Which crops *decreased* in area on your farm in the last 4 years?

1._____ 2._____ 3._____

E.4. Did you cultivate grain legumes before you came in contact with the N2Africa project? Yes_____ No:_____
If yes, proceed with questions E.5.-E.7. If no, please proceed with question E.8.

E.5. Describe how legume cultivation in the field has changed in the last 4 years, and what the reason was for this change. Think about changes in crop management, improved varieties, intercropping, crop rotation, area, yield, etc.

_____

_____

_____

_____

_____

E.6. Describe how you typically cultivated grain legumes 4 years ago by filling in the table below:

	Legume 1: _____	Legume 2: _____	Legume 3: _____
Variety/ies (Specify)			
Mineral fertiliser applied? (If yes, specify type)			
Organic inputs applied? (If yes, specify type)			
Inoculant applied? (Tick if yes)			
Pesticides applied (Tick if yes)			

E.7. Describe for each legume crop how grain production, area, and amount of produce used for sale changed over the last four years by filling in the table below. Please pay attention to units.

Legume crop	In the last 4 years, how did grain yield change (per ha or per field)?	Can you give the typical yield 4 years ago and current yield per unit area, e.g. kg per ha?	In the last 4 years, did the area with this legume on your farm change? (tick)	Can you give the area under this legume 4 years ago and in the current season?	In the last 4 years, did the amount of legume grain (raw or processed) sold change (tick)	How much did the sale change? (Give the amount sold 4 years ago and the amount currently sold)
	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____
	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____

	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ _ Current: _____ _
	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ Current: _____	Increase_____ Decrease____ No difference____	4 years ago: _____ _ Current: _____ _

E.8. Do you process legume grain at home? Yes:_____ No:_____
If yes, how do you currently process legume grain (e.g. grinding into soy flour)?
Did the way of processing change compared with 4 years ago?

	Type of legume grain	Specify current processing of legume grain	Specify processing of legume grain in the past (if any different)
1.			
2.			
3.			

E.9. Do you use **legume haulms**? Yes:_____ No:_____
If yes, how do you currently use legume haulms? Did the use of legume haulms change in the last 4 years?

	Type of legume haulm	Specify current use of haulms (e.g. for sale, animal feed)	Specify use of haulms in the past (if any different)
1.			
2.			
3.			

F. Nutrition

F.1. In a normal year (not a drought year for instance), which months of the year do you struggle to find sufficient food to feed everyone in the household?
Tick the box(es).

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Tick the months when you struggle												

F.2. In a normal year, which months does the food consumed in the household **mainly** comes from your own farm and which months mainly from other sources?
Tick the box(es).

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Tick the months when food comes from the farm												
Tick the months when food comes from other sources												

F.3. How often do you eat grain legumes and legume leaves in your household? (which kinds, number of times per week, main or side dish)

	Which grain legume?	Number of times per week		How eaten? Main or side dish?
		Peak season	Low season	
1.				
2.				
3.				
4.				
	Which legume leaves?			
1.				
2.				

F.4. Individual dietary diversity score (proxy for nutritional adequacy of the diet)
Please describe the foods (meals and snacks) that you ate or drank yesterday, at home or outside the

home. Start with the first food or drink of the morning. Write down all foods and drinks mentioned. When composite dishes are mentioned, write down the ingredients.

	Dish	Ingredients
Breakfast		
Snack		
Lunch		
Snack		
Dinner		
Snack		

Was yesterday a celebration or feast day where you ate special foods or where you ate more, or less than usual? Yes:_____ No:_____

Did you consume red palm oil or palm nuts yesterday? Yes:_____ No:_____

Do you have any questions / comments for us?

_____

Thank you for your time and cooperation.

List of project reports

1. N2Africa Steering Committee Terms of Reference
2. Policy on advanced training grants
3. Rhizobia Strain Isolation and Characterisation Protocol
4. Detailed country-by-country access plan for P and other agro-minerals
5. Workshop Report: Training of Master Trainers on Legume and Inoculant Technologies (Kisumu Hotel, Kisumu, Kenya-24-28 May 2010)
6. Plans for interaction with the Tropical Legumes II project (TLII) and for seed increase on a country-by-country basis
7. Implementation Plan for collaboration between N2Africa and the Soil Health and Market Access Programs of the Alliance for a Green Revolution in Africa (AGRA) plan
8. General approaches and country specific dissemination plans
9. Selected soyabeans, common beans, cowpeas and groundnuts varieties with proven high BNF potential and sufficient seed availability in target impact zones of N2Africa Project
10. Project launch and workshop report
11. Advancing technical skills in rhizobiology: training report
12. Characterisation of the impact zones and mandate areas in the N2Africa project
13. Production and use of rhizobial inoculants in Africa
18. Adaptive research in N2Africa impact zones: Principles, guidelines and implemented research campaigns
19. Quality assurance (QA) protocols based on African capacities and international existing standards developed
20. Collection and maintenance of elite rhizobial strains
21. MSc and PhD status report
22. Production of seed for local distribution by farming communities engaged in the project
23. A report documenting the involvement of women in at least 50% of all farmer-related activities
24. Participatory development of indicators for monitoring and evaluating progress with project activities and their impact
25. Suitable multi-purpose forage and tree legumes for intensive smallholder meat and dairy industries in East and Central Africa N2Africa mandate areas
26. A revised manual for rhizobium methods and standard protocols available on the project website
27. Update on Inoculant production by cooperating laboratories
28. Legume Seed Acquired for Dissemination in the Project Impact Zones
29. Advanced technical skills in rhizobiology: East and Central African, West African and South African Hub
30. Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones
31. Existing rhizobiology laboratories upgraded
32. N2Africa Baseline report
33. N2Africa Annual country reports 2011

34. Facilitating large-scale dissemination of Biological Nitrogen Fixation
35. Dissemination tools produced
36. Linking legume farmers to markets
37. The role of AGRA and other partners in the project defined and co-funding/financing options for scale-up of inoculum (banks, AGRA, industry) identified
38. Progress Towards Achieving the Vision of Success of N2Africa
39. Quantifying the impact of the N2Africa project on Biological Nitrogen Fixation
40. Training agro-dealers in accessing, managing and distributing information on inoculant use
41. Opportunities for N2Africa in Ethiopia
42. N2Africa Project Progress Report Month 30
43. Review & Planning meeting Zimbabwe
44. Howard G. Buffett Foundation – N2Africa June 2012 Interim Report
45. Number of Extension Events Organized per Season per Country
46. N2Africa narrative reports Month 30
47. Background information on agronomy, farming systems and ongoing projects on grain legumes in Uganda
48. Opportunities for N2Africa in Tanzania
49. Background information on agronomy, farming systems and ongoing projects on grain legumes in Ethiopia
50. Special Events on the Role of Legumes in Household Nutrition and Value-Added Processing
51. Value chain analyses of grain legumes in N2Africa: Kenya, Rwanda, eastern DRC, Ghana, Nigeria, Mozambique, Malawi and Zimbabwe
52. Background information on agronomy, farming systems and ongoing projects on grain legumes in Tanzania
53. Nutritional benefits of legume consumption at household level in rural sub-Saharan Africa: Literature study
54. N2Africa Project Progress Report Month 42
55. Market Analysis of Inoculant Production and Use
56. Identified soyabean, common bean, cowpea and groundnut varieties with high Biological Nitrogen Fixation potential identified in N2Africa impact zones
57. A N2Africa universal logo representing inoculant quality assurance
58. M&E Workstream report
59. Improving legume inoculants and developing strategic alliances for their advancement
60. Rhizobium collection, testing and the identification of candidate elite strains
61. Evaluation of the progress made towards achieving the Vision of Success in N2Africa
62. Policy recommendation related to inoculant regulation and cross border trade
63. Satellite sites and activities in the impact zones of the N2Africa project
64. Linking communities to legume processing initiatives
65. Special events on the role of legumes in household nutrition and value-added processing

66. Media Events in the N2Africa project
67. Launch N2Africa Phase II – Report Uganda
68. Review of conditioning factors and constraints to legume adoption and their management in Phase II of N2Africa
69. Report on the milestones in the Supplementary N2Africa grant
70. N2Africa Phase II Launch in Tanzania
71. N2Africa Phase II 6 months report
72. Involvement of women in at least 50% of all farmer related activities
73. N2Africa Final Report of the First Phase: 2009-2013
74. Managing factors that affect the adoption of grain legumes in Uganda in the N2Africa project
75. Managing factors that affect the adoption of grain legumes in Ethiopia in the N2Africa project
76. Managing factors that affect the adoption of grain legumes in Tanzania in the N2Africa project
77. N2Africa Action Areas in Ethiopia, Ghana, Nigeria, Tanzania and Uganda in 2014
78. N2Africa Annual report Phase II Year 1
79. N2Africa: Taking Stock and Moving Forward. Workshop report
80. N2Africa Kenya Country Report 2015
81. N2Africa Annual Report 2015
82. Value Chain Analysis of Grain Legumes in Borno State, Nigeria
83. Baseline report Borno State
84. N2Africa Annual Report 2015 DR Congo
85. N2Africa Annual Report 2015 Rwanda
86. N2Africa Annual Report 2015 Malawi
87. Contract Sprayer in Borno State, Nigeria
88. N2Africa Baseline Report II Ethiopia, Tanzania, Uganda, version 2.1
89. N2Africa rhizobial isolates in Kenya
90. N2Africa Early Impact Survey, Rwanda

Partners involved in the N2Africa project

A2N

Bayero University Kano (BUK)

Caritas Rwanda

Diobass

Eglise Presbyterienne Rwanda

Ethiopian Institute of Agricultural Research

Kwame Nkrumah University of science and Technology

MIRCEN
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Resource Projects-Kenya

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