



N2Africa Early Impact Survey Ghana

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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, Ghana, Mozambique, Kenya, and Zimbabwe).

This report is meant to provide a comparison among farmers Ghana, that were involved in legume cultivation. The results of the baseline survey (2010) and the early impact survey (2012 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.

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 actions 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.

Conclusions

292 interviews were conducted in Ghana to retrieve information on the use of N2Africa technologies in the 2012 season. 38% of all interviewed households had received a legume package from the project in the 2012 season. In addition, 5% of the interviewed farmers mentioned they had never received any N2Africa package at all. As a result, 43% of the interviewed households were excluded in the evaluation of independent use of N2Africa technologies in the 2012 season.

N2Africa farmers grew more soyabean than at the start of the project. Over the whole data set, the percentage soyabean farmers in the current survey more than doubled from 42% in the baseline survey to 86% in the current survey, irrespective of whether farmers had received a soyabean package in 2010 and/or 2011 or not. According to farmer estimates, the



soyabean area has on average increased with 0.10 ha per soyabean farmer (from 0.60 ha to 0.70 ha). In addition, soyabean yields increased by 247 kg ha⁻¹. Among the soyabean farmers, 18% used P fertilizer only, 10% used inoculant only and 11% used P fertilizer plus inoculants. Although input use was low, it did increase compared to the baseline, where 1.3% used mineral fertilizer and 0.6% used inoculants. 80% of soyabean farmers cultivated the variety Jenguma, which was distributed in the packages.

The project's impact on groundnut or cowpea production appeared to be limited. Compared to the baseline, the percentage farmers growing cowpea increased from 57% to 64% and the percentage groundnut farmers decreased from 79% to 61%. From the farmers who had received a cowpea or groundnut package in 2010 and/or 2011, 76% and 74% respectively cultivated the legume in 2012. However, the area cultivated with these legumes declined by 0.07ha on average for both crops, while the (farmer estimated) total cultivated area had increased with an average of 0.82 ha over the past four years. 17% and 12% of households used P fertilizer on groundnut and cowpea respectively. In the baseline, only 6% and 1% of households applied fertiliser in groundnut or cowpea. The majority of cowpea and groundnut farmers cultivated the varieties that were distributed to them in the N2Africa package.

The increase in soyabean area per farm balanced out the decrease in groundnut and cowpea area. As a result, the total area under legumes per farm changed little, despite an increase in overall farm size.

The majority of farmers obtained legume seeds, non-legume seed and fertilizer for the 2012 cropping season, mainly from agro-dealers and/or open market and in the case of non-legume seed also from the government. Farmers who had obtained those inputs were better resource endowed than farmers who had not.

Keywords

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



1 Introduction

This report is meant to provide a comparison among farmers in Ghana, that were involved in legume cultivation. The results of the baseline survey (2010 season) and the early impact survey (2012 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 (292 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. We compare results of the early impact survey before and after households received an 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. The baseline survey is used to compare farmers that participated in the project with a wider population sample.

1.1 Baseline survey

The interviews for the N2Africa baseline survey were conducted in October 2010. 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 Ghana 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 February and March 2013. 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, Ghana, 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 (Huisling and Franke, 2013). The provided type of input packages for legume cultivation differed among the Ghanaian farmers. The input package contained legume seed (cowpea, soyabean, groundnut), mineral fertilizer and/or inoculants. All farmers participated in N2Africa dissemination trials and the data refer to the 2012 season. 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 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 four actions sites in Ghana targeted by N2Africa were located in Bawku West (Upper East region) and Chereponi, Karaga and Savelugu (Northern region) (Figure 2.1).

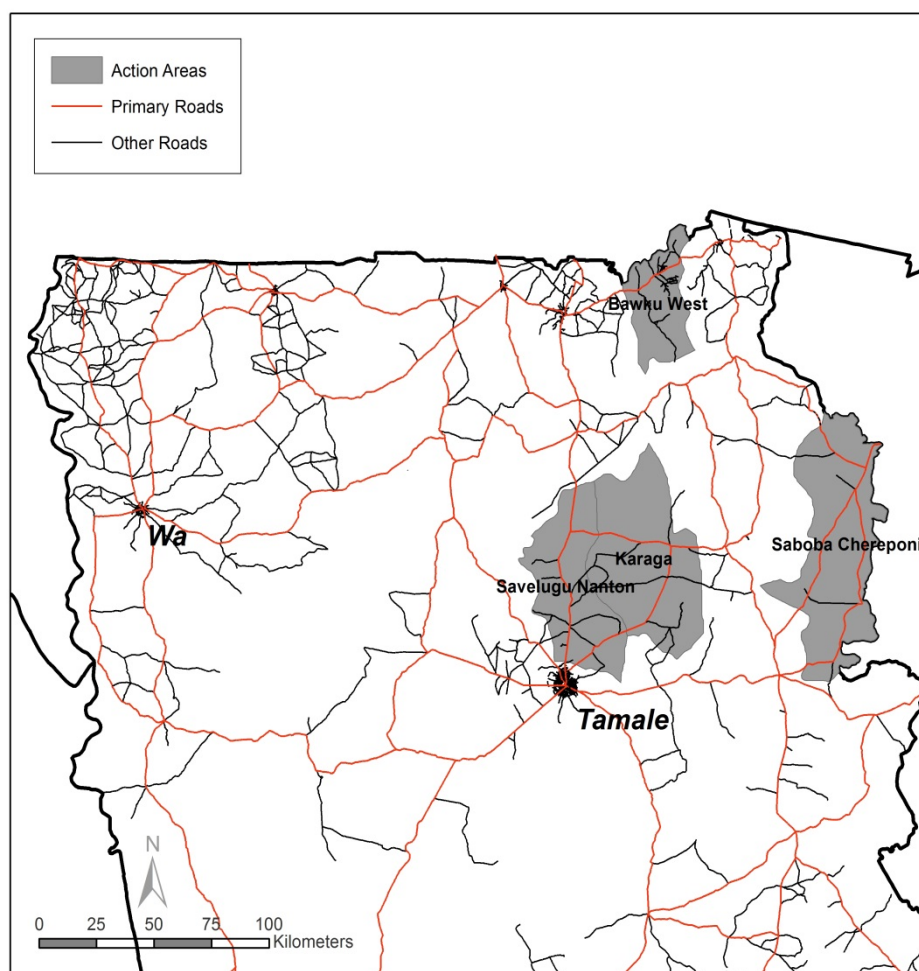


Figure 2.1: Map of Africa depicting Ghana and the approximate locations of action sites where N2Africa conducts activities (Farrow, 2016).

2.2 Households interviewed

In total, 292 farmers were interviewed for the early impact survey (EIS). 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 had been Satellite farmers in the N2Africa project (Table 2.1). This was particularly the case in Savelugu/Nanton. Slightly more male than female farmers were interviewed and lead Farmers were more often male than female (Table 2.2 and 2.3).



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

Previous role farmer	Bawku West (n=132)	Chereponi (n=83)	Karaga (n=38)	Savelugu/ Nanton (n=39)
Lead farmer	45%	35%	50%	15%
Satellite farmer	50%	65%	50%	85%

Table 2.2: Gender of N2Africa interviewed farmers, segregated by action site.

Gender farmer	Bawku West (n=132)	Chereponi (n=83)	Karaga (n=38)	Savelugu/ Nanton (n=39)
Female farmer	47%	51%	32%	49%
Male farmer	53%	49%	68%	51%

Table 2.3: Previous role in N2Africa from interviewed farmers, segregated by gender of the N2Africa farmer.

Previous role farmer	Female farmer (n=135)	Male farmer (n=157)
Lead farmer	30%	46%
Satellite farmer	68%	52%

2.3 Socio-economic characteristics of interviewed households

The average socio-economic indicators differed somewhat per action site. Farmers in Savelugu/Nanton seemed to be the least resource endowed, with lowest average values for Tropical Livestock Unit (TLU), farm size and value of assets (Table 2.4). Furthermore, the Table shows that farmers in Bawku West had the highest value of assets and highest TLU, farmers in Karaga had the largest average farm size (6.4 ha).

Table 2.4: Average values of socio-economic household characteristics of interviewed farmers per district.

District	TLU	Age house old head	Farm size (ha)	Value assets (US\$)	Adult equival ent	Hiring labour (%)	Hiring out labour (%)
Bawku West	5.7	50.2	3.3	1091.2	8.3	92	72
Chereponi	4.6	48.2	5.4	776.2	9.9	47	45
Karaga	4.9	47.2	6.4	753.4	9.6	97	39
Savelugu/Nanton	2.9	43.3	2.0	441.9	8.4	62	41
Grand Total	4.9	48.3	4.1	874.4	8.9	76	56

Male headed households seemed to be better resource endowed than female headed households (Table 2.5). Yet, all female headed households hired in labour. Former Lead farmers also seemed a little better resource endowed than former Satellite farmers. However, differences in resource endowment between Lead and Satellite farmers were much smaller than differences between male and female headed households.



Table 2.5: Average values of socio-economic household characteristics of interviewed farmers per gender of the farmer, gender of the household head and role of the farmer in the project.

Farmer type	Gender or role	n	TLU	Age HH head (years)	Farm size (ha)	Value assets (US\$)	Adult equivalent (n)	Hiring labour (%)	Hiring out labour (%)
Farmer	Female	135	4.2	50.9	3.3	961	8.9	71	53
	Male	157	5.5	49.9	4.8	800	9.0	79	58
Household head	Female	14	3.7	42.3	2.8	481	7.8	100	57
	Male	274	5.0	50.8	4.2	901	8.9	74	56
Role farmer	Lead	113	5.7	50.4	4.3	1348	9.0	81	54
	Satellite	172	4.4	50.0	4.1	585	8.9	71	55

All households indicated cropping was an important source of income, accounting on average for 62% of the total income (Table 2.6). Livestock was mentioned by the majority of farmers as a source of income, but contributed much less to the total income than cropping. Many farmers also mentioned trade, casual labour and other businesses as important sources of household income (34%, 29%, 21%, respectively). Only few households had one or more members having a salaried job. However, in those cases the average share of the salaried job was 21% of the total income.

Table 2.6: Sources of income mentioned by farmers and the average share a particular source of income, when pursued in a household, has in the total income (%). Note that farmers could mention multiple sources of income.

Source of income	% farmers mentioning	% of total income
Cropping	100	62
Food/agro processing	2	31
Livestock	96	22
Salaried job	6	21
Trade	34	20
Poultry	4	20
Other business	21	15
Remittances	13	14
Sale of firewood	1	10
Casual labour	29	10
Building and construction	1	10
Bicycle repair/hairdresser/seamstress	1	9

The socio-economic indicators total TLU, age of household head, household size and farm size were often positively correlated with each other ($p < 0.01$) (Table 2.7). Only farm size did not show any significant correlation with the age of the household head. The value of assets was only significantly correlated to the TLU.



Table 2.7: Spearman's rank correlation matrix for socio-economic indicators (raw data used, log transforming the data did not change much).

Socio-economic indicators	Adult equivalent	Age household head	Farm size (acres)	Total TLU	Value assets
Adult equivalent	1				
Age household head	0.413*	1			
Farm size (acres)	0.267*	0.118	1		
Total TLU	0.469*	0.247*	0.222*	1	
Value assets	0.11	-0.028	0.106	0.368*	1

* significant at $p < 0.01$



3 Legume cultivation and use

3.1 Households cultivating legumes

In the baseline survey (2010 season) and the early impact survey (2012 season), cowpea, soyabean and groundnut were commonly cultivated legumes. Overall, the percentage of farmers that cultivated soyabean in 2012 did drastically change compared to 2010; the percentage of soyabean cultivating farmers had increased more than twofold. The percentage of cowpea cultivating farmers had remained more or less equal. However, the percentage groundnut farmers decreased with 18% (Table 3.1).

Table 3.1: Farmers growing cowpea, soyabean or groundnut in the 2010 season and in the 2012 season (%).

Legume	Farmers growing the legume in the 2010 season (%)	Farmers growing the legume in the 2012 season (%)
Cowpea	57	64 ¹
Soyabean	42	86 ²
Groundnut	79	61 ³

¹ 11% of the cowpea farmers (also) intercrop cowpea, with maize, millet or sorghum (Figure 3.1).

² 9% of the groundnut farmers (also) intercrop groundnut, Bambara nut, sorghum, maize or millet (Figure 3.1).

³ 16% of the soyabean farmers (also) intercrop soyabean, with maize (Figure 3.1).

Table 3.2 shows that maize, rice, millet and sorghum were among the most commonly cultivated crops. Maize was allocated the largest average area (Figure 3.1). The majority of the farmers did not practise intercropping.

Table 3.2: Farmers growing particular crops in the 2012 season (%).

Crop	Farmers growing the legume in the 2012 season (%)
Bambara nut	7
Cotton	3
Maize	84
Millet	33
NERI	1
Rice	3
Sorghum	23
Yam	7

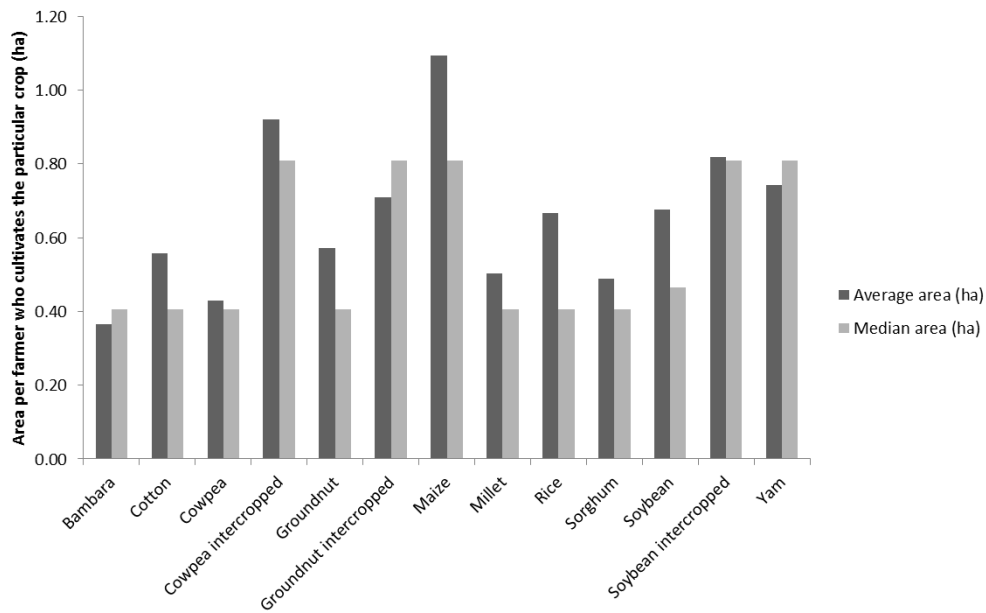


Figure 3.1: The average and median crop areas per farmer who cultivated the particular crop in the 2012 season (ha).

On average, male farmers who cultivated cowpea, groundnut and soybean cultivated these legumes on larger areas than female farmers. The gender of the household head and the role of the farmer in the project did not seem to affect the average legume areas.

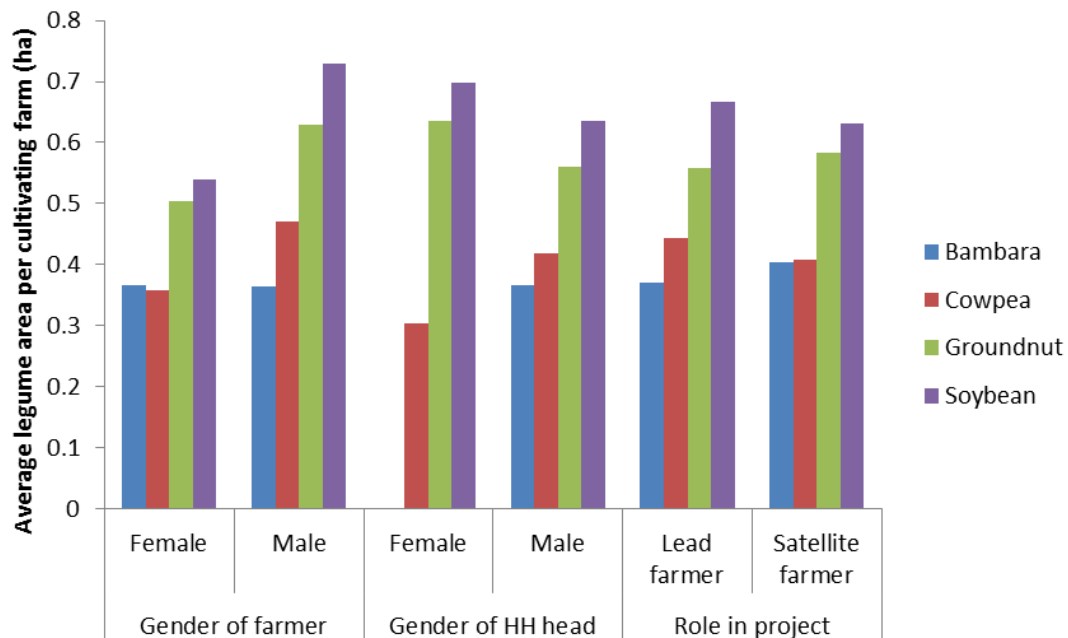


Figure 3.2: Average area of Bambara nut, cowpea, groundnut and soybean per household that cultivated the particular legume, as affected by gender of the farmer, gender of the household head and role of the farmer in the project (ha).



3.2 Use of inputs

Fields in which legumes were intercropped with (mainly) cereals received mineral fertilizer and inorganic inputs more often than fields in which legumes were grown as a sole crop. This is probably, because the fertilizer was targeted to the cereals. In general, the use of mineral fertilizer on legumes increased compared to data from 2010 season (Table 3.3). Also, in the 2012 season, for about 13% of the soyabean fields, inoculant was used compared to the 0.6% of the fields in the 2010 season. Note that farmers had received N2Africa packages including fertilizer and inoculant in 2012 season.

Table 3.3: Legume fields receiving mineral fertilizer, inorganic input or inoculant treatment in the 2010 season and in the 2012 season (%).

Legume fields monoculture	2010 Season				2012 Season			
	Total fields (#)	Mineral fertilizer ¹ (%)	Inorganic input ² (%)	Inoculant (%)	Total fields (#)	Mineral fertilizer ³ (%)	Inorganic input (%)	Inoculant (%)
Bambara nut	58	0	0	0	18	0	11	0
Cowpea	205	6.3	4.4	0	181	10	1	0
Groundnut	317	1.0	4.4	0	165	9	5	0
Soyabean	165	1.3	2.4	0.6	238	15	2	13
Legume fields intercropped	2010 Season				2012 Season			
Cowpea					26	38	42	0
Groundnut					16	25	0	0
Soyabean					42	88	31	5

¹ NPK or TSP, in some cases in combination with MOP, SA (sulphate of ammonium) or UREA.

² Undefined

³ Compound D

Lead farmers applied mineral fertilizer more often to their legume fields than Satellite farmers (Figure 3.3). With soyabean, male farmers and farmers from male headed households applied mineral fertilizer more often than female farmers or farmers from female headed households. Contrary, with cowpea, female farmers and female headed households used mineral fertilizer more often. For groundnut on the other hand, male farmers applied mineral fertilizer more often than female farmers. Female-headed households also applied more fertilizers than male-headed households.

Male and Lead farmers more often inoculated soyabean seed than Satellite farmers and female farmers (Figure 3.4). At the same time, female headed households used inoculants more often than male headed households. Note however, that there were only 1 female headed households (Table 2.5).

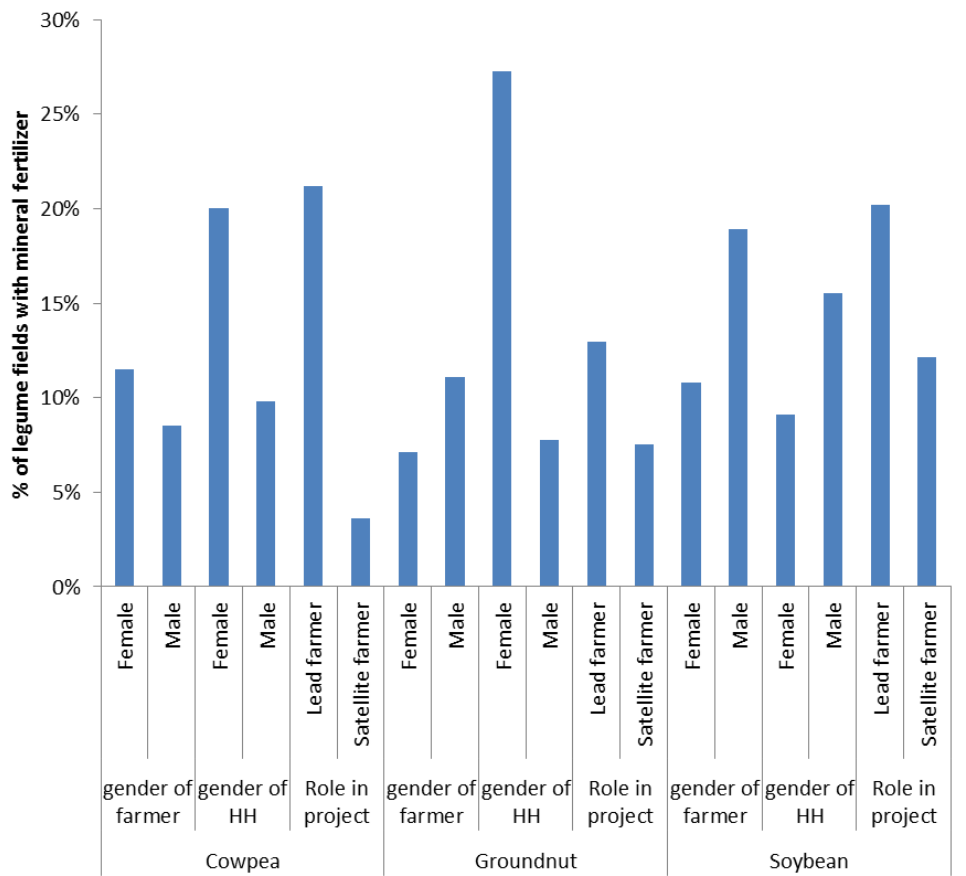


Figure 3.3: Cowpea, groundnut and soyabean fields receiving mineral fertilizer, as affected by gender of the farmer, gender of the household head and role of the farmer in the project (%).

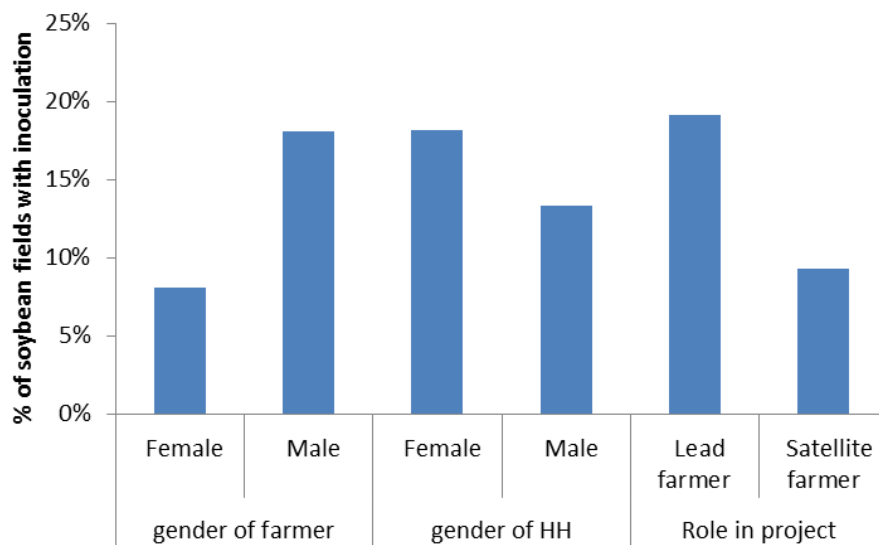


Figure 3.4: Soyabean fields with inoculated seeds as affected by gender of the farmer, gender of the household head and role of the farmer in the project (%).



3.3 Use of crops

About half of the produce from cowpea, groundnut and soyabean was marketed (Table 3.4). The relative amounts of legume produced for sale, for consumption in the household and for seed have not changed compared to the 2010 season.

Table 3.4: Average percentages of crop produce for sale, use in the household, payment/food for hired labour and for seed.

Crop use	n	2010 Season			2012 Season			
		Sale (%)	Household (%)	Seed (%)	Sale (%)	Household (%)	Payment / food hired labour (%)	Seed (%)
Bambara nut	20	25	57	17	17	56	5	21
Cotton	8				100	0	0	0
Cowpea	179	40	46	14	45	38	3	14
Groundnut	160	56	24	19	49	28	4	19
Maize	231				38	49	7	6
Millet	89				23	61	6	11
Rice	94				52	29	5	14
Sorghum	61				25	58	6	11
Soyabean	236	63	24	13	62	21	5	12

Almost all EIS- farmers used the legume haulms as livestock feed (Table 3.5). About a quarter of the farmers used the haulms in addition to livestock feed for making compost.

Table 3.5: Percentages of farmers that use legume haulms in a particular way.

Legume haulms use	Cowpea (n=155)	Groundnut (n=182)	Soyabean (n=156)
Burnt in the field/left on the farm	1%	0%	1%
Composting	1%	1%	4%
Fuel wood	0%	0%	1%
Livestock feed	65%	66%	42%
Livestock feed and composting	21%	23%	28%
Livestock feed and mulch	0%	1%	13%
Livestock feed and potash	0%	0%	5%
Livestock feed and sale	10%	5%	1%
Livestock feed, composting and potash/saltpetre/sale	3%	2%	4%
Sale	0%	1%	0%

3.4 Sources of inputs

The majority of EIS-farmers had used legume seed in the 2012 season (75%) (Table 3.6). Legume seed was mainly sourced from agro-dealers, the open market and NGOs and to a lesser extent from N2Africa, relatives and the government (Table 3.7). 61% of the farmers had obtained non-legume seed, mainly from agro-dealers and the government. The majority of the farmers had also obtained mineral fertilizer, mainly from agro-dealers. 13% of the



farmers had obtained inoculant, all coming from N2Africa (via NGOs). Whereas inoculants were always distributed by NGOs, directly or indirectly all through N2Africa, (non-)legume seed and fertilizer were mainly obtained from agro-dealers or the market.

Table 3.6: Farmers who used certain inputs at the beginning of the 2012 season (%).

Farmers who obtained (%)	Legume seed	Non-legume seed	P-based fertilizer	Other fertilizer	Inoculant
	75%	61%	73%	75%	13%

Table 3.7: Source of which farmers obtained inputs, in order of importance. Note that some farmers sourced inputs from multiple sources.

Source of which farmers obtained inputs	Legume seed	Non-legume seed	P-based fertilizer	Other fertilizer	Inoculant
Main source	Agro-dealer	Agro-dealer	Agro-dealer	Agro-dealer	NGO
Second source	Ngo/market	MoFA	MoFA	MoFA	N2Africa
Other source	N2Africa, relatives, MoFA	N2Africa, market, NGO relatives	NGO, N2Africa	NGO, N2Africa	

EIS-farmers who had obtained fertilizer, legume seed and/or non-legume seed seemed to be better resource endowed than farmers who had not (Table 3.8 and 3.9). Except for a larger average farm size, farmers who had obtained inoculant seemed to be more or less equal in terms of resource endowment indicators to farmers who had not obtained inoculant. Relatively more farmers indicated they had not obtained inoculants. The observed differences in resource endowment between farmers who had obtained seed and fertilizer and who had not, can perhaps be linked to the ability to buy these inputs. (However, it could also be something else, e.g. a geographical factor, in case the poorer farmers live in an area without good market access).

Table 3.8: Average characteristics of households that used specific inputs.

Households that used inputs	n	TLU	Farmers that hired labour (%)	Value assets (Cedi)	Farm size (ha)
Legume seed	220	5.12	74	927	4.56
Non-legume seed	179	5.32	81	1036	4.53
P-fertilizer	213	5.05	83	919	4.18
Other fertilizer	218	5.02	85	911	4.11
Inoculant	39	5.14	77	722	5.25



Table 3.9: Average characteristics of households that had not used specific inputs.

Households that had not used inputs	n	TLU	Farmers that hired labour (%)	Value assets (Cedi)	Farm size (ha)
Legume seed	72	4.25	82	716	2.79
Non-legume seed	113	4.26	67	624	3.48
P-fertilizer	79	4.54	55	738	4.04
Other fertilizer	74	4.57	47	764	4.15
Inoculant	253	4.87	75	898	3.95



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 (ha), yield (kg ha⁻¹) and amount of produce used for sale (kg). 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.

Half of the interviewed farmers mentioned that their cultivated area increased, with an average increase of 1.25 ha (Table 4.1). Overall, farmers indicated that the average farm area had increased by 0.82 ha during the past four years. Increasing demands for food and cash by growing families and the wish to make farming into a business were the main reasons to increase the cultivated area. Also access to improved varieties and agro-inputs and access to ploughing or tractor services were reasons for farmers to increase the cultivated area. In addition, farmers mentioned reasons such as increased labour availability, increased financial means, training farmers received from projects or MoFA and simply having access to more land.

A small proportion of farmers indicated the cultivated area decreased (13%) (Table 4.1). In this case, it was often because available land was subdivided or the costs for farm inputs or ploughing were considered too high to maintain large areas. Other reasons, such as losing land to nature conservation or development programs, insufficient family labour, insufficient financial means and decreasing size to allow for more efficient management were also mentioned.

Table 4.1: Changes in cultivated area, comparing 2012 with the situation four years ago (% and ha).

Change in cultivated area	Farmers mentioning change (%)	Difference (ha)
Decrease	13	-2.22
Increase	50	1.25
No difference	35	0.00
Total		0.82

Based on the numbers of farmers mentioning a decrease or increase in area of a certain crop, the production of cowpea, maize and soyabean mainly seemed to have increased, after farmers received an input package (Table 4.2). On the other hand, the production of sorghum, groundnut and millet seemed to be decreasing.

Table 4.2: Farmers mentioning a decrease or increase in area per crop (%).

Crop	Farmers mentioning a decrease (%)	Farmers mentioning an increase (%)
Bambara nut	0.7	0.3
Cotton	0.7	0.7
Cowpea	8.6	33.9
Groundnut	33.9	18.5
Maize	13.0	69.2
Millet	22.3	2.4
Rice	16.1	11.3
Sorghum	29.1	2.4
Soyabean	6.2	55.5
Yam	2.1	0.3



Overall, 84% of the interviewed EIS-farmers cultivated legumes before they participated in N2Africa. Farmers indicated that after they received a legume input package they changed the way they cultivated legumes. The most obvious change in legume cultivation seemed to be changes in variety, followed by changes in crop management or agronomic practices (Table 4.3). Only 20% explicitly mentioned 'higher yield'. Training and provided inputs by NGOs or MoFA were often the reason for farmers to start changing legume cultivation. For 10% of the farmers the change in legume cultivation comprised lower yields, often related to declining soil fertility or erratic rainfall patterns.

Table 4.3: Changes in legume cultivation over the past four years as described by farmers. Note that farmers often mentioned multiple changes (n=248).

Change in legume cultivation	Farmers mentioning change (%)
Use of other varieties	54%
Crop management/better agronomic practices	34%
Higher yields	20%
Crop rotation	16%
Plant spacing	15%
Use of fertilizer	11%
Lower yields	10%
Row planting	9%
Intercropping	8%
Pest and disease management	7%
Larger legume area	6%
Use of inoculants	4%
Shift from groundnut to soyabean/cowpea	4%
Post harvest handling/storage	4%
Mono-cropping of legumes	3%
'New' technologies	2%
Other	7%

Reported yield, area (ha) and amounts sold of soyabean and cowpea (kg) seemed to have mainly increased (Table 4.4). Many farmers reported higher yields per farm, but we could not quantify average changes in yield due to missing units. In addition, the difference between yield (kg ha^{-1}) and farm production (kg farm^{-1}) was not always clear. Although, as many farmers reported increases as decreases in groundnut area, more farmers reported decreases than increases in groundnut yields and amounts sold. Half of the farmers indicated that the area of cultivated Bambara nuts stayed the same. However, the amounts being sold decreased (58%).



Table 4.4: Farmers mentioning a decrease, increase or no difference in legume yield, area and amount sold comparing 2012 to four years ago (%).

Indicator	Legume	Number of farmers mentioning change (n)	Decrease (%)	Increase (%)	No difference (%)
Yield	Bambara nut	12	33	50	17
	Cowpea	195	27	67	6
	Groundnut	205	55	41	4
	Soyabean	226	28	65	6
Area (ha)	Bambara nut	12	25	25	50
	Cowpea	195	26	37	37
	Groundnut	205	33	33	34
	Soyabean	226	19	46	34
Amount sold (kg)	Bambara nut	12	58	25	17
	Cowpea	195	28	58	13
	Groundnut	205	51	39	10
	Soyabean	226	25	66	9

Although more cowpea farmers mentioned an increase in area than a decrease, the absolute change in area was negative (Table 4.5). The absolute change in groundnut area was also negative. For soyabean there was a substantial average increase in area of 0.13 ha. However, this seemed to be compensated by the reduction in area of groundnut and cowpea, which equalled 0.15 ha. On average, farmers reported declining groundnut yields, and increasing cowpea and soyabean yields.

Table 4.5: Average changes in yield (kg ha⁻¹), area (ha) and amounts sold (kg) segregated by all surveyed farmers who reported a decrease or an increase and the average overall change.

Indicator	Legume	Average decrease	Average increase	Overall change (average)
Yield (kg ha ⁻¹)	Bambara nut	-469	350	19
	Cowpea	-504	469	98
	Groundnut	-772	543	-307
	Soyabean	-415	438	86
Area (ha)	Bambara nut	-0.19	0.20	0.01
	Cowpea	-0.62	0.30	-0.06
	Groundnut	-0.59	0.34	-0.09
	Soyabean	-0.53	0.48	0.13
Amount sold (kg)	Bambara nut	-80	67	-30
	Cowpea	-133	100	21
	Groundnut	-266	105	-95
	Soyabean	-196	200	84

The trend of reducing areas of cowpea and groundnut (Table 4.5) observed among all the surveyed farmers was also observed for those farmers, who received a cowpea and groundnut input package (Table 4.6). The average decrease in amount of cowpea and



groundnut sold was even larger among this selected group compared to all farmers. Whereas groundnut yields seemed to have reduced compared to four years ago, cowpea and especially soyabean yields have increased.

Table 4.6: Average changes in legume area (ha) and amounts sold (kg) among those farmers cultivating the particular legume and who received a legume package in 2010 and/or 2011.

Indicator	Legume	4 years ago (average)	2012 season (average)	Absolute change (average)
Yield (kg ha ⁻¹)	Cowpea	557	659	102
	Groundnut	1189	789	-400
	Soyabean	806	1053	247
Area (ha)	Cowpea	0.555	0.483	-0.072
	Groundnut	0.727	0.653	-0.074
	Soyabean	0.599	0.701	0.102
Amount sold (kg)	Cowpea	133	122	-11
	Groundnut	349	185	-164
	Soyabean	206	286	80



5 Use of legume input packages

5.1 Legume input packages received

Participating farmers had received a N2Africa legume input package in 2010, 2011, 2012, or in two of these years (Table 5.1). In total, 289 farmers had received a legume input package, mainly in 2011 and 2012. The majority of the households, who had received a legume input package, had received the same legume package twice (Table 5.2). Although only farmers who had received a N2Africa package in the past were supposed to be selected for the impact survey, 16 farmers (5%) indicated they had not received an input package. A possible explanation for this phenomenon is that in some cases another household member than the N2Africa farmer was interviewed.

Table 5.1: Overview of years in which farmers received a legume input package.

Year input package received	Number of farmers who received a legume input package
2010	30
2011	74
2012	31
2010 & 2011	57
2011 & 2012	81
No inputs received	16
Total	289

Soyabean was the most widely disseminated legume (Table 5.2). Almost all farmers mentioned that the soyabean input packages included inoculant. Fertilizer was not included in all packages. Only 3% indicated that the cowpea input packages included inoculants, and around 50% of the farmers indicated that the package included fertilizer. Biocides seemed to have been included in about 1/3 of the cowpea packages. Table 5.2 shows that 146 farmers who received an input package in season 2 did not mention the specific type and content of the package.



Table 5.2: Numbers of farmers who received a particular legume package and the percentage of farmers who mentioned to have received additional inputs.

Input	Cowpea package (%)	Groundnut package (%)	Soyabean package (%)	Soyabean and cowpea package (%)	Blank (%)
Number of farmers who received a legume package – for 1st time	74	44	143	13	18
Including fertilizer ¹	49%	91%	68%	69%	6%
Including inoculant ²	3%	7%	92%	85%	6%
Including biocides ³	31%	0%	1%	0%	0%
Number of farmers who received a legume package –for 2nd time	46	27	73	0	146
Including fertilizer ¹	57%	81%	55%	n.a.	1%
Including inoculant ²	0%	4%	86%	n.a.	1%
Including biocides ³	37%	0%	1%	n.a.	1%

¹ Fertilizer included NPK, NPK + MOP, NPK + SA, TSP, TSP + MOP and TSP + UREA. TSP was included more often than NPK.

² Inoculant refers to Biofix, Legumefix or just 'inoculant'.

³ Biocides refer to Cyperdicot and in a few cases to Lambda.

The majority of farmers who received an N2Africa legume package in 2010 and/or 2011 also cultivated legumes in 2012 (Table 5.3). However, only few farmers used inputs, especially in cowpea and groundnut (12%, 17%, respectively). Input use in soyabean was a bit more widespread, but inoculants used in the 2012 season were also distributed by N2Africa.

Table 5.3: Legume cultivation and use of legume input packages in 2012 season.

Legume	Number of farmers that received a legume input package in 2010 and/or 2011	Farmers cultivating in 2012 season (%)	Farmers using inputs in 2012 season			
			No inputs (%)	P-fertilizer (%)	Inoculant (%)	P-fertilizer + inoculant (%)
Cowpea	54	76%	88%	12%		
Groundnut	31	74%	83%	17%		
Soyabean	95	86%	61%	18%	10%	11%



Table 5.4 shows the legume varieties that were included in the input packages, distributed in 2010 and/or 2011. Farmers indicated they cultivated the cowpea varieties such as 'Songotura', 'Apaagbala' and 'Bawutawuta', the groundnut variety 'Chinese' and/or the soyabean variety 'Jenguma'. The majority of farmers also used these varieties in 2012. Especially among soyabean farmers, the use of a local soyabean variety was limited.

Table 5.4: Farmers cultivating particular varieties of cowpea, groundnut and soyabean in 2012. Some farmers cultivated multiple varieties (%). Results from farmers who received an input package in 2010 and/or 2011.

Cowpea (n=112)		Groundnut (n=102)		Soyabean (n=155)	
Variety	Farmers (%)	Variety	Farmers (%)	Variety	Farmers (%)
Songotura	35	Chinese	75	Jenguma	80
Apaagbala	32	Local	14	Anidaso	13
Local	18	Manipinta	11	blank/unknown variety	3
Bawutawuta	8	Samnut 22	6	Local	2
Black eye unknown variety/blank	7 6	Samnut 23	3	Sallintuya 1	2
Paddy-tuya	5	AGRIC unknown	1 1		

All farmers who had received an input package mentioned they received accompanying training on a range of topics (Table 5.5). Training topics that were mostly mentioned by farmers were on inoculation, legume agronomy, pest and disease management, plant spacing and post harvest handling. Farmers were trained in fewer topics when they received a package for the second time.



Table 5.5: Farmers who received training on particular topics during the first or second season they received an N2Africa package (%).

Farmers who received a legume package – for 1 th time (n=272)		Farmers who received a legume package – for 2 nd time (n=143)	
Training topic	Farmers (%)	Training topic	Farmers (%)
How to use inoculant	51	How to use inoculant	33
Legume agronomy	42	Legume agronomy	31
Pest (and disease) management	21	Pest (and disease) management	18
Plant spacing	21	Plant spacing/seeding rate	13
Post harvest handling	15	Post harvest handling	13
Planting in rows	14	Composting	10
Legume processing/utilization	13	Legume use and processing	9
Use of fertilizer	11	Other ²	9
Other ¹	8	Row planting	8
Field measurement	7	N2Africa project	7
Composting	6	BNF or nodules	6
Extension methodology/group	6	Group formation/dynamics	6
Leadership training	6	Intercropping/rotation	6
N2Africa project	5	Leadership training	6
Seed multiplication	5	Nutritional aspects	6
Timing of activities/farm	5	Gender aspects	4
Intercropping/rotation	4	Marketing	4
Marketing	4	(Timely) harvesting	3
BNF or root nodules	3	Fertilizer use	3
Nutritional aspects	3	Field demarcation/measurement	3
Weed control	3	Seed multiplication	3
Harvesting	2	Weed control	3

¹ Other includes soil fertility management, soil preparation techniques, use of improved seeds, land selection, increasing yield, planting in monocrop, field management, improved planting methods and production planning.

² Other includes yield measurement, farm management, farm sanitation, varietal identification/improved varieties, timing of cultural practise, soil fertility management and field preparation.

For the period 2007-2011, 32% (n=92) of the surveyed farmers mentioned that they had received inputs and/or training from sources other than N2Africa, mostly from the government (MoFA) and NGOs. Inputs and/or training were provided for soyabean and cowpea, with training on general agronomic practices, pest and disease management, seed germination testing and correct line and plant spacing in the case of cowpea and use of certified seed in the case of soyabean being the most important topics. Without any crop specified, many of those farmers also received training in general agronomic practices for legumes, use of fertilizer, financial management and group dynamics.



6 Nutrition

Table 6.1 shows the food sources on which households rely during the year and the percentage of farmers which are struggling to get sufficient food during the year. From September to February, most households relied on food from the farm and only very few were struggling to get sufficient food. From March to August food also came from other sources, and more people were struggling to find sufficient food. The peak of the 'hungry season' seems to be in July, where very few still relied on food from the farm and 86% of the interviewed households could not find sufficient food easily.

Table 6.1: Food source and the percentages of households which are struggling to get sufficient food during the year (%).

Food source	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Food comes from farm	80%	76%	56%	31%	14%	8%	29%	67%	91%	92%	93%	92%
Food comes from other sources	1%	3%	21%	45%	68%	83%	60%	18%	7%	2%	1%	1%
Struggling to get sufficient food	0%	1%	17%	37%	61%	86%	68%	27%	3%	1%	0%	0%

Figure 6.1: Food source and the percentages of households which are struggling to get sufficient food during the year (%).

In Ghana, cowpea was the most commonly eaten legume, followed by groundnut (Table 6.2). During peak season, farmers were eating legumes on average 12.2 times per week. During low season this number dropped to 5.7 times per week. Legumes were usually eaten as main dish. In the baseline survey, households consumed on average legumes 6.0 times per week during peak season and 2.6 times per week during low season. Compared to the baseline survey, the frequency of eating legumes had thus increased.



Table 6.2: Average times per week legumes are eating during peak and low season for all interviewed households.

Season	Bambara nut	Cowpea	Groundnut	Pigeon pea	Soyabean	All legumes
Peak season	0.4	5.0	3.5	0.1	3.2	12.2
Low season	0.2	1.9	1.6	0.1	1.9	5.7



7 Feedback from farmers

Table 7.1. shows the categorized additional feedback or questions from the interviewed farmers. These suggestions can be taken into account for future activities and project interventions.

Table 7.1: Categorized comments or questions from the interviewed farmers.

Comment/question	Times mentioned
We appreciate the project/it has helped us to improve legume production	15
Larger demonstration plot/input package (also for satellite farmers)	14
The project should be extended to reach more farmers/other communities	13
Will there be program extension/Will N2Africa continue to support farmers/what does the project do for farmers in the next season?	9
(Assist MoFA to) help make inoculant available	8
More training/support is needed	8
We also need credit	7
We need inoculants (for increased production, larger farm)	7
Pests and disease management in cowpea and soyabean (want N2Africa to include, or questions about this topic)	5
Project starts late/Inputs came late	5
Why all these questions/What is the real intent of all these questions?	5
Looking forward to more improved cowpea varieties (weevil resistant)	4
The project should be extended to include cereal crop production	3
Any plans with livestock (improved breeds) in the project?	2
Need for machines for soyabean harvest/more advanced ways of harvested and threshing soyabean	2
Increased support for legume cultivation can improve nutritional levels	2
Training (use of inoculants, farm management) was very useful	2
Addressing soil fertility will be more beneficial	1
How can we improve the productivity of our farms?	1
How can we reverse the decreasing yields?	1
Need for non-shattering soyabean varieties	1
Price of improved cowpea seeds needs to be reduced	1
Reduction on input prices is needed	1
Soyabean utilization programmes should target more women	1
Technical advice received from AEAs under N2Africa should be made sustainable	1
What intervention is the project putting in place to reduce poverty at the rural level	1
Why is there a focus on women?	1
Will there be a programme to replace the introduced varieties when they also get old?	1



8 Literature

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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.

Huising, J. and Franke, L. (2013). Early impacts of the N2Africa project. www.n2africa.com.



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)		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)
				Type:	Amount+unit			
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 soya 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



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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
 91. N2Africa Early Impact Survey, Ghana



Partners involved in the N2Africa project

