



## **Dissemination Approaches for Scaling Up Improved Legume Technologies in Tanzania**

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## **N2Africa**

**Putting nitrogen fixation to work for smallholder farmers in Africa**



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## Acronyms and Abbreviations

1. A&A Adaptation and Adoption
2. ACT African Conservation Tillage Network
3. AFAP African Fertilizer and Agribusiness Partnership
4. ASA Agricultural Seed Agency
5. ASHC Africa Soil Health Consortium
6. BDO Business Development Officer
7. BMGF Bill and Melinda Gates Foundation
8. BRITEN Building Rural Incomes Through Enterprise
9. CABI Centre for Agriculture and Bioscience International
10. CATI Computer-aided Telephone Interviews
11. CRS Catholic Relief Services
12. CLA Collaboration, Learning and Adaptation (CLA)
13. D&D Delivery and Dissemination
14. D2R Development to Research
15. FRI Farm Radio International
16. GALA Gender and the Legume Alliance: Integrating multi-media communication approaches and input brokerage
17. ICT Information Communication Technology
18. IITA International Institute for Tropical Agriculture
19. INGO International Non-Governmental Organization
20. KAP Knowledge, attitude and practices
21. LEAD Livelihood Enhancement through Agricultural Development Project
22. LoI Letter of Intent
23. M&E Monitoring and Evaluation
24. N2Africa Putting Nitrogen-fixation to work for smallholder farmers in Africa
25. ODK Open Data Kit
26. OVI Objectively Verifiable Indicator
27. PPP Public-Private Partnership
28. RUDI Rural Urban Development Initiatives
29. SAIRLA Sustainable Intensification of Agricultural Research and Learning in Africa
30. SILT Scaling-up Improved Legume Technologies
31. SAI Sustainable Agricultural Intensification
32. ToT Training of Trainers
33. TOC Theory of Change
34. UPTAKE Up-scaling Technologies in Agriculture through Knowledge Extension
35. WUR Wageningen University and Research



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## Short summary

A number of projects in Tanzania jointly developed and used innovative and complementary communication approaches to scale-up improved legume technologies and established sustainable input supply systems. To assess the effectiveness of these communications approaches, N2Africa, the Centre for Agriculture and Bioscience International (CABI), Farm Radio International (FRI) and other partners designed a survey tool using Computer Aided Telephone Interviews (CATI). The survey consisted of two modules: the first module focused on farmer behaviour on beans and soyabean, intention to buy, availability of inputs and demographics; the second on farmer exposure and learning through dissemination campaigns. The report at hand pertains to findings of the second module.

The second module showed that 86% of the respondents recently grew beans or soyabean while 91% intended to do so in the next suitable season. From the initial sources of knowledge for beans/ soyabean, 4.2% of the respondents mentioned radio, and after having heard the introduction jingles obtained from FRI for the five target campaigns, 32 (46%) mentioned to have listened to one or more of the survey target radio campaigns. This is 2% of the total sample of 1,646 respondents.

Despite near equal exposure to the radio campaigns, women listened to fewer episodes than men. More than 80% of women listened to three or less episodes, against 37% of men, while half or more episodes of the target campaigns applied to 45% of the men and 8% of the women.

Onwards, the second module principally evolved around the question '*What are the 3 most important or relevant topics you learned about soyabean or beans in the last 3 years*'. It was found that the N2Africa and partners' dissemination campaigns resulted in 85% of the respondent mentioning on average 2.6 important new learning topics while for 15% the campaigns had no (new) learning effect.

*Row cropping* was the most frequently mentioned topic by 37% of the respondents. Another 37% mentioned *earlier land preparation*. *Crop rotation*, mentioned by 12% of the respondents, 8% *seeding rates*, 5% *remove diseased crop residues*. On inputs, 31% mentioned the *use of chemical fertilizer*, 22% *use quality seeds (certified or QDS)*, 21% *use of manure*, 19% *pesticide use*, 4% *herbicide use*, 3% *use of inoculants*, and 2% *use of PICS bags for storage*.

The learning topics mentioned were found to be in line with uptake, although uptake saw (much) higher percentages as not all topics would have been new to the respondents. In that light, it is for instance worthwhile to mention that '*Use of PICS bags for storage*' was meant as learning topic by a small percentage (2%), but the first module showed that PICS bags are in use with 29% of the respondents.

The popularity of the topics '*Row planting*', '*Early land preparation*' and '*Use of chemical fertilizer*' also matches with the first module. The first module showed that chemical fertilizers were used on farmer main field in the last completed season by 44% of the respondents. For seed, only 9% of the farmers had bought certified-quality seeds. However, on the question about farmers' intention to '*purchase certified seeds of the most preferred variety at TShs. 3,000 per kg for the next suitable season*', 1,696 out of 2,477 farmers (68%) confirmed this intention. This means that uptake of quality seed was mainly hampered by lack of availability/ inaccessibility, and not by awareness on the use of quality seeds.

For '*Use of inoculants*', mentioned by only 3% as major learning topic, 8% of the farmers used, and about 20% of the farmers were aware of inoculants, of which 83% intended to buy inoculant at TZS 10,000 per 100-gram sachet. Of this 83%, three quarters (73%) did not have a source to buy inoculants. Like for seeds, uptake is therefore constrained by non-availability, but in contrast, low awareness is also an important limiting factor for the uptake of inoculants.

After topics, the question was asked '*If you had to choose one major influence on your learning, what would this be as regards Interventions*'.

An intervention for their learning topic applied to 68% of the respondents. *Demonstration plots* were the most frequently mentioned major influence on learning, mentioned by 85% of the 68%. Another 10% mentioned radio programs, and 7% Information leaflets and posters.

The fact that '*Demonstration plots*' are leading as the most important intervention could be explained by the source of respondents: 90% of the respondents came from the N2Africa partner value chain (VC)





project organizations. Demonstrations often come with a package of field days and if in strategic locations, can be observed by anyone having an interest or happens to pass by them.

After interventions, the question was asked '*If you had to choose one major influence on your learning on the topics, what it would be as regards personal relation -interactions*'.

On average 1.5 different interactions were mentioned. *From my own experience* was the most frequently mentioned interaction with a major influence on learning by 49% of the respondents for whom at least one interaction applied (97%). Another 34% mentioned extension officers, and 27% Neighbours, friends and family. On private sector chain actors, CBOs were mentioned by 15% of the respondents, 8% village-based advisors (VBAs), 7% Agro-dealers and 0.3% a private company.

The last question asked was '*Would you like to receive other information on soyabeans or beans*'. Most respondents (96%) wished to receive *other* information and on average 2 *other* topics were mentioned.

The top six topics mentioned were 'quality seeds', 'markets', 'marketing', 'pesticide use', 'use the right variety' and 'use of chemical fertilizer'. Markets and marketing were more frequently mentioned by men than women, and if combined were mentioned by near half (42%) of the respondents.

## Keywords

Common bean, soyabean, monitoring evaluation and learning (MEL), dissemination, Tanzania

## 1 Background

The study at hand was implemented under a Service Agreement between the International Institute of Tropical Agriculture (IITA) and iLogix in support of the N2Africa Project in collaboration with the Legume Alliance sister projects. These comprise the African Soil Health Consortium (ASHC), Scaling-up Improved Legume Technologies (SILT), Gender and the Legume Alliance: Integrating multi-media communication approaches and input brokerage (GALA) and Up-scaling Technologies in Agriculture through Knowledge Extension (UPTAKE) projects.

These projects jointly developed and used innovative and complementary communication approaches to scale-up improved legume technologies and established sustainable input supply systems. The projects aimed to facilitate an information and distribution network of improved legume technologies driven by farmers and input suppliers, supported by various business models and ICT systems. This is in line with two strategic objectives of the N2Africa project:

- 1) Delivery and dissemination, sustainable input supply, and market access;
- 2) Enable learning and assess impacts at scale through strategic M&E.

N2Africa, the Centre for Agriculture and Bioscience International (CABI), Farm Radio International (FRI) and other partners designed a comprehensive farmer survey tool using Computer Aided Telephone Interviews (CATI) (see annex i). The survey tool consisted of two modules. The first module focused on farmer behaviour on beans and soyabean, intention to buy, availability of inputs and demographics. The second module focused on farmer exposure and learning through dissemination campaigns. GALA contracted the first and N2Africa the second module. The report at hand pertains to findings of the second module.





## 2 Methodology and approach

### 2.1 Sampling frame and Sample size

The target group for the survey tool were farmers from N2Africa, SILT, GALA and part of the UPTAKE target areas in the main bean and soyabean growing regions in Tanzania (Figure 1).

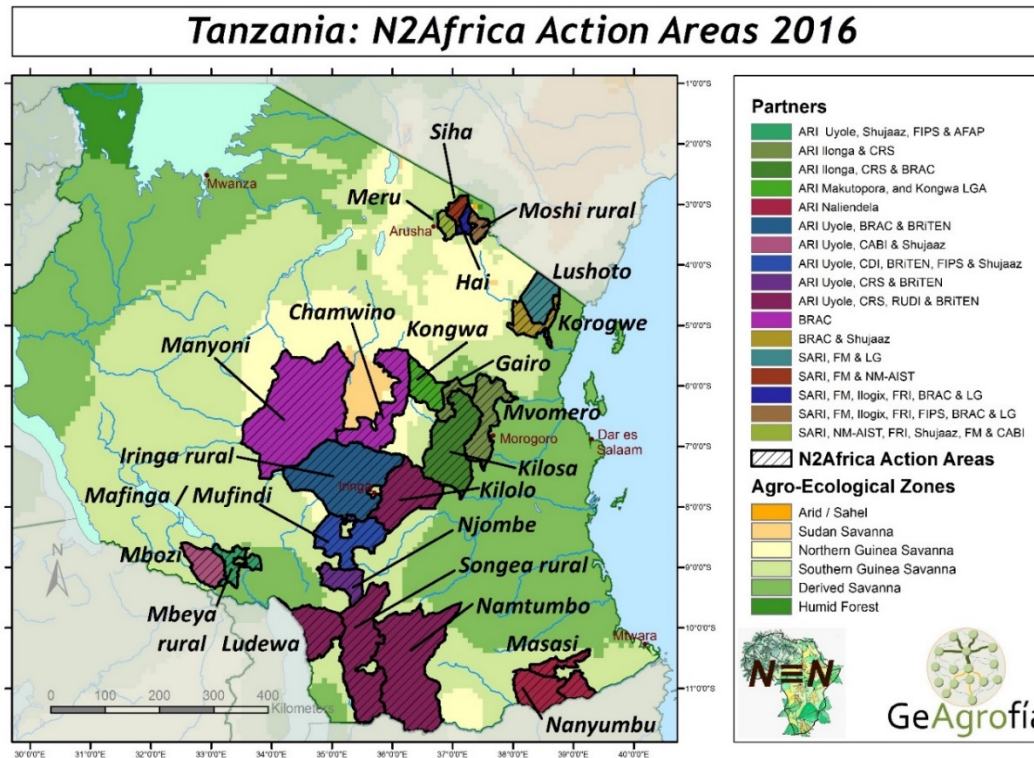


Figure 1. N2Africa Action areas - Districts in 2015-2018

The first module was completed by the end of Nov. 2017 and generated 2,930 complete (phone) interviews. Between Feb. 08-16, 2018, these 2,930 farmers were called a second time for the module on exposure and learning through dissemination campaigns. The call back for the second module was expected to result in at least a 40% success rate or 1,250 completed interviews. Achieved was 1,646 completes or 56% of the 2,930 completes from the first module.

Enumerators recorded from voice the gender of the respondent. For the 2,930 numbers from the first module, 1,646 second module completes were derived with near the same percentage of female (36% and 37%) from both first and second module interviews respectively (Table 1). In 42 cases a man answered in the first module and for the second a woman picked up, in 51 cases this was vice versa.

Table 1. Second module versus first module gender percentages (n=1,646)

Dissemination module Gender	Male	Female	Total	Male	Female	Total
Male	996	51	1,047	96%	8%	64%
Female	42	557	599	4%	92%	36%
<b>Total</b>	<b>1,038</b>	<b>608</b>	<b>1,646</b>	<b>63%</b>	<b>37%</b>	<b>100%</b>



The survey tool comprised 61 questions using a skip logic. iLogix' deliverable was a clean database of 1,250 completed interviews in excel while iLogix and IITA collaborated and monitored the field work progress. The IITA deliverables are analysis and reporting after receiving the clean database.

Most (90%) respondents' mobile phone numbers dialled in the survey were provided by N2Africa Value Chain (VC) projects related partners under formal Public Private Partnership (PPP) agreements, including Agricultural Research Institutes (ARI), Rural Urban Development Initiatives (RUDI), the Catholic Relief Services (CRS) in collaboration with the African Conservation Tillage Network (ACT) and Building Rural Incomes Through Enterprise (BRITEN), African Fertilizer and Agribusiness Partnership (AFAP), the Anchor or nucleus farm Clinton Foundation project, BRAC's Livelihood Enhancement through Agricultural Development (LEAD) project and Faida Market Link (Faida MaLi). Additional numbers (10%) were built by iLogix from various sources and have no overlap with the above VC-Projects but could have been exposed to notably the Radio campaigns. The number of completed interviews per Region and organization is given in Table 2.

**Table 2.** Region of residence versus organization linked to respondents' affiliation in numbers

Region	RUDI-CRS	Faida MaLi	BRAC	ARI	No-VC	AFAP	Clinton Found.	Total
Kilimanjaro	2	173	58	57	47	0	0	337
Tanga	1	174	13	94	2	0	0	284
Ruvuma	224	0	3	0	4	21	0	252
Njombe	173	0	1	0	12	7	0	193
Iringa	20	1	54	0	15	19	65	174
Morogoro	6	2	20	66	52	0	0	146
Mbeya	4	0	35	2	20	12	2	75
Other	18	15	90	38	5	17	2	185
<b>Total</b>	<b>448</b>	<b>365</b>	<b>274</b>	<b>257</b>	<b>157</b>	<b>76</b>	<b>69</b>	<b>1,646</b>
Kilimanjaro	0%	47%	21%	22%	30%	0%	0%	20%
Tanga	0%	48%	5%	37%	1%	0%	0%	17%
Ruvuma	50%	0%	1%	0%	3%	28%	0%	15%
Njombe	39%	0%	0%	0%	8%	9%	0%	12%
Iringa	4%	0%	20%	0%	10%	25%	94%	11%
Morogoro	1%	1%	7%	26%	33%	0%	0%	9%
Mbeya	1%	0%	13%	1%	13%	16%	3%	5%
Other	4%	4%	33%	15%	3%	22%	3%	11%
<b>Total</b>	<b>27%</b>	<b>22%</b>	<b>17%</b>	<b>16%</b>	<b>10%</b>	<b>5%</b>	<b>4%</b>	<b>100%</b>

The sample frame seen in Table 2 shows 157 farmers (10%) are not linked to a partner value chains project (No-VC), while the balance (90%) stemmed from the various organizations linked to the N2Africa project and this applies to both modules using the same pool of mobile numbers.

## 2.2 Survey Set-up

The aim of both modules of the study was to capture respondents residing in the VC projects' target areas, quantify their input demand and supply gaps and create insights in their behaviour and intentions, to develop a 'product for the private sector' and other stakeholders.



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Data collected from different variables on uptake, campaign exposure etc. would auto-generate certain relationships between them, while dissemination (exposure) related questions gave insight in the type of exposure and what was learnt new over the last 3 years, hence a comparison over time.

## 2.3 Report set-up

The first module was analysed and reported on earlier in the GALA Milestone 4 report deliverable 3.7 entitled 'Common Bean and Soyabean Farmer Seed and Inoculant Demand and Supply in Tanzania'.

A bird eye view of the main findings is presented in Chapter 3 for context and linkages. The second module is presented in Chapter 4, following the sequence of questions in the survey tool (annex i). Linkages between the two modules are narrated upon in Chapter 4.4 'Learning topics and information sources synopsis', which also summarizes findings from the survey tool individual questions analysis in Chapters 4.1 to 4.3.

An integrated analysis of the two modules is ongoing under the GALA project as well as follow-up panel (a sample from the master database) Monitoring Evaluation and Learning (MEL) surveys.

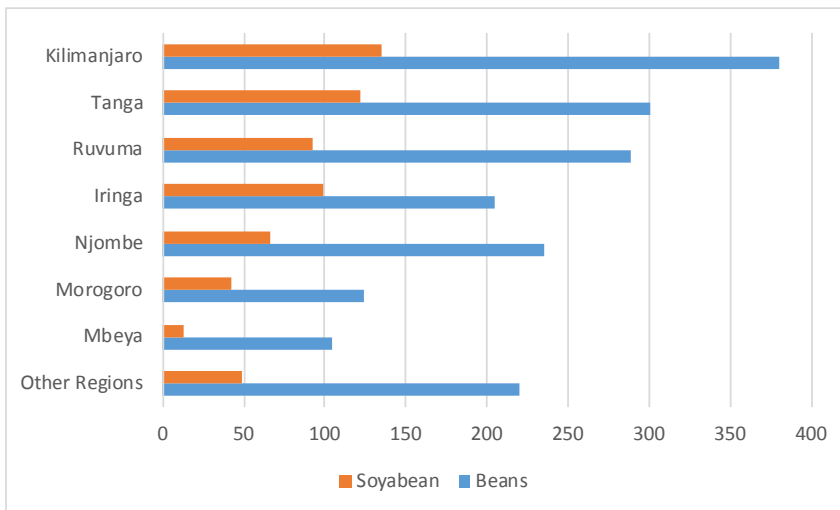


### 3 First Module Report

#### 3.1 Introduction

The purpose of the first module was to present a quantification of the demand and supply gap for certified common bean seed, soyabean seed and inoculants in the target areas of N2Africa and its partners in Tanzania. From the 2,930 respondents, 2,477 (85%) grew common beans or soyabeans the last completed season, 15% did not grow either. Of the 2,477 farmers that grew common bean or soyabean, 619 (25%) were soyabean farmers and 1,858 (75%) common bean farmers. Soyabean farmers often also grew beans while none of the common bean farmers grew soyabean. The farmers who grew common beans or soyabeans were asked on input usage, intention to buy certified seeds of a preferred variety and inoculants plus demographics.

The survey covered 25 regions in Tanzania. The top eight (8) Regions covered 90% of the 2,477 farmers (Figure 2). These Regions were (1) Kilimanjaro (19%), (2) Ruvuma (15%), (3) Tanga (15%), (4) Iringa (12%), (5) Njombe (12%), (6) Morogoro (8%), (7) Dodoma (5%) and (8) Mbeya (5%). Information on districts to village levels was also collected and available in case further details may be desirable.



**Figure 2.** Sample sizes of bean and soyabean farmers per Region (n = 2,477)

Due to the name confusion of notably the popular bean variety bean variety Soja Njano, for Kilimanjaro and Tanga regions, the data in Figure 2, present a mix-up between beans and soyabean as information from other sources confirm soyabean remains very rare in these two Northern Tanzania regions.

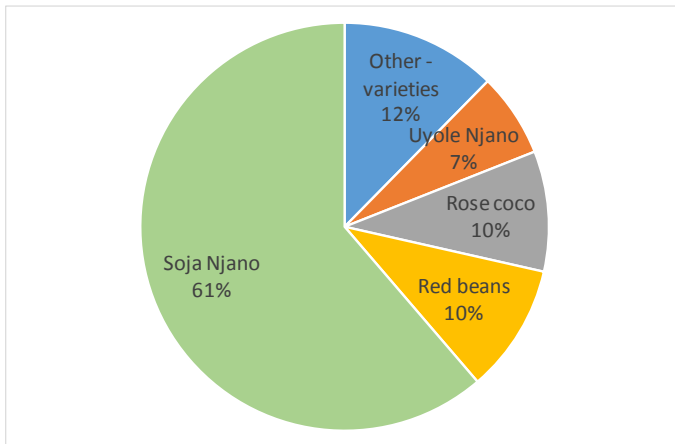
#### 3.2 Seeds

The farmers who grew common bean or soyabean (n=2,477) were asked, *‘if available, would you intend to purchase certified seeds of your most preferred variety at a cost of TShs. 3,000 per kg for the next suitable season?’*. Out of 2,477 farmers, 1,696 farmers (68%) confirmed their intention to buy their most preferred variety at that price.

The most preferred variety names showed that in 1,384 (82%) of the cases this was a common bean and 312 (18%) a soyabean variety. This meant that of the 619 (25%) soyabean farmers, 307 (50%) most preferred variety pertained a bean- and not a soyabean variety. On the other hand, only 35 (3%) of the originally common bean farmers mentioned a soyabean variety as most preferred. This indicates that soyabean popularity was in a decline at the end of 2017 likely caused by the policy of adding VAT to animal feed causing a sharp decline in the market for soyabean, this policy has since been reversed.



Analysis of the most preferred varieties that farmers intend to buy at TShs. 3,000 per kg for the next suitable season therefore depicts 1,384 common bean- and 312 soyabean farmers (Figures 3 and 4).

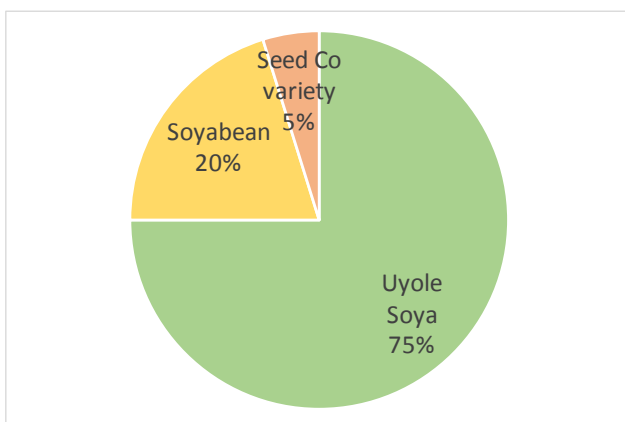


**Figure 3.** Most preferred common bean varieties in percentages of farmers (n = 1,384)

**Table 3.** Bean farmers preferred seed variety next season average buying amounts (kg) per farmer

Most preferred bean variety	Av. kg	N (%)	Σ Kg	Σ Kg (%)
Soja Njano	28	61%	23,473	64%
Rose coco	28	10%	3,744	10%
Red beans	22	10%	3,165	9%
Uyole Njano	24	7%	2,173	6%
Other - varieties	23	12%	3,854	11%
<b>Total</b>	<b>26</b>	<b>100%</b>	<b>36,409</b>	<b>100%</b>

Soja Njano has the largest market share (64%) regarding farmers intention to buy preferred varieties (Figure 3 and Table 3). This is followed by Rose coco (10%), Red beans (9%), Uyole Njano (6%). The other bean varieties make up a multitude of local names where each one presents only a small percentage of farmers preference.



**Figure 4.** Most preferred soyabean varieties in percentages of farmers (n = 312)



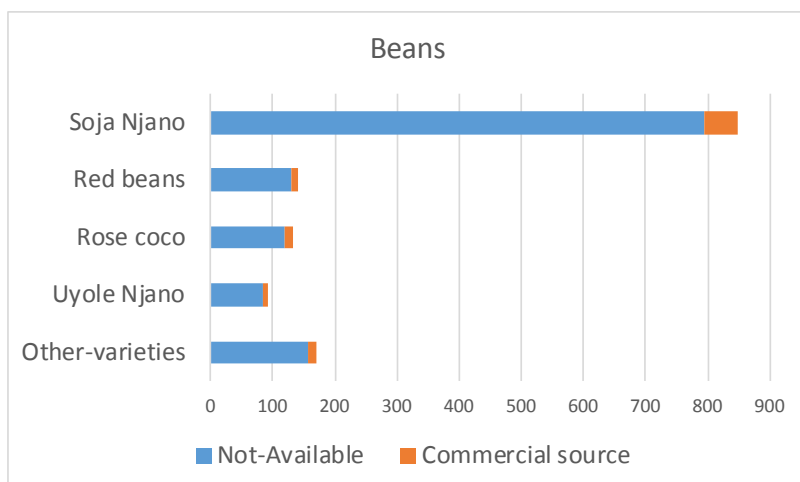
In Table 4 and Figure 4, soyabean varieties were grouped into the Uyole Soya types (mainly Uyole-2) and where, after assistance, farmers would not recognize a variety name or use a local name (20%) in 'soyabean'. The Seed Co varieties were also combined (mainly Safari). Table 4 shows that 75% of the farmers intended to buy Uyole Soya with a 78% market share in number of kg. The overall average amounts intended to buy was 29 kg per farmer for soyabean against 26 kg per farmer for bean seeds.

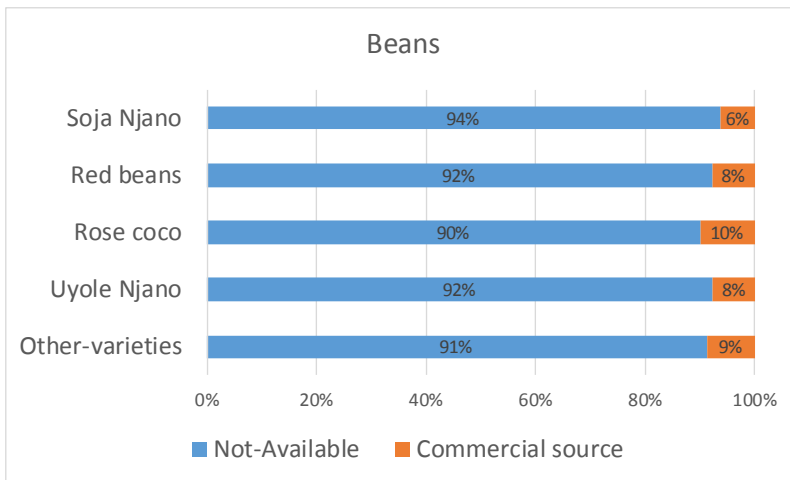
**Table 4.** Soyabean farmers most preferred seed variety average buying amounts (kg) for next season

Most preferred soyabean variety	Av. kg	N (%)	Σ Kg	Σ Kg (%)
Uyole Soya	31	75%	7,158	78%
Soyabean	26	20%	1,623	18%
Seed Co variety	27	5%	406	4%
<b>Total</b>	<b>29</b>	<b>100%</b>	<b>9,187</b>	<b>100%</b>

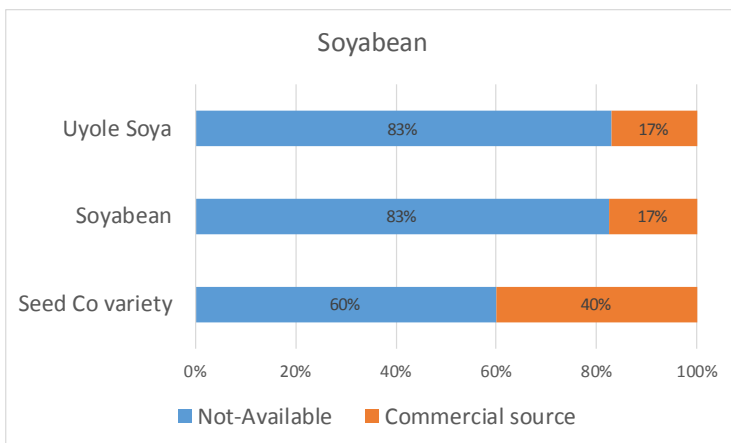
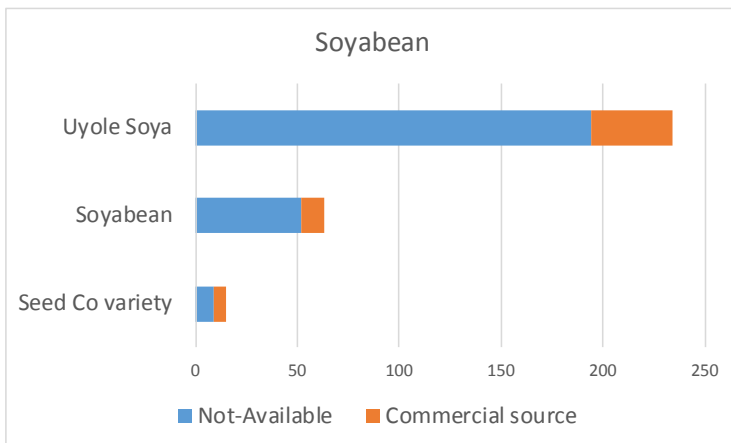
Before being 'assisted' by reading out the variety names, over 50% of the farmers were not 'spontaneously' aware of the soyabean variety name they had been growing. For common beans, near 100% of the farmers knew the variety (local) names. The low awareness of soyabean variety names indicates some 'branding' may be appropriate if to commercialize for instance Uyole Soya.

From the 1,384 farmers intending to buy their most preferred certified bean varieties, 99 (7%) anticipated that the commercial sources of these seeds are an agro-dealer (4%), Farmers' association (2%), Seed company (1%) or Outgrowing agreement (0.4%) (Figure 5) whereby above average, 10% expects that rose coco is available through a commercial source, and below average, 6% for Soja Njano.





**Figure 5.** Next season anticipated source of certified bean seeds (n=1,384)



**Figure 6.** Next season anticipated source of certified soyabean seeds (n=312)

For the 312 farmers seen in Figure 6 intending to buy soyabean varieties, 57 (18%) anticipated that the commercial sources of these seeds are agro-dealer (7%), Farmers' association (6%), Seed company (5%) or Outgrowing agreement (0.3%). For Uyole Soya and Soyabean this is 17% while for Seed Co varieties this is 40% of the farmers for which these varieties are most preferred.



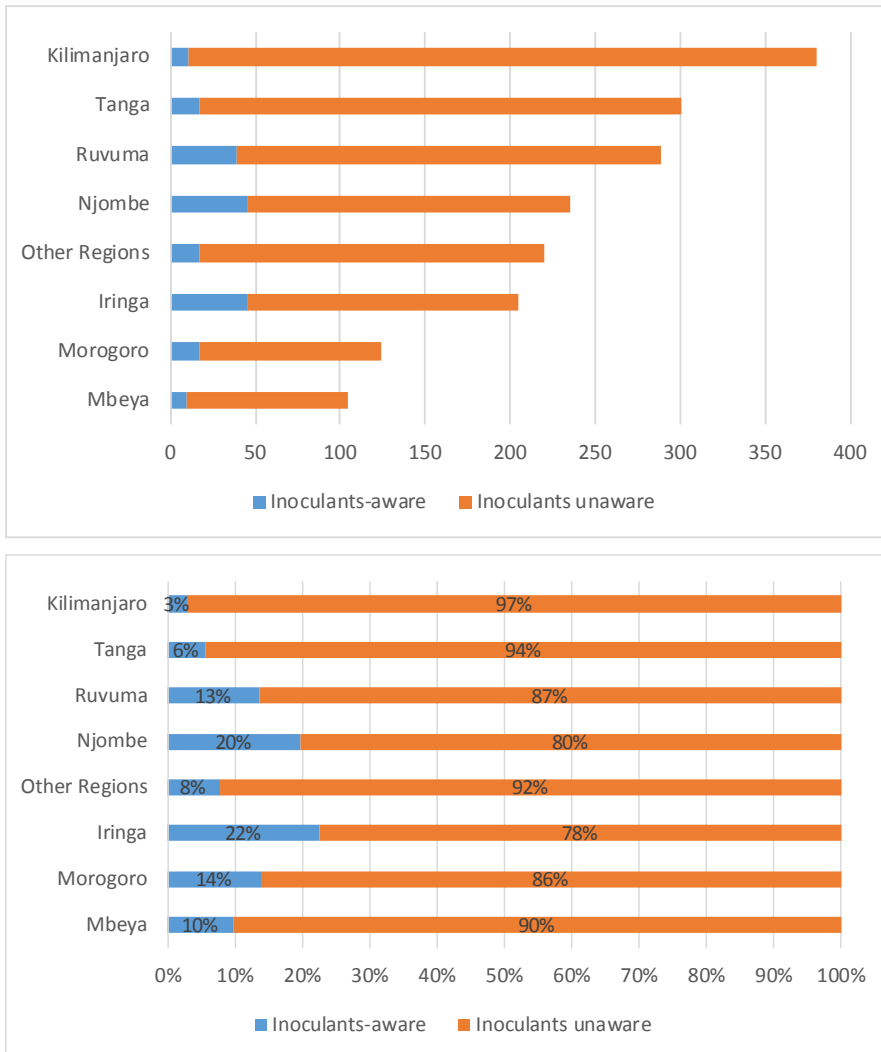


### 3.3 Inoculants

Inoculant products Legume Fix and Biofix were registered in Tanzania as fertilizer supplements in 2014. Both source companies provided inoculants for soyabean and beans. As per a recent report from N2Africa, inoculants sold in 2017 are estimated at 4,000 packets (250g per packet) of Legume Fix and 12,140 packets (100g per packet) of Biofix. From the inoculant sales, 90% were soyabean and 10% bean inoculants.

It was known from previous surveys that many farmers, even after having used inoculants, would not recognize the name, also not if a local name is used. Hence, the enumerators were thoroughly briefed, including through leaflets and manuals, about what inoculants are, how they look, and that inoculants are applied on seeds. Descriptions were in the trend of a black powder you apply to your soyabean or bean seeds just before planting, it is a natural fertilizer sold in sachets of 250 or 100-grams.

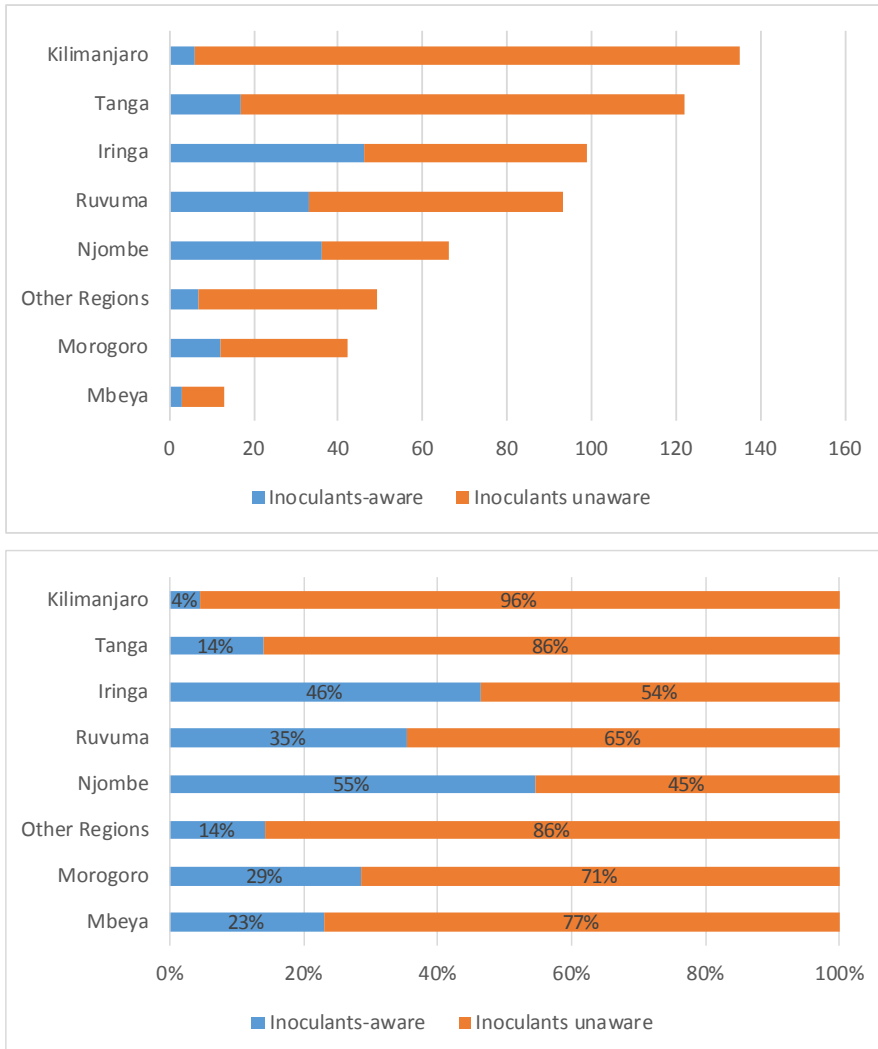
For 1,858 farmers who had not been growing soyabeans the last completed season, but did grow common beans, 203 (11%) were aware of inoculants prior to the interview. The types of inoculants were not further detailed as in the brand name, whether for common beans or soyabeans. Awareness for common bean farmers was the highest in Iringa (22%) and Njombe (20%) (Figure 7).



**Figure 7.** Common Bean farmers awareness of inoculants per region (n=1,858)

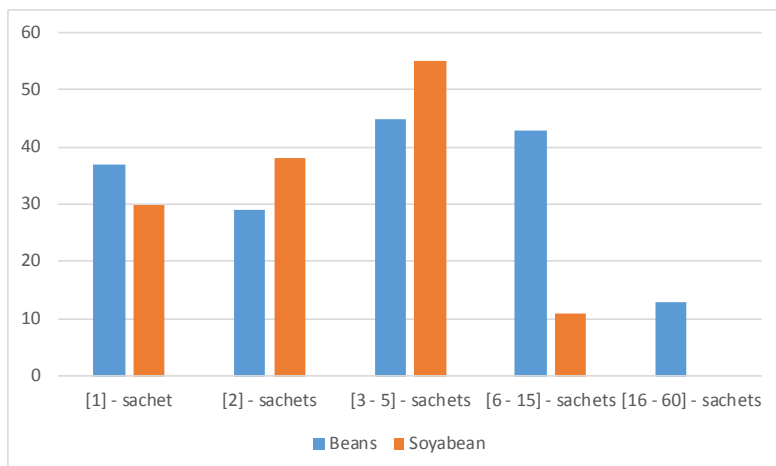


For the 619 farmers that grew soyabean last completed season, 160 (26%) were aware of inoculants (Figure 8). Awareness was the highest in Njombe (55%) and Iringa (46%) Regions.



**Figure 8.** Soyabean farmers awareness of inoculants per region (n=619)

Of the 363 farmers being aware of inoculants, 301 (83%) intended to buy inoculant at TZS 10,000 per 100-gram sachet for the next suitable season. This was the same percentage for soyabean and bean farmers (Figure 9). The average number of sachets per farmers was for soyabean farmers 3.1, bean farmers 6.6.



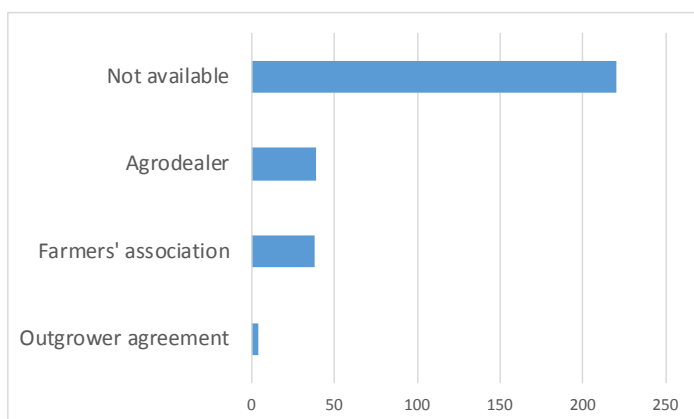
**Figure 9.** Number of 100-gram inoculant sachets to buy for the next season (n=301)

The distribution pattern saw considerable differences between the farmers: soybean farmers largely intended to buy 2 or 3-5 sachets, whereas a quarter of the bean farmers intended to buy 6-15 sachets (Table 5). The larger purchasing quantities can be related to farmers that participated in the African Fertilizer and Agribusiness Partnership (AFAP) training sessions that promoted bean inoculants.

**Table 5.** Inoculants farmers intended to buy at TZS 10,000 per 100-gram sachet (n=301)

Inoculants to buy	Beans	Soyabean	Total
[1] – sachet	22%	22%	22%
[2] – sachets	17%	28%	22%
[3 - 5] – sachets	27%	41%	33%
[6 - 15] – sachets	26%	8%	18%
[16 - 60] – sachets	8%	0%	4%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Among the 301 farmers intending to buy inoculants, 81 farmers (27%) indicated that they anticipate to source inoculants from an Agro-dealer (13%), Farmers' association (13%) or Outgrowing agreement (1%) (Figure 10). Hence, 73% did not have an anticipated source. This was the same for bean and soyabean farmers.



**Figure 10.** Next season anticipated source of inoculants (n=301)

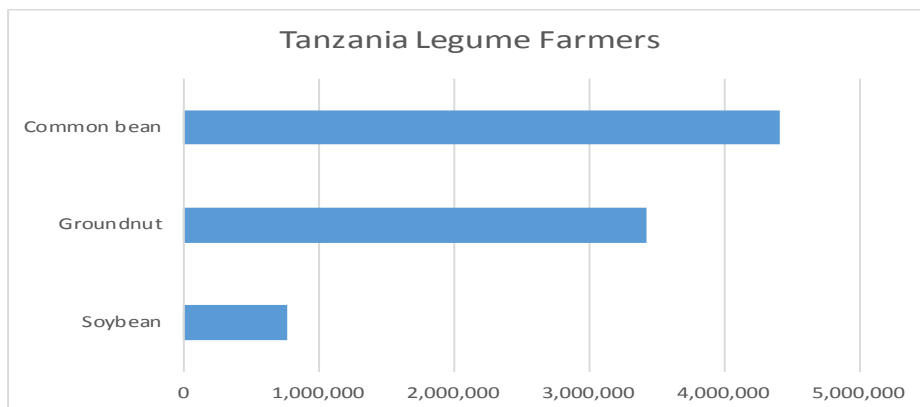


### 3.4 Market opportunities for the target inputs

A quantification of the demand and supply gap for certified common bean seed, soyabean seed and inoculants in the target areas of N2Africa and its partners in Tanzania is summarized below.

- For the bean variety Soja Njano, there was a market demand in early 2018 comprising 61% of the bean farmers to buy on average 28 kg of certified seeds at TSH 3,000 per kg per farmer. Only 6% of these 61% of farmers anticipated they could access (buy) the Soja Njano seeds, whereas the remaining 94% anticipated that they would not be able to buy the seed.
- For the soyabean variety Uyole Soya-2, there was a market demand comprising 38% of the soyabean farmers to buy on average 31 kg of certified seeds at TSH 3,000 per kg per farmer. Of this 38%, 17% anticipated they could access (buy) the seed, whereas the remaining 83% of the farmers anticipated that the seed would not be available to purchase.
- For soyabean and common bean farmers combined, 13% were aware of inoculants. Of the 13% farmers, 83% intended to buy inoculants at TSH 10,000 per 100 grams. This represents a market comprising 11% of the common bean and soyabean farmers in the target areas to buy on average 500 grams of inoculants. Less than a third (27%) of the 11% of farmers anticipated they could buy these inoculants, 73% anticipated that inoculants would not be available to them to purchase.

According to GeoAfrica databases, there are 4.4 million common bean farmers, 3.4 million groundnuts, although not a target crop but added to see the relative importance of groundnut against the other legumes, and 0.8 million soyabean farmers in Tanzania, partly overlapping when multiple legumes are grown. Per the report findings above and provided cost-effective supply chain strategies can be designed and implemented, there seems to be a substantial market opportunity for the target inputs.



**Figure 11.** Legume farmers in Tanzania per crop type (GeoAfrica)



## 4 Second Module Report

### 4.1 Target crops cultivation, behaviour and intention

In the second module, 86% of the respondents indicated that they recently grew beans or soyabean, with no significant difference between male or females (Table 6).

**Table 6.** Do or did you recently grow beans or soyabean (n=1,646)

Beans-Soyabean	Male	Female	Total	Male	Female	Total
Yes	907	509	1,416	87%	85%	86%
No	140	90	230	13%	15%	14%
<b>Total</b>	<b>1,047</b>	<b>599</b>	<b>1,646</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

The main reason for not growing legumes was that beans/ soyabean were not deemed suitable for the farm (Table 7). Men gave this answer significantly more often than women ( $P<0.01$ ). Women indicated a 'lack of money – other personal problems' significantly more often than men ( $P<0.01$ ), which tends to confirm the notion that women have less access to or control over resources than men. Lack of seeds is the second most important reason given (20%), while 14% of respondents mentioned they are not farmers or farming (anymore). In all, the 14% is a small percentage and most respondents grow legumes (beans more than soyabean, as the findings from the first module showed).

**Table 7.** Reasons for not recently growing beans or soyabean by gender (n=200) (30 respondents missing)

Why not recently growing beans or soyabean	Male	Female	Total
Beans/soyabean are not suitable for my farm	<b>30%**</b>	18%	25%
Lack of seeds	19%	21%	20%
Lack of money - other personal problems	9%	<b>26%**</b>	16%
I am not a farmer	15%	12%	14%
I stopped planting crops in general	5%	5%	5%
It is not profitable - does not make money	<b>6%*</b>	2%	5%
It is not up to me to make decision on growing beans/soyabean or not	3%	5%	4%
Lack of land	1%	5%	3%
Poor Climatic Condition	4%	0%	3%
Lack of Rainfall	2%	2%	2%
No particular reason	1%	4%	2%
Excess Rainfall	2%	0%	1%
I am not doing the farming	1%	0%	1%
Lack of interest	1%	0%	1%
Lack of time	1%	0%	1%
Type of Soil	1%	0%	1%
<b>Total</b>	<b>59%</b>	<b>41%</b>	<b>100%</b>

A large majority (91%) of the respondents intended to grow beans or soyabean the next suitable season (Table 8), which is 5% more than the 86% recent growers. The other 9% had no intention to do so.



**Table 8.** Will grow beans or soyabean in the next suitable season (n=1,646)

<b>Beans-Soyabean next suitable season</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Yes	953	542	1,495	91%	90%	91%
No	94	57	151	9%	10%	9%
<b>Total</b>	<b>1,047</b>	<b>599</b>	<b>1,646</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

The main reasons for stopping to grow bean or soyabean were financial – personal (22%), lack of seeds (19%), unsuitability for the farm (18%) and unprofitable (13%) (Table 9). Gender differences were not statistically significant due to the relatively small numbers.

**Table 9.** Reasons for stopping to grow beans or soyabean versus gender (n=67)

<b>Why not recently growing beans or soyabean</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Lack of money - other personal problems	23%	22%	22%
Lack of seeds	23%	15%	19%
Beans-soyabean are not suitable for my farm	23%	11%	18%
It is not profitable - does not make money	10%	19%	13%
I stopped planting crops in general	3%	15%	7%
It is not up to me to make decision on growing beans-soyabean or not	8%	4%	6%
Poor Climatic Condition	5%	4%	4%
Lack of land	3%	0%	1%
No particular reason	0%	4%	1%
Started planting other Crops	3%	0%	1%
Diseases	3%	0%	1%
Crop rotation	0%	4%	1%
I am not yet prepared	0%	4%	1%
<b>Total</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>

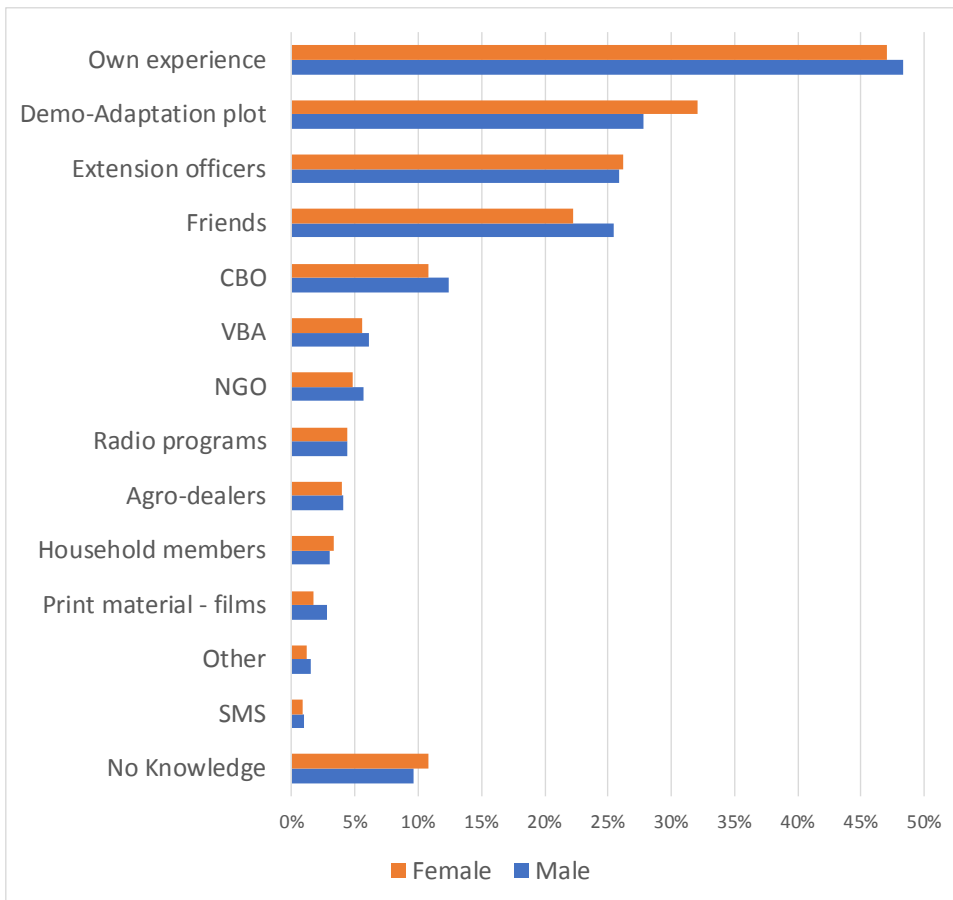
## 4.2 Information and knowledge sources

In the first module of the survey tool, only 18% of the farmers answered 'yes' to the question: *'Did you receive information, participated in a training or received any assistance for soyabean or beans in the last 3 years'*. This small percentage called for a re-think of the formulation of this question that would bring out more farmers to mention information sources, knowledge and learning, regardless of having (recently) grown beans or soyabean.

The re-formulated questions for the second module were:

*'In the last 3 years, where or how did you get the knowledge to grow soybeans or beans'* and, if not a recent grower, *'Regardless of growing beans-soyabean or not, in the last 3 years, where or how did you get the knowledge on soyabeans or beans'* (see Annex i, questions 12 and 14).

The knowledge questions were further split in a 'spontaneous' and 'assisted' question and in both cases multiple answers and 'other' open answers were possible. The multiple 'spontaneous', 'assisted' and open-ended questions were combined, the results of which are seen in Figure 12.



**Figure 12.** Knowledge sources on beans-soyabean (n=1,646). CBO = Community Based Organization, VBA = Village Based Advisor

Nearly half of the respondents mentioned ‘Own experience’ as a source of knowledge on beans and/or soyabean (Figure 12), followed by demonstration-adaptation plots which at a  $P < 0.05$  level is significantly more often mentioned by women (32%) than men (28%) as a source of information, average 29%. Next are extension officers, friends, Community Based Organizations (CBOs), Village Based Advisors (VBAs), NGOs, Radio programs, Agro-dealers, household members, Print material/ films and SMS. No knowledge is mentioned by 164 respondents (10%), leaving 1,482 (90%) to continue the survey.

In Figure 12, 3% of the male and 2% of the female respondents mentioned ‘Print material/ films’ as information source. This category was composed of: film/ video, newspaper/ magazine articles, Shujaaz comics on beans and information leaflets and posters. Respondents who mentioned Shujaaz were getting a follow-up question: ‘For the Shujaaz comic on Beans, how many issues did you obtain or read through’. Only two respondents recalled (after assistance) Shujaaz comic as a source of knowledge for beans and did not remember how many issues they had gone through.

From the 16 respondents (6 spontaneous and 10 assisted, 1% of total respondents) who mentioned ‘Information leaflets and posters’ as a source of knowledge, nine remembered the source of the leaflet/ poster: Clinton Foundation (3), Agrodealers (2), Tanzanian Agricultural Research Institute (ARI) (1), The East African newspaper (1), ARI Selian (1) and BRITEN (1).

On average, respondents mentioned about two different information sources. Only 6% of the respondents mentioned more than two sources (Table 10).





**Table 10:** Number of different information sources mentioned on beans-soyabean (n=1,646)

Nr. Sources	Male	Female	Total	Male	Female	Total
0	99	65	164	9%	11%	10%
1	218	132	350	21%	22%	21%
2	660	365	1,025	63%	61%	62%
3	56	27	83	5%	5%	5%
4	13	10	23	1%	2%	1%
5	1	0	1	0.1%	0%	0.1%
<b>Total</b>	<b>1,047</b>	<b>599</b>	<b>1,646</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

From the 69 respondents who mentioned 'Radio Programs' as information source, almost half (46%) mentioned that they remembered the name of the Radio Campaign. There were no significant gender differences.

**Table 11.** If the respondent remembered the name of the Radio Program on beans-soyabean (n=69)

Radio Campaign name known	Male	Female	Total	Male	Female	Total
Yes	19	13	32	44%	50%	46%
No	24	13	37	56%	50%	54%
<b>Total</b>	<b>43</b>	<b>26</b>	<b>69</b>	<b>62%</b>	<b>38%</b>	<b>100%</b>

Respondents who indicated to remember the name, were asked to name the Radio Campaign(s) spontaneously (un-assisted), allowing multiple answers (Table 12).

**Table 12.** Name of the Radio Campaign on beans-soyabean mentioned un-assisted (n=32)

Radio Campaign on beans or soyabean	Male	Female	Total
Jukwaa la Mkulima	3	3	6
Kilimo Bora	2	2	4
Fahari Yangu	0	2	2
From Kenyan TV	1	1	2
Fahari Yangu, Kilimo Chetu, Inuka	1	0	1
Kilimo Bora, Ibon	1	0	1
Kilimo Bora, Tbc	1	0	1
Kilimo Chetu	1	0	1
Kilimo Chetu, Amka	1	0	1
Kilimo Kwanza, Tbc	0	1	1
Mkulima Wa Kisasa	1	0	1
Soya Ni Pesa	1	0	1
I don't remember (in hindsight)	6	4	10
<b>Total</b>	<b>19</b>	<b>13</b>	<b>32</b>

About a third of the respondents (10) was in hindsight not able to recall the name of the Radio Campaign spontaneously (Table 12). The target Radio Campaigns for the survey were:



1. Fahari Yangu - Beans
2. Jukwaa la Mkulima - Beans
3. Kilimo Chetu - Soyabean
4. Kilimo Sound - Soyabean
5. Kilimo Bora - Soyabean

These and others were mentioned single or multiple times. Next, the names of the five target Radio Campaigns were read out to both the respondents that mentioned not remembering the name and the ones that mentioned they did and had spontaneously answered as per Table 12. The combined spontaneous and assisted answers are seen in Table 13. The campaigns Jukwaa la Mkulima and Fahari Yangu on beans and Kilimo Bora on soyabean were most frequently remembered. Table 13 also includes names which were not part of the target campaigns like Kenyan TV which likely refers to the series 'Shamba Shape-up' Ibon, TBC, Amka.

**Table 13.** Spontaneous and assisted Radio Campaigns mentioned on beans-soyabeans (n=69)

Radio Campaign, beans or soyabean	Male	Female	Total	Male	Female	Total
Jukwaa la Mkulima	7	4	11	16%	15%	16%
Kilimo Bora	7	3	10	16%	12%	14%
Fahari Yangu	2	4	6	5%	15%	9%
Kilimo Chetu	5	0	5	12%	0%	7%
From Kenyan TV	1	1	2	2%	4%	3%
Kilimo Bora, Ibon	1	0	1	2%	0%	1%
Kilimo Bora, Tbc	1	0	1	2%	0%	1%
Kilimo Chetu, Amka	1	0	1	2%	0%	1%
Mkulima Wa Kisasa	1	0	1	2%	0%	1%
Soya Ni Pesa	1	0	1	2%	0%	1%
Kilimo Chetu, Kilimo Bora	1	0	1	2%	0%	1%
Kiliani Arusha	1	0	1	2%	0%	1%
Fahari Yangu, Kilimo Chetu, Inuka, Jukwaa la Mkulima	1	0	1	2%	0%	1%
Jukwaa la Mkulima, Tbc	0	1	1	0%	4%	1%
Kilimo Kwanza, Tbc	0	1	1	0%	4%	1%
I don't remember	2	3	5	5%	12%	7%
Did not listen to the (other) programs mentioned	11	9	20	26%	35%	29%
<b>Total</b>	<b>43</b>	<b>26</b>	<b>69</b>	<b>62%</b>	<b>38%</b>	<b>100%</b>

As it was anticipated from earlier experience (field level focus groups) that campaign name-recalling may be difficult, audio introduction jingles obtained from FRI for the five target campaigns were played to the respondents. They were then asked to confirm if they listened to each of the target Radio Campaigns and if affirmative, the number of episodes they listened to.

**Table 14.** Jingle recognized target Radio Campaigns mentioned on beans-soyabeans (n=69)

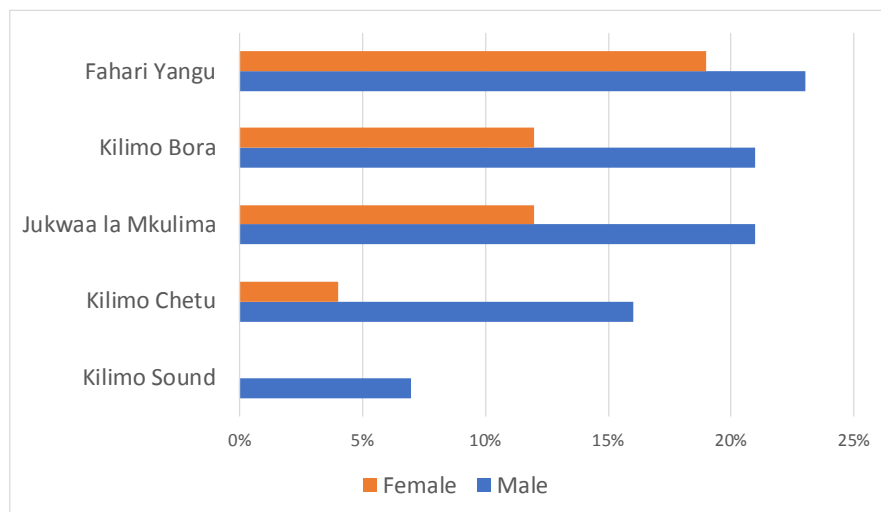
Radio Campaigns	Male	Female	Total	Male	Female	Total
Fahari Yangu	3	4	7	14%	36%	22%
Jukwaa la Mkulima	3	2	5	14%	18%	16%
Kilimo Chetu	3	1	4	14%	9%	13%



Kilimo Bora	5	3	8	24%	27%	25%
Fahari Yangu, Jukwaa la Mkulima	1	1	2	5%	9%	6%
Fahari Yangu, Kilimo Bora	1	0	1	5%	0%	3%
Fahari Yangu, Jukwaa la Mkulima, Kilimo Chetu	1	0	1	5%	0%	3%
Fahari Yangu, Jukwaa la Mkulima, Kilimo Sound	1	0	1	5%	0%	3%
Fahari Yangu, Jukwaa la Mkulima, Kilimo Chetu, Kilimo Bora	1	0	1	5%	0%	3%
Fahari Yangu, Jukwaa la Mkulima, Kilimo Chetu, Kilimo Sound, Kilimo Bora	2	0	2	10%	0%	6%
<b>Total listened to target Radio Campaigns</b>	<b>21</b>	<b>11</b>	<b>32</b>	<b>66%</b>	<b>34%</b>	<b>100%</b>
I did not listen to any of the radio campaigns I heard from the jingles	22	15	37	51%	58%	54%
<b>Total</b>	<b>43</b>	<b>26</b>	<b>69</b>	<b>62%</b>	<b>38%</b>	<b>100%</b>

Of the 69 respondents (4.2%) that had mentioned radio as a source of knowledge for beans/ soyabean, and after having heard the introduction jingles, 32 (46%) mentioned to have listened to one or more of the target Radio Campaigns (Table 14). This is 2% of the total sample of 1,646 respondents.

Compared to the 38 respondents (55%) after the spontaneous and assisted name recall (Table 13), this percentage is lower. Also, the numbers per target campaign altered after hearing the jingles. The majority (75%) listened to only one radio campaign. Another 9% listened to two campaigns, and 16% to three or more. Differences in the recognition of radio campaigns were not significant between men and women. There were also no differences between youth versus adults (data not presented).



**Figure 13.** Playing Jingle: Did you listen to this radio program called – as per campaign name (n=69)

After playing the jingle, Fahari Yangu turned out to be the Radio Campaign most frequently listened (Figure 13). Almost a quarter (22%) recalled having listened to the campaign. Jukwaa la Mkulima was the next most frequently listened to Radio Campaign with 17% having listened to the campaign. Like Jukwaa la Mkulima, Kilimo Bora was listened to by 12 respondents (17%). Kilimo Chetu was listened to by 8 respondents (12%). Kilimo Sound was listened to by 3 respondents (4%).



**Table 15.** Radio Campaigns merged on how many episodes listened to of the 16 weekly episodes

Nr. of episodes	Male	Female	Total	Male	Female	Total
One	1	4	5	3%	<b>33%**</b>	10%
Two	8	2	10	21%	17%	20%
Three	5	4	9	13%	<b>33%**</b>	18%
Four	7	1	8	18%	8%	16%
About half	6	0	6	<b>16%**</b>	0%	12%
More than half	6	0	6	<b>16%**</b>	0%	12%
Most to all	4	1	5	11%	8%	10%
Other	1	0	1	3%	0%	2%
<b>Total</b>	<b>38</b>	<b>12</b>	<b>50</b>	<b>76%</b>	<b>24%</b>	<b>100%</b>

Despite near equal exposure to the campaigns, women listened to fewer episodes than men (Table 15, Linear-by-Linear Association,  $P < 0.01$ ). More than 80% of women listened to three or less episodes, against 37% of men. Assuming that listening to (more than) half of the episodes would be a threshold to obtain (sufficient) knowledge, this applied to 45% of the men and 8% of the women.

## 4.3 Learning topics and information sources synopsis

### 4.3.1 Three most important learning topics

The next section on the survey tool pertained: *The 3 most important or relevant topics you learned about soyabean or beans in the last 3 years.* Respondents who answered earlier 'I have no knowledge on growing beans or soyabean' would exit the survey at this point (164 or 10% of the total respondents).

If the first, second and third most important topic are treated as equally important, the top three most important topics can be established (Table 16).

**Table 16.** Three most important topics learnt in last 3 years on beans-soyabean (n=1,482)

Topics	Male	Female	Total	Male	Female	Total
Row cropping	327	186	513	36%	37%	37%
Earlier land preparation	317	195	512	35%	39%	37%
Use of chemical fertilizer	288	150	438	32%	30%	31%
Use quality seeds (certified or QDS)	206	98	304	23%	20%	22%
Use of manure	179	113	292	20%	23%	21%
Pesticide use	180	86	266	20%	17%	19%
Intercropping	83	84	167	9%	<b>17%**</b>	12%
Crop rotation	118	47	165	<b>13%*</b>	9%	12%
Markets	115	38	153	<b>13%**</b>	8%	11%
Use right variety	76	43	119	8%	9%	8%
Seeding rates	63	45	108	7%	9%	8%
Marketing	74	33	107	8%	7%	8%
Weed management without herbicides	53	49	102	6%	<b>10%**</b>	7%
Storage	41	35	76	5%	<b>7%*</b>	5%
Cooking	50	25	75	6%	5%	5%



Test soil before fertilizer application	51	23	74	6%	5%	5%
Remove diseased crop residues	33	32	65	4%	6%*	5%
Herbicide use	36	16	52	4%	3%	4%
Use of fertilizer rates/blends	31	20	51	3%	4%	4%
Processing	31	14	45	3%	3%	3%
Use of inoculants	32	11	43	4%	2%	3%
Pest management without pesticides	18	9	27	2%	2%	2%
Use of PICS bags for storage	16	10	26	2%	2%	2%
Introduction to new crop varieties	15	6	21	2%	1%	1%
Other	31	9	40	3%*	2%	3%
<b>Subtotal</b>	<b>2,464</b>	<b>1,377</b>	<b>3,841</b>	<b>260%</b>	<b>257%</b>	<b>259%</b>
No topic applies	43	37	80	5%	7%*	5%
<b>Total</b>	<b>2,507</b>	<b>1,414</b>	<b>3,921</b>	<b>265%</b>	<b>264%</b>	<b>265%</b>

*Row cropping* was the most frequently mentioned topic with 513 mentions by 37% of the respondents for whom at least one topic applied (95%). Another 37% mentioned earlier land preparation, and 31% the use of chemical fertilizer. The use of 'quality seeds' was expected to be related to 'Introduction new crop varieties', but the latter was the least frequently mentioned topic (1%). This can be explained by the fact that although many interventions were on seed, the varieties as such were often not new to the farmers. Moreover, a new bean variety was in the end less preferred than the existing one. Hence, farmers were rather looking to rejuvenate their existing varieties, than to replace them with new ones.

Interesting topics in 'other', although only mentioned by few respondents, were 'Seasonal crop planning' (3), Profitability of soyabean/ bean farming (2), Capital necessity for soybean/ bean farming (2), Modern farming (1) and Harvesting (2).

Differences between men and women were significant at  $P < 0.01$  for 'Intercropping' (beans for consumption versus cash), 'Markets' (cash) and 'Weed management without herbicides' (a no cash practice), and at  $P < 0.05$  for 'Crop rotation' (soyabean – cash), 'Storage' (consumption), 'Remove diseased crop residues' (no cash practice), 'Other' (modern farming) and 'No topic applies'. This hints towards women being more on the 'crop husbandry' and 'household consumption' side and men putting more importance on 'income' related topics. But overall men and women show largely the same interest, i.e. the top six topics show no significant gender differences and represent the bulk of the learning topics mentioned.

On average 2.6 learning topics were mentioned. For 80 respondents (5%) 'no (new) learning topic' applied over the last 3 years. In earlier questions, 164 (10%) respondents mentioned to have no knowledge on beans or soyabean. Therefore, for a total of 244 respondents (15%), the campaigns seemed to have had no learning effect.

The first module of the survey focused on uptake of practices. The learning topics mentioned in Table 16 are in line with uptake, although uptake saw (much) higher percentages as not all topics would have been new to the respondents. In that light, it is for instance worthwhile to mention that '*Use of PICS bags for storage*' was meant as learning topic by a small percentage (2%), but the first module showed that PICS bags are in use with 29% of the respondents (with no differences between gender or age).

The popularity of the topics '*Row planting*', '*Early land preparation*' and '*Use of chemical fertilizer*' also matches with the first module. The first module showed that chemical fertilizers were used on farmer main field in the last completed season by 44% of the respondents (more on soyabean (49%) than beans (42%), and less on intercropped (40%) than mono-cropped (48%) fields). The top five (80%) of fertilizers used were DAP (42%), Urea (15%), Yara fertilizers (8%), DAP + Urea (6%), NPK (5%) and Booster (4%).

For seed, 22% of respondents mentioned to have learned about the '*Use of quality seeds, certified or QDS*'. The first module showed that only 9% of the farmers had bought certified-quality seeds. However,



on the question about farmers' intention to '*purchase certified seeds of the most preferred variety at TShs. 3,000 per kg for the next suitable season*', 1,696 out of 2,477 farmers (68%) confirmed this intention. This means that uptake of quality seed was mainly hampered by non-availability/inaccessibility, and not by awareness on the use of quality seeds.

For '*Use of inoculants*', only 3% of the respondents indicated that this was a major learning topic. The first module showed that 8% of the farmers used, and about 20% of the farmers were aware of inoculants, of which 83% intended to buy inoculant at TZS 10,000 per 100-gram. Of this 83%, three quarters (73%) did not have a source to buy inoculants. Like for seeds, uptake is therefore constrained by non-availability, but in contrast, low awareness is also an important limiting factor for the uptake of inoculants.

#### 4.3.2 Sources of learning

After a topic (Table 16), the question was asked '*If you had to choose one major influence on your learning, what would this be as regards Interventions*' The results of this question are seen in Table 17.

**Table 17.** Interventions with major influence on learning for the three most important topics (n=1,402)

Intervention	Male	Female	Total	Male	Female	Total
Demonstration plots	508	298	806	83%	88%	85%
Radio programs	66	27	93	11%	8%	10%
Information leaflets and posters	45	18	63	7%	5%	7%
News-papers / magazine articles	32	12	44	5%	4%	5%
SMS messages on beans	21	20	41	3%	6%	4%
A small input package	22	8	30	4%	2%	3%
Films – videos	15	6	21	2%	2%	2%
Seminar	6	1	7	1%	0.3%	0.7%
Shujaaz comic on beans	3	1	4	0.5%	0.3%	0.4%
Agricultural Show	1	0	1	0.2%	0%	0.1%
Shamba Shape Up (TV)	1	0	1	0.2%	0%	0.1%
<b>Subtotal</b>	<b>720</b>	<b>391</b>	<b>1,111</b>	<b>80%</b>	<b>78%</b>	<b>79%</b>
Interventions don't apply	294	160	454	33%	32%	32%
<b>Total</b>	<b>1,014</b>	<b>551</b>	<b>1,565</b>	<b>112%</b>	<b>110%</b>	<b>112%</b>

*Demonstration plots* was the most frequently mentioned major influence on learning with 806 mentions by 85% of the respondents for whom at least one intervention applied (68%), 57% of the total number (n=1,402) in Table 17. Another 10% mentioned radio programs, and 7% Information leaflets and posters.

The fact that '*Demonstration plots*' are leading as the most important intervention could be explained by the source of respondents: 90% of the respondents came from the N2Africa partner value chain (VC) project organizations (see Table 1). Demonstrations often come with a package of field days and if in strategic locations, can be observed by anyone having an interest or happens to pass by them.

The Agricultural Research Institutes (ARIs), RUDI-CRS in partnership with ACT, AFAP, Clinton Foundation and BRAC-LEAD implemented demonstrations. Although these were sometimes beyond the target crops, they may still be perceived as an important learning source for crop practices in general.

'A small input package' (including seeds handed out and tried on a small portion of the farm) was mentioned 30 times (3%), and this may overlap or be seen as a demonstration plot if the 'mother-baby' approach applied that was promoted by N2Africa, partners and FIPS. It could also be seen as part of 'my own experience' but would require further information to confirm if this would be the case.



Although demonstrations were more frequently mentioned by women (88%) versus men (83%), there was no significant difference between men and women, the same is true for the other interventions and when interventions did not apply. On average 0.8 interventions were mentioned. For 454 respondents (32%) 'no intervention' applied over the last 3 years. For 798 respondents (57%) one intervention applied, for 137 respondents (10%) two and 1% mentioned three different interventions (see Table 18).

**Table 18:** Number of different interventions for learning mentioned on beans-soyabean (n=1,402)

Nr. Interventions	Male	Female	Total	Male	Female	Total
0	294	160	454	33%	32%	32%
1	507	291	798	56%	58%	57%
2	93	44	137	10%	9%	10%
3	9	4	13	1%	1%	1%
<b>Total</b>	<b>903</b>	<b>499</b>	<b>1,402</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

After interventions, the question was asked 'If you had to choose one major influence on your learning on the topics, what it would be as regards personal relation -interactions' with results seen in Table 19.

**Table 19.** Interactions with major influence on learning for the three most important topics (n=1,402)

Interaction	Male	Female	Total	Male	Female	Total
From my own experience	416	252	668	48%	53%	49%
Extension officers	316	147	463	36%*	31%	34%
Neighbours, friends and family	233	130	363	27%	27%	27%
CBO / Farmer Group members	139	66	205	16%	14%	15%
Village-based advisors	99	46	145	11%	10%	11%
Agro-dealers	56	41	97	6%	9%	7%
Another household member	29	21	50	3%	4%	4%
NGO	15	6	21	2%	1.3%	1.6%
Private company	4	0	4	0.5%	0%	0.3%
ARI	1	1	2	0.1%	0.2%	0.1%
Other	6	3	9	1%	1%	1%
<b>Subtotal</b>	<b>1,314</b>	<b>713</b>	<b>2,027</b>	<b>146%</b>	<b>143%</b>	<b>145%</b>
Interactions don't apply	29	19	48	3%	4%	3%
<b>Total</b>	<b>1,343</b>	<b>732</b>	<b>2,075</b>	<b>149%</b>	<b>147%</b>	<b>148%</b>

From my own experience was the most frequently mentioned interaction with a major influence on learning with 668 mentions by 49% of the respondents for whom at least one interaction applied (97%) (see Table 19). Another 34% mentioned extension officers, and 27% Neighbours, friends and family. Differences between men and women were significant at  $P < 0.02$  for extension officers.

On private sector chain actors and farmer organizations, also related to the N2Africa and partners' business models (not reported on), the most frequently mentioned with 15% were Community based organizations – farmer group members (CBOs), 8% village-based advisors (VBAs), 7% agro-dealers and 0.3% a private company. On average 1.5 different interactions were mentioned. For 48 respondents (3%) 'no interaction' applied over the last 3 years. For 782 respondents (56%) one interaction applied, for 471 respondents (34%) two and 7% mentioned three different interactions (see Table 20).





**Table 20:** Number of different interactions for learning mentioned on beans-soyabean (n=1,402)

Nr. Interactions	Male	Female	Total	Male	Female	Total
0	29	19	48	3%	4%	3%
1	503	279	782	56%	56%	56%
2	302	169	471	33%	34%	34%
3	69	32	101	8%	6%	7%
<b>Total</b>	<b>903</b>	<b>499</b>	<b>1,402</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

A further exploration of the link between interventions and interactions is presented in Table 21.

**Table 21.** Interactions\* versus Interventions\*\* linked to three most important topics (n=1,402)

Interaction	None	Demo	Leaflet	Radio	SMS	Pack	Films	Total
Experience	267	333	44	54	23	16	7	744
Extension	74	384	32	30	15	7	3	545
Neighbours	129	174	41	33	11	11	7	406
CBO	39	148	22	17	5	0	7	238
VBA	10	121	21	13	5	2	6	178
Agro-dealer	15	64	21	9	11	7	7	134
HH member	23	18	1	6	2	2	1	53
No Interaction	30	23	1	2	0	1	0	57
<b>Total</b>	<b>587</b>	<b>1,265</b>	<b>183</b>	<b>164</b>	<b>72</b>	<b>46</b>	<b>38</b>	<b>2,355</b>

Experience	<b>36%**</b>	45%**	6%	<b>7%*</b>	3%	2%	1%	32%
Extension	14%**	<b>70%**</b>	6%	6%	3%	1%	1%*	23%
Neighbours	32%	43%**	<b>10%**</b>	<b>8%*</b>	3%	3%	2%	17%
CBO	16%**	<b>62%**</b>	<b>9%*</b>	7%	2%	0%**	<b>3%*</b>	10%
VBA	6%**	<b>68%**</b>	<b>12%**</b>	7%	3%	1%	<b>3%*</b>	8%
Agro-dealer	11%**	48%	<b>16%**</b>	7%	<b>8%**</b>	<b>5%**</b>	<b>5%**</b>	6%
HH member	<b>43%*</b>	34%**	2%	11%	4%	4%	2%	2%
No Interaction	<b>53%**</b>	40%**	2%	4%	0%	2%	0%	2%
<b>Total</b>	<b>25%</b>	<b>54%</b>	<b>8%</b>	<b>7%</b>	<b>3%</b>	<b>2%</b>	<b>2%</b>	<b>100%</b>

\* Information leaflets - posters (Leaflets) were combined with News-papers & magazine articles and Shujaaz comics. Agricultural shows and seminars with Demonstrations (Demo). The TV series Shamba Shape-up with Films – videos (Films).

\*\* NGO and ARI are combined with Extension Officers. Private company with Agro-dealers, and Other with Interactions don't apply.

If 'own experience' was mentioned there was significantly more often mention of 'no 'intervention' and radio programs but less than average of demonstration plots.

If 'Extension officers' were mentioned, this was significantly positively related to 'Demonstration plots' and significantly negatively related to 'no interventions apply' and 'films and videos'. The strong link with demonstrations can be explained as these are often conducted by extension officers.

'Neighbours, friends and family' are significantly positively linked to 'Information leaflets, posters news-papers & magazine articles (Leaflets)' and radio campaigns and negatively to demonstration plots.



On 'My Community Based Organization / Farmer Group members' (CBO) these are significantly positively related to demonstration plots, leaflets and films and negatively to no-interventions and 'A small input package'. A similar pattern is seen for 'Village Based Advisors' (VBAs), that are significantly positively related to demonstration plots, leaflets and films and negatively to no-interventions.

On 'Agro-dealers' these are significantly positively related to Leaflets, SMS message, A small input package and films and negatively to no-interventions. Although not clearly on the radar of the N2Africa and partners campaigns in Tanzania, it may be that information films or videos on beans – soyabean were developed and shown at CBO or farmer groups levels while also VBAs and Agrodealers were involved and-or had films on their smartphones being common campaigns for Ghana and Nigeria.

'Other household members' (HH member) as a source of information is significantly positively related to no-intervention and negatively to demonstration plots, showing a similar pattern to own experience.

In cases 'No interactions' were mentioned, this was significantly positively related to 'No Interventions' and negatively to demonstration plots. Next is was analysed how the number of different interventions influenced learning topics (Table 22).

**Table 22.** Three most important topics learnt in last 3 years on beans-soyabean versus number of different interventions (n=1,402)

Topics	0	1	2	3	Total
Row cropping	36%	40%	20%	23%	37%
<b>Earlier preparation*</b>	34%	37%	43%	62%	37%
<b>Chemical fertilizer*</b>	27%	33%	37%	31%	31%
Use quality seeds	18%	24%	25%	0%	22%
Use of manure	20%	21%	20%	31%	21%
Pesticide use	18%	20%	15%	0%	19%
Intercropping**	18%	10%	5%	0%	12%
<b>Crop rotation*</b>	10%	12%	19%	8%	12%
Markets	12%	10%	13%	15%	11%
<b>Use right variety**</b>	7%	8%	16%	15%	8%
Seeding rates	9%	7%	9%	23%	8%
<b>Marketing**</b>	5%	8%	12%	23%	8%
Weed management*	10%	6%	5%	8%	7%
<b>Storage**</b>	4%	5%	11%	8%	5%
Cooking	5%	6%	5%	8%	5%
<b>Test soil*</b>	4%	5%	10%	8%	5%
<b>Remove residues**</b>	2%	6%	7%	31%	5%
Herbicide use	3%	5%	3%	0%	4%
<b>Use of fertilizer rates*</b>	2%	5%	5%	0%	4%
Processing	4%	3%	4%	0%	3%
Use of inoculants	2%	4%	3%	8%	3%
Pest management	2%	2%	1%	0%	2%
Use of PICs bags	2%	2%	1%	0%	2%
New crop varieties	0%	2%	2%	0%	1%
Other	3%	3%	4%	0%	3%
<b>Total</b>	<b>32%</b>	<b>57%</b>	<b>10%</b>	<b>1%</b>	<b>100%</b>



At  $P < 0.01$  level, positive significant relations are seen (see Table 22) between 'use right variety (i.e. long duration, short duration, disease resistant, non-shattering)', 'marketing', 'storage' and 'remove crop residues damaged by pests or diseases' meaning these learning topics are relatively more frequently mentioned when the respondents were exposed to more interventions. At a  $P < 0.05$  level this is also true for 'earlier land preparation', 'use of chemical fertilizer', 'crop rotation', 'test soil before fertilizer application' and 'use of fertilizer rates/blends'. A negative significant relation at  $P < 0.01$  level is seen for 'intercropping' and  $P < 0.05$  for 'weed management without herbicides'.

**Table 23.** Three most important topics learnt in last 3 years on beans-soyabean versus number of different interactions (n=1,402)

Topics	0	1	2	3	Total
Row cropping	35%	36%	38%	33%	37%
<b>Earlier preparation**</b>	13%	34%	41%	46%	37%
Chemical fertilizer	42%	30%	31%	37%	31%
Use quality seeds	29%	20%	23%	24%	22%
Use of manure	25%	21%	21%	17%	21%
Pesticide use	23%	19%	18%	19%	19%
Intercropping	13%	12%	12%	10%	12%
<b>Crop rotation**</b>	4%	10%	14%	15%	12%
Markets	17%	11%	10%	7%	11%
<b>Use right variety*</b>	0%	9%	10%	4%	8%
Seeding rates	8%	8%	7%	8%	8%
<b>Marketing*</b>	6%	7%	7%	16%	8%
Weed management	2%	8%	7%	6%	7%
<b>Storage**</b>	2%	4%	6%	15%	5%
Cooking	2%	5%	7%	5%	5%
Test soil before	2%	5%	6%	9%	5%
<b>Remove residues**</b>	0%	4%	5%	11%	5%
Herbicide use	0%	4%	4%	5%	4%
Use of fertilizer rates	2%	3%	5%	2%	4%
Processing	2%	4%	3%	1%	3%
Use of inoculants	2%	2%	4%	4%	3%
Pest management	2%	2%	3%	2%	2%
Use of PICs bags	0%	2%	2%	3%	2%
<b>New crop varieties*</b>	2%	1%	3%	2%	1%
Other	6%	3%	3%	2%	3%
<b>Total</b>	<b>3%</b>	<b>56%</b>	<b>34%</b>	<b>7%</b>	<b>100%</b>

For the number of interactions (see Table 23), this overlaps with interventions in positively significant relationship between their number and 'earlier land preparation', 'crop rotation', 'use the right variety', 'marketing', 'storage', and 'remove crop residues damaged by pests or diseases'. In addition, 'Introduction to new crop varieties' is also significantly positively linked to number of interactions.

In Table 24 and 25 interventions and interactions are further separately linked to topics.



**Table 24.** Topics versus interventions\* for the three most important topics (n=1,402)

Topics	None	Demo plot	Leaflets	Radio	SMS	Input pack	Films	Total
Earlier land preparation	153	303	45	43	18	10	9	581
Row cropping	162	322	16	27	6	6	5	544
Use of chemical fertilizer	122	284	38	25	9	6	6	490
Use quality seeds (either certified or QDS)	81	195	18	25	5	9	4	337
Use of manure	90	170	22	16	14	7	6	325
Pesticide use	82	160	11	19	5	5	3	285
Crop rotation	46	98	17	16	2	5	5	189
Intercropping	80	71	7	8	3	2	3	174
Markets	55	82	15	11	5	4	0	172
Use right variety	31	77	20	8	4	1	0	141
Marketing	21	75	10	8	8	2	4	128
Seeding rates	39	64	7	5	5	1	4	125
Weed management without herbicides	46	47	6	6	4	2	0	111
Storage	17	43	12	5	5	5	1	88
Test soil before fertilizer application	19	44	8	8	5	1	3	88
Cooking	22	45	5	5	4	3	0	84
Remove crop residues damaged by pests or diseases	8	46	10	7	5	4	2	82
Use of fertilizer rates/blends	7	38	6	4	2	0	1	58
Herbicide use	12	32	4	0	3	3	2	56
Processing	17	20	3	3	3	0	3	49
Use of inoculants	7	31	6	1	1	2	0	48
Pest management without pesticides	8	15	0	4	2	0	0	29
Use of PICs bags for storage	8	15	0	3	0	0	1	27
Introduction to new crop varieties	2	17	1	1	2	1	0	24
Other	14	21	2	4	0	2	1	44
<b>Total</b>	<b>1,149</b>	<b>2,315</b>	<b>289</b>	<b>262</b>	<b>120</b>	<b>81</b>	<b>63</b>	<b>4,279</b>



Topics	None	Demo plot	Leaflets	Radio	SMS	Input pack	Films	Total
Earlier land preparation	26%	52%	8%	7%*	3%	2%	2%	14%
Row cropping	30%	59%**	3%**	5%	1%**	1%*	1%	13%
Use of chemical fertilizer	25%*	58%**	8%	5%	2%	1%	1%	11%
Use quality seeds (either certified or QDS)	24%*	58%*	5%	7%	1%	3%	1%	8%
Use of manure	28%	52%	7%	5%	4%*	2%	2%	8%
Pesticide use	29%	56%	4%*	7%	2%	2%	1%	7%
Crop rotation	24%	52%	9%	8%	1%	3%	3%	4%
Intercropping	46%**	41%**	4%	5%	2%	1%	2%	4%
Markets	32%	48%	9%	6%	3%	2%	0%	4%
Use right variety	22%	55%	14%**	6%	3%	1%	0%	3%
Marketing	16%**	59%**	8%	6%	6%**	2%	3%	3%
Seeding rates	31%	51%	6%	4%	4%	1%	3%	3%
Weed management without herbicides	41%**	42%*	5%	5%	4%	2%	0%	3%
Storage	19%*	49%	14%**	6%	6%	6%**	1%	2%
Test soil before fertilizer application	22%	50%	9%	9%	6%*	1%	3%	2%
Cooking	26%	54%	6%	6%	5%	4%	0%	2%
Remove crop residues damaged by pests or diseases	10%**	56%*	12%**	9%	6%*	5%*	2%	2%
Use of fertilizer rates/blends	12%*	66%*	10%	7%	3%	0%	2%	1%
Herbicide use	21%	57%	7%	0%*	5%	5%	4%	1%
Processing	35%	41%*	6%	6%	6%	0%	6%**	1%
Use of inoculants	15%*	65%*	13%	2%	2%	4%	0%	1%
Pest management without pesticides	28%	52%	0%	14%	7%	0%	0%	1%
Use of PICs bags for storage	30%	56%	0%	11%	0%	0%	4%	1%
Introduction to new crop varieties	8%*	71%*	4%	4%	8%	4%	0%	1%
Other	32%	48%	5%	9%	0%	5%	2%	1%
<b>Total</b>	<b>27%</b>	<b>54%</b>	<b>7%</b>	<b>6%</b>	<b>3%</b>	<b>2%</b>	<b>1%</b>	<b>100%</b>

\* Information leaflets and posters (Leaflets) were merged with News-papers & magazine articles and Shujaz comic on beans. Agricultural shows and seminars with demonstration plots. The TV series Shamba Shape-up with Films – videos (Films).

Table 24 shows that if 'interventions don't apply' (None), a significantly positive relation is seen with mention of the learning topics 'intercropping' and 'weed management without herbicides'. These topics are on the other hand significantly less represented for 'demonstrations'. Furthermore, a reversed pattern is seen in Table 24 between 'no interventions' and 'demonstrations' where topics are negatively related for the former but positively for the latter. For 'demonstrations', a range of best practices and inputs related topics are significantly more frequently mentioned, notably 'row cropping', 'use of chemical fertilizer', 'use quality seeds (either certified or QDS)' but also 'marketing'.

For 'Information leaflets and posters (Leaflets) that were merged with News-papers & magazine articles and Shujaaz comic on beans' this is significantly positively related to 'use the right variety', 'storage' and 'Remove crop residues damaged by pests or diseases'. Radio is related to 'earlier land preparation' and SMS notably to 'marketing', where this is likely influenced by receiving price information.



**Table 25.** Topics versus personal relations, interactions\* for the three most important topics (n=1,402)

Topics	None	Experienc	Ext.	Friends	CBO	VBA	Agro	H.H.	Total
Earlier land preparation	11	267	166	149	73	67	46	17	796
Row cropping	21	227	217	110	87	53	26	16	757
Use of chemical fertilizer	22	179	167	107	79	57	37	9	657
Use quality seeds (either certified or	19	123	120	82	50	35	18	10	457
Use of manure	13	136	110	72	37	27	18	12	425
Pesticide use	11	115	106	45	51	26	27	8	389
Crop rotation	3	76	62	55	22	19	9	14	260
Intercropping	7	95	42	49	15	11	8	15	242
Markets	8	80	47	36	24	10	7	4	216
Use right variety	0	38	47	49	17	12	8	4	175
Marketing	3	67	25	30	18	14	10	4	171
Seeding rates	4	53	45	20	11	13	11	2	159
Weed management without herbicides	3	57	23	31	7	10	10	6	147
Storage	2	39	19	31	14	12	15	1	133
Test soil before fertilizer application	2	44	23	20	13	8	6	3	119
Cooking	1	51	14	25	7	8	3	8	117
Remove damaged crop residues	0	38	28	16	8	9	11	2	112
Herbicide use	1	17	22	23	2	5	5	4	79
Use of fertilizer rates/blends	1	17	25	16	8	6	2	2	77
Use of inoculants	1	18	16	8	10	9	6	1	69
Processing	1	24	18	10	3	2	2	0	60
Pest management without pesticides	1	14	12	7	5	1	1	2	43
Use of PICs bags for storage	1	7	13	8	6	2	1	2	40
Introduction to new crop varieties	1	12	11	2	7	1	3	1	38
Other	3	20	9	10	11	4	1	0	58
<b>Total</b>	<b>140</b>	<b>1,814</b>	<b>1,387</b>	<b>1,011</b>	<b>585</b>	<b>421</b>	<b>291</b>	<b>147</b>	<b>5,796</b>





Topics	None	Experienc	Ext.	Friends	CBO	VBA	Agro	H.H.	Total
Earlier land preparation	1%**	34%*	21%	19%*	9%	8%*	6%*	2%	14%
Row cropping	3%	30%*	29%**	15%**	11%*	7%	3%*	2%	13%
Use of chemical fertilizer	3%	27%**	25%*	16%	12%*	9%*	6%	1%*	11%
Use quality seeds	4%*	27%**	26%*	18%	11%	8%	4%	2%	8%
Use of manure	3%	32%	26%	17%	9%	6%	4%	3%	7%
Pesticide use	3%	30%	27%*	12%**	13%*	7%	7%*	2%	7%
Crop rotation	1%	29%	24%	21%*	8%	7%	3%	5%**	4%
Intercropping	3%	39%*	17%**	20%	6%*	5%	3%	6%**	4%
Markets	4%	37%	22%	17%	11%	5%	3%	2%	4%
Use right variety	0%*	22%**	27%	28%**	10%	7%	5%	2%	3%
Marketing	2%	39%**	15%*	18%	11%	8%	6%	2%	3%
Seeding rates	3%	33%	28%	13%*	7%	8%	7%	1%	3%
Weed management without herbicides	2%	39%	16%**	21%	5%*	7%	7%	4%	3%
Storage	2%	29%	14%*	23%**	11%	9%	11%**	1%	2%
Test soil before fertilizer application	2%	37%*	19%	17%	11%	7%	5%	3%	2%
Cooking	1%	44%**	12%**	21%	6%	7%	3%	7%**	2%
Remove damaged crop residues	0%	34%*	25%	14%	7%	8%	10%**	2%	2%
Herbicide use	1%	22%*	28%	29%**	3%*	6%	6%	5%	1%
Use of fertilizer rates/blends	1%	22%*	32%*	21%	10%	8%	3%	3%	1%
Use of inoculants	1%	26%	23%	12%	14%	13%*	9%	1%	1%
Processing	2%	40%	30%	17%	5%	3%	3%	0%	1%
Pest management without pesticides	2%	33%	28%	16%	12%	2%	2%	5%	1%
Use of PICs bags for storage	3%	18%*	33%	20%	15%	5%	3%	5%	1%
Introduction to new crop varieties	3%	32%	29%	5%	18%*	3%	8%	3%	1%
Other	5%	34%	16%	17%	19%*	7%	2%	0%	1%
<b>Total</b>	<b>2%</b>	<b>31%</b>	<b>24%</b>	<b>17%</b>	<b>10%</b>	<b>7%</b>	<b>5%</b>	<b>3%</b>	<b>100%</b>

\* NGO and ARI are merged with Extension Officers. Private company with Agro-dealers, and Other with Interactions and Interventions don't apply.



Table 25 shows that in the relatively few cases (2%) where there were no 'interactions' (none) as an information source, there was significantly less mention of 'earlier land preparation' and 'use the right variety' but significantly more on 'quality seeds'. 'Own experience' is significantly linked to six learning topics, in number of cases, this applies most frequently to 'earlier land preparation' and from thereon 'intercropping', 'marketing', 'soil testing', 'cooking' and 'remove crop residues damaged by pests and diseases'. 'Cooking' is also related to 'other household members' and significantly less related to 'extension officers' indicating this topic, although present in all interaction, tends to be learned more through diffusion and own experimenting – practicing contrary to for instance 'use of chemical fertilizer'.

Comparing the patterns between 'own experience' and 'extension officers' it is seen that on the topics 'row cropping', 'use of chemical fertilizer', 'use quality seeds', 'intercropping', marketing, soil testing and 'use of fertilizer rates/blends', opposite significant relations apply. Whereby 'extension officers' are in general more significantly positively related to inputs and good agronomic practices and own experience to for instance 'intercropping' which was not part of most campaigns' recommended practices.

Further significant relationships are seen in Table 25 which apply within the overall pattern i.e. percentages that interactions link to learning topics. Perhaps noteworthy is the positively significant link between VBAs and inoculants as the VBA model was recently introduced in Tanzania to enhance farmers' knowledge and access to last mile delivery of inputs and hints this has becoming effective.

#### 4.4 Other information needs

The question was asked '*Would you like to receive other information on soyabeans or beans*'. Most respondents (96%) wished to receive *other* information on beans or soyabeans (Table 26) and were asked '*What other information would you like to receive about soyabeans or beans*', being a spontaneous, multiple answers question whereby earlier pre-coded topics through a skip logic were omitted as options (Table 27).

**Table 26.** To receive other information on soyabeans or beans (n=1,482)

Other Info.	Male	Female	Total	Male	Female	Total
Yes	911	515	1,426	96%	96%	96%
No	35	21	56	4%	4%	4%
<b>Total</b>	<b>946</b>	<b>536</b>	<b>1,482</b>	<b>64%</b>	<b>36%</b>	<b>100%</b>

**Table 27.** Other information needs on beans-soyabeans (n=1,426)

Other topics	Male	Female	Total	Male	Female	Total
Quality seeds (certified / QDS)	234	135	369	30%	31%	30%
Markets	194	80	274	24%**	18%	22%
Marketing	160	76	236	20%	17%	19%
Pesticide use	149	83	232	19%	19%	19%
Use right variety	136	68	204	17%	16%	17%
Use of chemical fertilizer	129	68	197	16%	16%	16%
Earlier land preparation	74	45	119	9%	10%	10%
Use of fertilizer rates/blends	81	34	115	10%	8%	9%
Use of manure	67	47	114	8%	11%	9%
Remove diseased crop residues	58	33	91	7%	8%	7%
Herbicide use	63	26	89	8%	6%	7%
Use of inoculants	50	33	83	6%	8%	7%



Storage	52	29	81	7%	7%	7%
Seeding rates	41	36	77	5%	8%*	6%
Processing	49	24	73	6%	6%	6%
New crop varieties	46	25	71	6%	6%	6%
Test soil before fertilizer	44	22	66	6%	5%	5%
Row cropping	35	29	64	4%	7%	5%
Crop rotation	28	18	46	4%	4%	4%
Pest management no pesticides	26	15	41	3%	3%	3%
Use of PICs bags for storage	19	7	26	2%	2%	2%
Intercropping	13	12	25	2%	3%	2%
Weed management no herbicides	17	5	22	2%	1%	2%
Modern farming	5	6	11	1%	1%	1%
<b>Subtotal</b>	<b>1,770</b>	<b>956</b>	<b>2,726</b>	<b>194%</b>	<b>186%</b>	<b>191%</b>
More training on soyabean /	119	79	198	13%	15%	14%
<b>Total</b>	<b>1,889</b>	<b>1,035</b>	<b>2,924</b>	<b>207%</b>	<b>201%</b>	<b>205%</b>

In Table 27, the mentions on the 24 specific topics were divided by the 1,228 respondents (86%). Another 198 respondents (14%) mentioned 'more training' in general and 11 (1%) of the re-coded open answers were around training on 'Modern farming', either as stating it as such and-or in combination with e.g. farm economics, seasonal planning, tractors, balance food and cash crop usage.

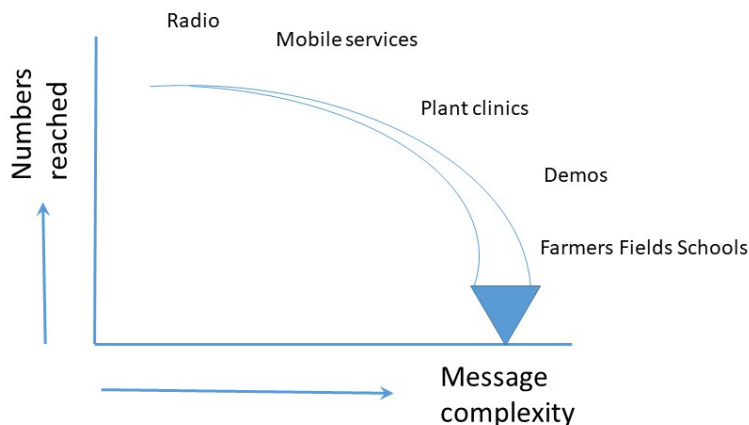
On average 2 *other* topics were mentioned (205%). The top 9 out of 24 topics (38%) make up 80% of the mentions being 'Quality seeds-certified or QDS' (30%), 'Markets' (22%), 'Marketing' (19%), 'Pesticide use' (19%), 'Use right variety' (17%), 'Use of chemical fertilizer' (16%), 'Earlier land preparation' (10%), 'Use of fertilizer rates/blends' (9%) and 'Use of manure' (9%).

At a  $P < 0.01$  level, 'Markets' is more frequently mentioned as *other* topic by men (24%) than women (18%), the same trend is seen for 'Marketing' and if combined make up 42% of the 1,228 respondents. At a  $P < 0.05$  level 'Seeding rates' is more often mentioned by women (8%) than men (5%).



## 5 Conclusions and Recommendations

There is a relationship between the complexity of a message and the suitability of a channel used to deliver it, as explained in Kansime et al. (2017) (Figure 14). Indirect methods, such as mass media, might be useful to raise awareness of topics that require a basic level of understanding, for example information about a new seed variety or the presence of a new pest, but might be less suitable to deliver more complex messages such as the proper use, rationale and potential benefits of inoculants.



**Figure 14.** Relations between communication channel, message complexity and reach

In line with Figure 14, the study shows that the 85% of the farmers that learned about important topics on soyabean or beans in the last 3 years, can largely be attributed to demonstration plots often accompanied with field days, extension officers, CBO and VBA interactions. This was to some extent complemented by print materials, radio programs, SMS and films.

The concerted investment required to achieve this level of effectiveness in learning was made possible through the N2Africa Public Private Partnership (PPP) approach and therefore a recommended mode of implementing value chain projects to significantly contribute to increased awareness.

On the uptake of improved practices and technologies, it is seen that mostly the recommended practices were taken up on farmers' own fields. This can be seen in the light that farming practices are not mutually exclusive i.e. one practice contributes to the effectiveness of another and it is not possible to omit one practice after using another. Similarly, different practices contribute to overall farm outputs.

Uptake of good agricultural practices thus paved the way for the technologies; chemical fertilizer, quality seed and inoculants to render their expected yield increase and benefits. Uptake of however certified seeds and inoculants was much less compared to the awareness and intention of farmers to do so. The reason was non-availability/ inaccessibility through commercial supply chain tiers and, in addition to common beans, that the farmer preferred variety was not registered, impeding seed production.

The effectiveness of the PPPs on notably closing the farmer quality (certified or QDS) soyabean, common beans seed and inoculant demand and supply gaps was less than expected. It is therefore recommended that a further analysis is made on the business models used by the value chain partners. These have since been modified with stronger private sector and for instance VBA involvement. After analysis, a follow-up survey is therefore recommended to assess demand and supply gap dynamics.

On the other hand, findings on the farmer preferred common bean variety 'Soja Njano' versus what was available have been broadly communicated through various media and recently resulted in its registration as Selian 13.

The approach of interviewing farmers individually by phone can bring out first hand reliable information on the perceptions and preferences of the individuals on a range of subjects including technologies and is therefore a recommended mode of conducting farmer surveys for this purpose.





## CATI survey for bean and soyabean farmers in Tanzania – section-II

Good Afternoon! My name is [.....] I am calling you back from CABI to follow up on an earlier conversation we had on beans or soyabeans. It is to assess your information sources and needs on how to grow these crops. The survey takes about 10 minutes. The information you provide will be used purely for research purposes; your answers will not affect any benefits or subsidies you may receive now or in the future. Do you want to take the survey?

### 1. Name of enumerator

1. [.....]

This will be automatically generated by the interview software

### 2. Date of interview

1. [DD/MM/YYYY]

This will be automatically generated by the interview software

### 3. Time of interview

1. [HH/MM/SS]

This will be automatically generated by the interview software

### 4. Gender of the respondent

1. Male
2. Female
3. Not captured

### 5. Does the household consent to provide information?

1. Yes
2. No
3. Call back

### 6. Do or did you recently grow beans or soyabean?

1. Yes -> follow yellow for skip logic
2. No

**If not growing beans-soyabeans – Spontaneous – single answer**

### 7. Why have you not recently or are not growing beans or soyabean?

1. I am not a farmer
2. Beans-soyabean are not suitable for my farm
3. Lack of seeds
4. It is not profitable – does not make money
5. No market – don't know where to sell
6. Don't know how to grow beans – soyabeans
7. I stopped planting crops in general
8. Lack of money – other personal problems
9. It is not up to me to make decision on growing beans-soyabean or not
10. Other



**If Other**

8. Specify other

1. [.....]

**All**

9. Will you grow beans or soyabean in the next suitable season?

1. Yes
2. No

**If Question 9 is No and – Question 6 is Yes – Spontaneous – single answer**

10. Why will you not grow beans or soyabean?

1. Beans-soyabean are not suitable for my farm
2. Lack of seeds
3. It is not profitable – does not make money
4. No market – don't know where to sell
5. I stopped planting crops in general
6. Lack of money – other personal problems
7. It is not up to me to make decision on growing beans-soyabean or not
8. Other

**If Other**

11. Specify other

1. [.....]

**Multiple Spontaneous – If not growing beans-soyabeans Question 6 is No**

12. Regardless of growing beans-soyabean or not, in the last 3 years, where or how did you get the knowledge on soybeans or beans?

1. **I have no knowledge on growing beans or soyabean -> exit**
2. A small input package including seeds was handed out and tried on a small portion of the farm
3. Radio programs
4. Demonstration plots
5. News-papers / magazine articles
6. Shujaaz comic on beans
7. Information leaflets and posters
8. Films – videos
9. SMS messages on beans or soyabeans
10. From my own experience
11. Another household member
12. Neighbours, friends and family
13. Extension officers
14. Village-based advisors
15. Agro-dealers
16. My Community Based Organization / Farmer Group members
17. Other, specify

**If Other**

13. Specify other

1. [.....]

**Multiple Spontaneous – if growing beans-soyabeans Question 6 is Yes**

14. In the last 3 years, where or how did you get the knowledge to grow soybeans or beans?

1. A small input package including seeds was handed out and tried on a small portion of the farm
2. Radio programs
3. Demonstration plots



4. News-papers / magazine articles
5. Shujaaz comic on beans
6. Information leaflets and posters
7. Films – videos
8. SMS messages on beans or soyabeans
9. From my own experience
10. Another household member
11. Neighbours, friends and family
12. Extension officers
13. Village-based advisors
14. Agro-dealers
15. My Community Based Organization / Farmer Group members
16. Other, specify

**If Other**

15. Specify other

1. [.....]

*Multiple Assisted – do not repeat values mentioned in the spontaneous question*

16. In the last 3 years, where or how did you [also] get knowledge to grow soybeans or beans?

1. A small input package including seeds was handed out and tried on a small portion of the farm
2. Radio programs
3. Demonstration plots
4. News-papers / magazine articles
5. Shujaaz comic on beans
6. Information leaflets and posters
7. Films – videos
8. SMS messages on beans
9. From my own experience
10. Another household member
11. Neighbours, friends and family
12. Extension officers
13. Village-based advisors
14. Agro-dealers
15. My Community Based Organization / Farmer Group members
16. Other, specify

*If Other*

17. Specify other

1. [.....]

*If radio programs are mentioned – Spontaneous or Assisted*

18. Do you remember the name or names of the radio program you listened to on soyabeans or beans?

1. Yes
2. No

*If yes remember – Spontaneous- Multiple*

19. Please state the name of the radio program you listened to on soyabeans or beans?

1. Fahari Yangu
2. Jukwaa la Mkulima
3. Kilimo Chetu
4. Kilimo Sound
5. Kilimo Bora
6. Other





*If Other*

20. Specify other

1. [.....]

*If yes or no remember – Assisted- Multiple– do not repeat values from the spontaneous question*

21. Did you [also] listen to any of the following radio programs on soyabeans or beans?

1. Fahari Yangu
2. Jukwaa la Mkulima
3. Kilimo Chetu
4. Kilimo Sound
5. Kilimo Bora
6. Other

*If Other*

22. Specify other

1. [.....]

Just to confirm, we play a short introduction jingle for the **Fahari Yangu** program

*[Enumerator please play the intro-Jingle for **Fahari Yangu**]*

23. Did you listen to this program called **Fahari Yangu** on [Beans]?

1. Yes
2. No

*If Yes*

24. Of the 16 weekly episodes of **Fahari Yangu** on [Beans], how many did you listen to?

1. One
2. Two
3. Three
4. Four
5. About half
6. More than half
7. Most to all
8. Other

*If Other*

25. Specify other

1. [.....]

Just to confirm, we play a short introduction jingle for the **Jukwaa la Mkulima** program

*[Enumerator please play the intro-Jingle for **Jukwaa la Mkulima**]*

26. Did you listen to this program called **Jukwaa la Mkulima** on [Beans]?

1. Yes
2. No

*If Yes*

27. Of the 16 weekly episodes of **Jukwaa la Mkulima** on [Beans], how many did you listen to?

1. One
2. Two
3. Three
4. Four
5. About half
6. More than half



7. Most to all
8. Other

*If Other*

28. Specify other

1. [.....]

Just to confirm, we play a short introduction jingle for the **Kilimo Chetu** program

*[Enumerator please play the intro-Jingle for **Kilimo Chetu**]*

29. Did you listen to this program called **Kilimo Chetu** on [Soyabeans]?

1. Yes
2. No

*If is Yes*

30. Of the 16 weekly episodes of **Kilimo Chetu** on [Soyabeans], how many did you listen to?

1. One
2. Two
3. Three
4. Four
5. About half
6. More than half
7. Most to all
8. Other

*If Other*

31. Specify other

1. [.....]

Just to confirm, we play a short introduction jingle for the **Kilimo Sound** program

*[Enumerator please play the intro-Jingle for **Kilimo Sound**]*

32. Did you listen to this program called **Kilimo Sound** on [Soyabeans]?

1. Yes
2. No

*If is Yes*

33. Of the 16 weekly episodes of **Kilimo Sound** on [Soyabeans], how many did you listen to?

1. One
2. Two
3. Three
4. Four
5. About half
6. More than half
7. Most to all
8. Other

*If Other*

34. Specify other

1. [.....]

Just to confirm, we play a short introduction jingle for the **Kilimo Bora** program



*[Enumerator please play the intro-Jingle for Kilimo Bora]*

35. Did you listen to this program called **Kilimo Bora** on [Soyabeans]?

1. Yes
2. No

*If is Yes*

36. Of the 16 weekly episodes of **Kilimo Bora** on [Soyabeans], how many did you listen to?

1. One
2. Two
3. Three
4. Four
5. About half
6. More than half
7. Most to all
8. Other

*If Other*

37. Specify other

1. [.....]

*If Shujaaz comic on common beans is mentioned Assisted or Spontaneously*

38. For the Shujaaz comic on [Beans], how many issues did you obtain or read through?

1. [.....]

*If Information leaflets and posters is mentioned Assisted or Spontaneously*

39. For Information leaflets and posters on soyabean or beans, where did you get them from?

1. AFAP
2. N2Africa
3. RUDI
4. CRS
5. Clinton Foundation
6. BRITEN
7. FAIDA MALI
8. Agrodealers
9. Tanzanian Agricultural Research Institute (ARI)
10. Other (specify)

*If Other*

40. Specify other

1. [.....]

The 3 most important or relevant topics you learned about soyabean or beans in the last year

*Spontaneous – Single Answer*

41. What is the **first** most important or relevant topic that you learned about soyabean or beans in the last 3 years?

1. Crop rotation
2. Earlier land preparation
3. Test soil before fertilizer application
4. Use of inoculants
5. Use of manure
6. Use of chemical fertilizer
7. Use of fertilizer rates/blends



8. Use right variety (i.e. long duration, short duration, disease resistant, non-shattering)
9. Introduction to new crop varieties
10. Use quality seeds (either certified or QDS)
11. Intercropping
12. Use of PICs bags for storage
13. Markets
14. Remove crop residues damaged by pests or diseases
15. Pest management without pesticides
16. Pesticide use
17. Weed management without herbicides
18. Herbicide use
19. Seeding rates
20. Row cropping
21. Marketing
22. Processing
23. Storage
24. Cooking
25. Other (specify)

*If Other*

42. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

43. If you had to choose one major influence on your learning of [Topic\_1] what would it be as regards [Interventions]?

1. A small input package including seeds was handed out and tried on a small portion of the farm
2. Radio programs
3. Demonstration plots
4. News-papers / magazine articles
5. Shujaaz comic on beans
6. Information leaflets and posters
7. Films - videos
8. SMS messages on beans
9. Other, specify

*If Other*

44. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

45. If you had to choose one major influence on your learning of [Topic\_1] what would it be as regards [personal relation -interactions]?

1. From my own experience
2. Another household member
3. Neighbours, friends and family
4. Extension officers
5. Village-based advisors
6. Agro-dealers
7. My Community Based Organization / Farmer Group members
8. Other

*If Other*



46. Specify other

1. [.....]

*Spontaneous – Single Answer – do not repeat value from Q33*

47. What is the [second] most important or relevant topics that you learned about soyabean or beans in the last 3 years?

1. Crop rotation
2. Earlier land preparation
3. Test soil before fertilizer application
4. Use of inoculants
5. Use of manure
6. Use of chemical fertilizer
7. Use of fertilizer rates/blends
8. Use right variety (i.e. long duration, short duration, disease resistant, non-shattering)
9. Introduction to new crop varieties
10. Use quality seeds (either certified or QDS)
11. Intercropping
12. Use of PICs bags for storage
13. Markets
14. Remove crop residues damaged by pests or diseases
15. Pest management without pesticides
16. Pesticide use
17. Weed management without herbicides
18. Herbicide use
19. Seeding rates
20. Row cropping
21. Marketing
22. Processing
23. Storage
24. Cooking
25. Other (specify)
26. **No other - > go to Q45 like to receive other information on soyabeans or beans**

*If Other*

48. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

49. If you had to choose one major influence on your learning of [Topic\_2] what would it be as regards [Interventions]?

1. A small input package including seeds was handed out and tried on a small portion of the farm
2. Radio programs
3. Demonstration plots
4. News-papers / magazine articles
5. Shujaaz comic on beans
6. Information leaflets and posters
7. Films - videos
8. SMS messages on beans
9. Other, specify

*If Other*



50. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

51. If you had to choose one major influence on your learning of [Topic 2] what would it be as regards [personal relation -interactions]?

1. From my own experience
2. Another household member
3. Neighbours, friends and family
4. Extension officers
5. Village-based advisors
6. Agro-dealers
7. My Community Based Organization / Farmer Group members
8. Other

*If Other*

52. Specify other

1. [.....]

*Spontaneous – Single Answer – do not repeat value from Q33 and Q39*

53. What is the [third] most important or relevant topics that you learned about soyabean or beans in the last 3 years?

1. Crop rotation
2. Earlier land preparation
3. Test soil before fertilizer application
4. Use of Inoculants
5. Use of manure
6. Use of chemical fertilizer
7. Use of fertilizer rates/blends
8. Use right variety (i.e. long duration, short duration, disease resistant, non-shattering)
9. Introduction to new crop varieties
10. Use quality seeds (either certified or QDS)
11. Intercropping
12. Use of PICs bags for storage
13. Markets
14. Remove crop residues damaged by pests or diseases
15. Pest management without pesticides
16. Pesticide use
17. Weed management without herbicides
18. Herbicide use
19. Seeding rates
20. Row cropping
21. Marketing
22. Processing
23. Storage
24. Cooking
25. Other (specify)
26. No other - > go to Q45 like to receive other information on soyabeans or beans

*If Other*



54. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

55. If you had to choose one major influence on your learning of [Topic\_3] what would it be as regards [Interventions]?

1. A small input package including seeds was handed out and tried on a small portion of the farm
2. Radio programs
3. Demonstration plots
4. News-papers / magazine articles
5. Shujaaz comic on beans
6. Information leaflets and posters
7. Films - videos
8. SMS messages on beans
9. Other, specify

*If Other*

56. Specify other

1. [.....]

*Spontaneous to Assisted – Single Answer*

57. If you had to choose one major influence on your learning of [Topic\_3] what would it be as regards [personal relation -interactions]?

1. From my own experience
2. Another household member
3. Neighbours, friends and family
4. Extension officers
5. Village-based advisors
6. Agro-dealers
7. My Community Based Organization / Farmer Group members
8. Other

*If Other*

58. Specify other

1. [.....]

59. Would you like to receive other information on soyabeans or beans?

1. Yes
2. No

*Spontaneous Multiple Answers*

60. What other information would you like to receive about soyabean or beans?

1. Crop rotation
2. Earlier land preparation
3. Test soil before fertilizer application
4. Use of inoculants
5. Use of manure
6. Use of chemical fertilizer
7. Use of fertilizer rates/blends
8. Use right variety (i.e. long duration, short duration, disease resistant, non-shattering)
9. Introduction to new crop varieties
10. Use quality seeds (either certified or QDS)
11. Intercropping
12. Use of PICs bags for storage



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13. Markets
  14. Remove crop residues damaged by pests or diseases
  15. Pest management without pesticides
  16. Pesticide use
  17. Weed management without herbicides
  18. Herbicide use
  19. Seeding rates
  20. Row cropping
  21. Marketing
  22. Processing
  23. Storage
  24. Cooking
  25. Other (specify)

*If Other*

61. Specify other

1. [.....]





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## 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 soyabean, common bean, cowpea, and groundnut varieties with proven high BNF potential and sufficient seed availability in target impact zones of N2Africa Project
10. Project launching 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 seeds 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 seeds 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. 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



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67. Launching 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 Launching 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
  92. Tracing seed diffusion from introduced legume seeds through N2Africa demonstration trials and seed-input packages
  93. The role of legumes in sustainable intensification – priority areas for research in northern Ghana
  94. The role of legumes in sustainable intensification – priority areas for research in western Kenya
  95. N2Africa Early Impact Survey, Phase I
  96. Legumes in sustainable intensification – case study report PROIntensAfrica
  97. N2Africa Annual Report 2016
  98. OSSOM Launch and Planning Meeting for the west Kenya Long Rains 2017
  99. Tailoring and adaptation in N2Africa demonstration trials
  100. N2Africa Project DR Congo Exit Strategy
  101. N2Africa Project Kenya Exit Strategy



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102. N2Africa Project Malawi Exit Strategy
  103. N2Africa Project Mozambique Exit Strategy
  104. N2Africa Project Rwanda Exit Strategy
  105. N2Africa Project Zimbabwe Exit Strategy
  106. N2Africa Annual Report 2017
  107. N2Africa review of policies relating to legume intensification in the N2Africa countries
  108. Stakeholder Consultations report
  109. Dissemination survey Tanzania



## Partners involved in the N2Africa project

