Using the LegumeCHOICE tool to support legume use on smallholder farms in Kisii and Migori counties in Kenya

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Using the LegumeCHOICE tool to support legume use on smallholder farms in Kisii and Migori counties in Kenya

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Summary

Focus group discussions (FGDs) were conducted in smallholder farms in Migori and Kisii Counties of Western Kenya to assess legumes grown by farmers, benefits derived from the legumes, and the challenges faced in legume production. Participating farmers were grouped based on gender and resource endowment while ensuring a balance across these categories. The LegumeCHOICE (LC) tool (developed in the LegumeCHOICE project) was used to support decision making on suitable legume species that can be grown in the villages where the FGDs were conducted and in surrounding areas.

Farmers understand legumes in relation to the functions they provide, however, they had limited knowledge of legume diversity (annual and perennial grain, herbaceous and tree legumes) and their management. Livelihood functions of legumes identified were provision of food, feed, mulching, fencing, construction materials, staking for banana and tomatoes, fuel, income and soil fertility improvement. Farmers also mentioned the use of Calliandra in apiculture and its leaves in treatment of constipation. Application of the LC tool showed the interrelated challenges and constraints faced by farmers in legume production include lack of quality seeds, inputs (e.g. fertilizer), technical information, prevalent incidence of pests and diseases, land scarcity, inadequate market access and information, labour, water scarcity, poor soils and weather variability. Variations by site were observed in demand for six legume functions (food, feed, income, soil fertility improvement, soil erosion control and fuel). Farmers' preferences varied by gender (e.g. men preferred erosion control to fuel which was demanded by women in Rongo) and site in some cases. Food and income were consistently the most preferred legume functions across gender, resource endowment and sites. Results from the LC tool hit list indicated a range of suitable legume species including pigeon pea, climbing bean, groundnut, soybean, field pea, Desmodium, Calliandra, Sesbania and Gliricidia.

These findings indicate that farmers have some understanding of legumes and their functions, but there is an interest and need for more information and training to gain a deeper understanding of legume diversity, their functions, management, benefits and potential uses. Addressing the challenges limiting legume production should allow for increased use of legumes in smallholder farms in the study region. The species suggested by the LC tool and selected by farmers for on-farm testing have some potential to meet the functions/benefits demanded by farmers.

Introduction

Background

A range of global drivers including population growth and climate change pose a serious threat to food and nutrition security in smallholder farming systems in western Kenya (Rao et al. 2015). Increased legume use has been advocated as one means of improving food and nutrition security. Legumes play important roles by delivering multiple services in line with sustainability principles through provision of food for human beings and feed for livestock, as a source of plant proteins, (Ojiewo et al. 2019), improved soil fertility through biological nitrogen fixation (BNF), erosion control (Muoni et al. 2019), and when used as a break crop among e.g. cereals, breaking pest and disease cycles (Stagnari et al. 2017).

Although legumes have potential to improve agricultural productivity on smallholder farms in western Kenya, improvements in legume production have not kept pace with those of cereals. Grain legumes, especially common bean, are often grown with maize, cassava and rice as intercrops or rotations. Intercropping in this region is more practiced than rotations. Legume cultivation depends not only on farmers' choices but on policymakers who have the responsibility to provide effective strategies to support the integration of legumes into farming systems. Therefore, there is need to focus on developing the role of legumes and their contribution to both the sustainable intensification of production and the livelihoods of smallholder farmers through training and extension including decision support tools such as the LegumeCHOICE tool (LC tool).

The LC tool was developed through the LegumeCHOICE project[1] and is now being applied through the LegumeSELECT project (2019–2021). LegumeSELECT aims to increase the contribution of legumes to smallholder livelihoods in sub-Saharan Africa (SSA) through improved decision making on suitable legumes in smallholder farmers environment. This will be achieved through an evidence-based approach by combining existing data with new data from experimentation to better understand the relationship between legume traits (water-use efficiency, nutrient-use efficiency and N-fixation), and farmer needs in a range of biophysical and socio-economic contexts.

The generated data will help further development of the current prototype version of the LC tool. This report outlines experiences in applying the LC tool in LegumeSELECT sites in Kisii and Migori Counties in western Kenya. The main aim of the exercise was to test the current version of the LC tool and to identify the constraints for legume intensification, the niches for new usage of legumes and suggest suitable legume types and species to be tested by smallholder farmers in the areas.

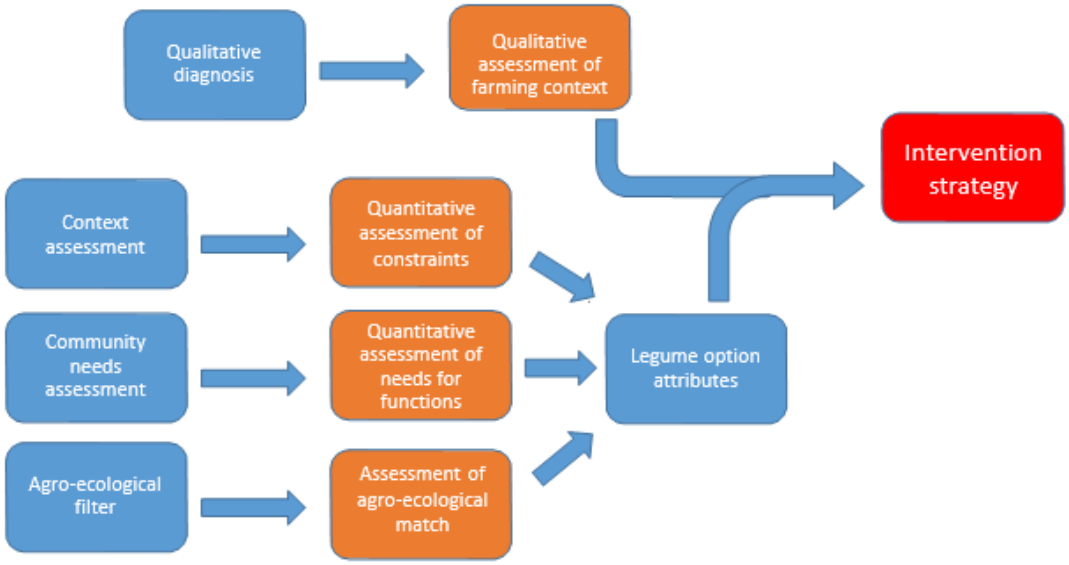
LegumeCHOICE (LC) tool

The LC tool offers a systematic framework for selecting appropriate legume species for smallholder farmers based on three main "filters". These filters help to match legumes to local conditions by considering their suitability to (1) agro-ecological conditions, (2) socio-economic situations, and (3) to farmer aspirations. Application of these filters generates a "hit list" of suitable legumes for the site in question from the list available (Figure 1). The agro-ecological filter includes

1 The LegumeCHOICE tool was developed as part of the LegumeCHOICE project (2014–2017) funded by the Federal Ministry of Economic Cooperation and Development (BMZ).

average rainfall, average annual temperature, altitude and soil pH using information obtained from literature and other existing decision support tools. The socio-economic filter considers factors limiting legume use which include land, labour, seeds, inputs and services, water/rainfall and markets based on farmers' views. The last filter, farmer aspirations, quantifies what local farmers are looking for from legumes i.e. assesses their preferences for a series of legume functions (Duncan et al. 2016).

Figure 1 Logical flow framework of the LegumeCHOICE tool displaying the various components contributing to a proposed intervention strategy



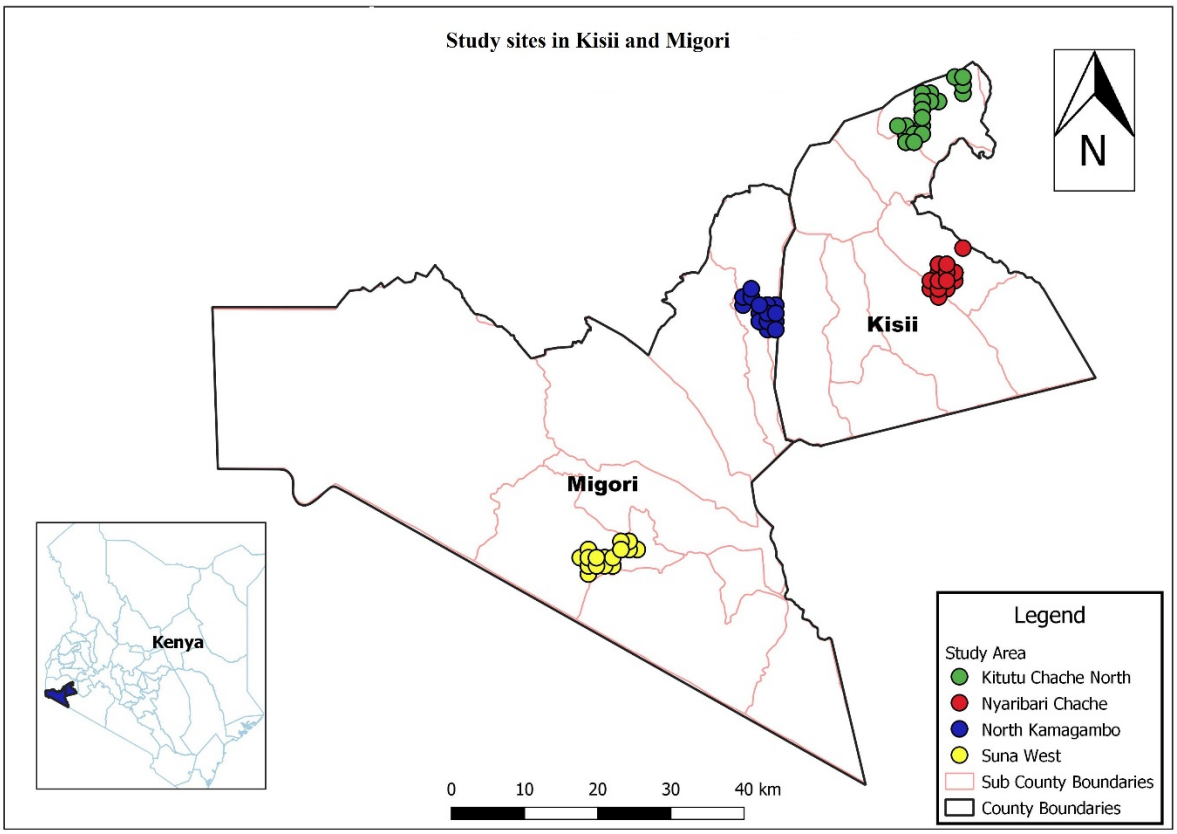
Adapted from (Duncan et al. 2016)

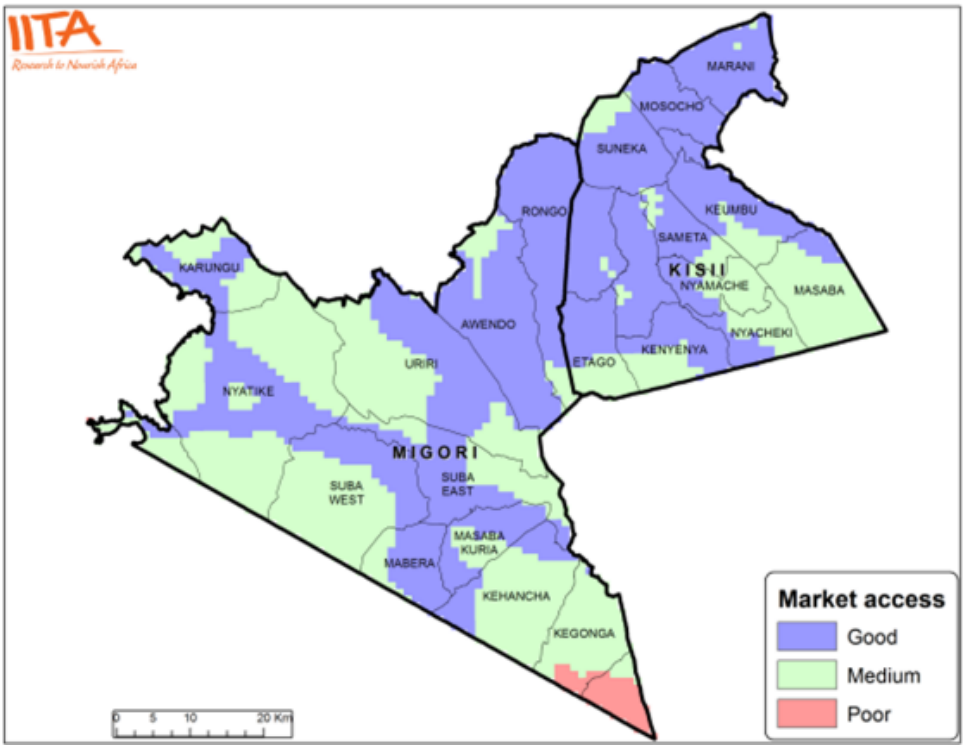
Methodology

Study sites

The study was conducted in August–September 2019 in Kisii (Kitutu Chache North and Nyaribari Chache sub-counties) and Migori (Rongo and Suna West sub-counties) counties in western Kenya. The field work took 2 days per site. The altitude in Kisii and Migori counties ranges between 1200 and 2000 meters above sea level (m.a.s.l – the highest altitude is in Kisii county which is characterized by undulating hills) and they receive rainfall (approximately 1500 mm per annum) in a bimodal pattern. The rainy seasons are referred to as the short and long rains. The sites have different levels of access to markets (Figure 2). Dominant soils at Suna West are classified as Planosols and the other sites are dominated by Acrisols. The cropping system in both counties is dominated by maize but other common crops include tea, cassava and sugarcane (Wainaina, Mukui and Mwita 2013; Odhiambo et al. 2014).

Figure 2. Map of implementation sites in Kisii and Migori showing the respective geo-locations of households participating in the project (top) and status of market access in the different sites (bottom). A sub-sample of farmers from the respective communities were invited for the LC tool focus group discussions





Identification of participants

Prior to the focus group discussions (FGDs), researchers involved in the LegumeSELECT project were trained on how the LC tool works. Extension officers facilitated identification of farmers to participate in the FGDs. Each FGD involved 18 farmers who were grouped based on gender and resource endowment. The resource endowment classes were determined based on farmers' land size, livestock holdings and other factors including fertilizer use and proportions of farm produce sold to the market. All the FGDs followed the following structure:

i. General introductions – the extension officer led the introductions by welcoming the farming community and the project team.

ii. Project introduction – the project team gave an overview of the project aims, as well as the objectives of the exercise.

iii. Focus group discussions – this consisted of qualitative diagnosis and pairwise ranking and was undertaken in separate male and female groups.

iv. Participatory matrix scoring – was an individual exercise for scoring of legume functions.

Applying the LegumeCHOICE tool

i. Qualitative diagnosis and pairwise ranking

This exercise was done in male and female groups to delve deeper into farmers' understanding of legumes (Figures 3 and 4), the benefits they derive from legumes, the main challenges encountered in their efforts to grow and manage legumes, factors limiting legume productivity as well as brainstorming on niches and opportunities (innovations or new uses) for legumes. The **pairwise ranking** exercise was done by the groups by presenting all possible pairs of legume functions to participants and asking them to vote by consensus on which function they perceived as the more important within each pair.

Figure 3 The use of pictorial aids to familiarize farmers with legumes of different classes (grain, herbaceous and tree) in Rongo using the local dialect.

Photo credit: ICRAF/Julius Njoroge

Figure 4 The team during focus group discussions (FGDs) that were carried out in male and female groups

Photo credit: ICRAF/John Nyaga

ii. Context assessment

The purpose of the exercise was to come up with a series of scores from zero to four (0–4) that indicated the strength of a series of generic constraints to legume production (land availability, labour, seed availability, market access, input availability, knowledge and skills, and water availability). The exercise was carried out in three groups based on three wealth classes (high, medium and low resource endowment). The scores from the groups were compared with the extension officers' (expert) scores.

iii. Participatory matrix scoring

This was done individually to understand community aspirations on legume functions and to allow triangulation of the results of the previous exercise (pairwise ranking). In this exercise farmers allocated 20 counters that were distributed among 6 key legume functions (food, feed, income, soil erosion control, soil fertility improvement and fuel) according to order of importance and their future farming aspirations. Farmers were asked to fill the provided score sheet individually and a facilitator photographed each sheet and recorded the data (Figure 5).

Figure 5 Example of matrix scoring sheet for the six key legume functions

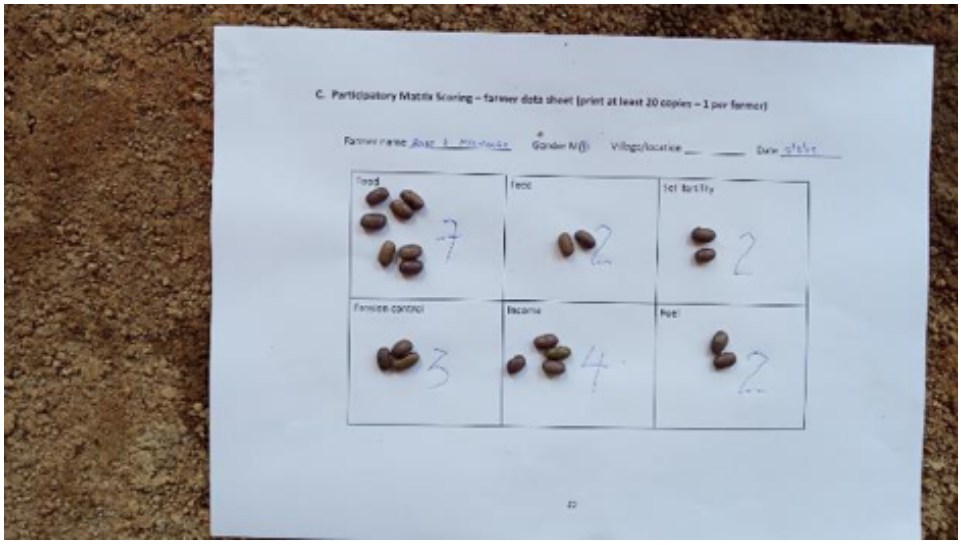


Photo credit: ICRAF/Ruth Kinuthia

iv. Data collation and LC tool output

The team combined the results of the context assessment, pairwise ranking and participatory matrix scoring with the agro-ecological parameters (annual rainfall, mean monthly temperature, altitude and soil pH) to come up with a list of legume options. A summary of the scores for each category (agro-ecological, socio-economic and farmer aspiration fits) was also generated against each legume species and this formed the basis for subsequent discussions on which legumes would be recommended for farmer testing. The outcome of the discussions was a list of potential legumes that would fulfil the priority needs of the farming communities, were compatible with the biophysical and socio-economic conditions and for which planting materials were readily accessible. These were then presented to the corresponding farming communities during the feedback sessions for discussions that led to legume selection for on-farm trials.

Results

Site 1: Kitutu Chache North

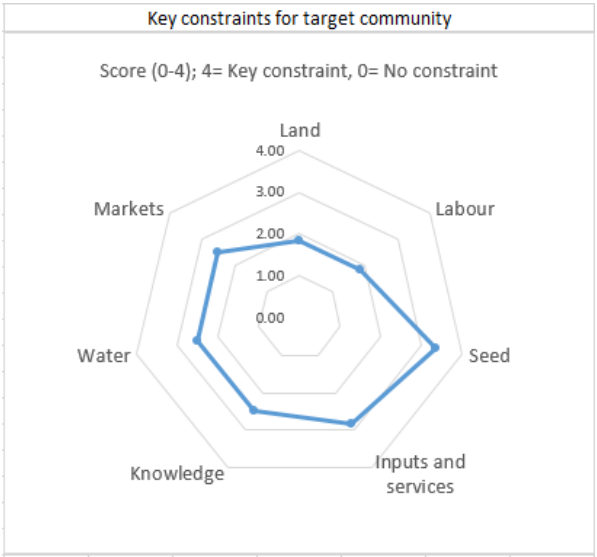
This site consisted of two venues, Marani and Metembe. Preliminary discussions showed that farmers understood legumes as plants that provide food, livestock feed, erosion control, fuel wood, income, medicine while improving soil fertility (the unique characteristic attributed to legumes). Grain legumes including bush bean (common bean), cowpea and groundnut were among the legumes grown by farmers (Table 1). Farmers mentioned several benefits from legume use including food, feed and medicinal use. The challenges limiting growing of legumes indicated by farmers were lack of seed, small land holdings, pests and disease attack (Table 1).

Table 1 Legumes grown in Kitutu Chache North, their benefits and the challenges faced by farmers in producing them

Legumes grown	Benefits	Challenges
Bush bean, green grams (yellow variety), cowpea, groundnut, soybean, pigeon pea, Desmodium and Calliandra	Food, Livestock feed, Soil fertility improvement, Fencing, Staking (bananas and tomatoes), beekeeping (using Calliandra), Medicinal value including treating constipation using Calliandra leaves, as well as blood and kidney purifying using soybean	Lack of quality (certified) seeds Poor (tired) soils Pest and disease attacks Low technical capacity Market challenges (low prices and lack of market for produce) Small land holdings Weather variability

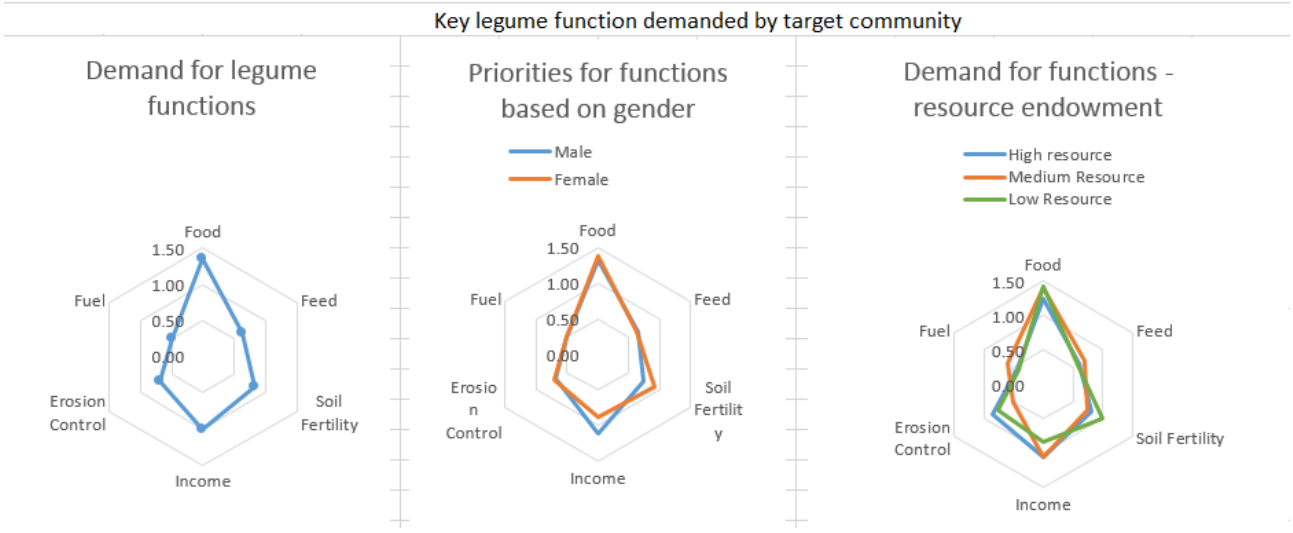
Despite the farming communities citing small land holdings as a constraint to legume production (and as a characteristic of the area), the output generated by the tool suggest that the main challenges revolve around availability of inputs and services and seed supply (Figure 6). This indicates that with improved input access, farmers might be able to make better use of the available land.

Figure 6 Scores for the major constraints of legume production in Kitutu Chache North



Food, income and soil fertility improvement were the top 3 important functions preferred by farmers of both genders and across all 3 resource endowment classes (Figure 7). Farmers seemed to appreciate the multipurpose nature of legumes as all functions had at least one counter during the matrix scoring exercise. Income was scored lower by female famers than male farmers while soil fertility was scored higher by females than males (Figure 7).

Figure 7 Legume priority needs as demanded by the farming communities in Kitutu Chache North (Marani and Metembe venues) based on gender and resource endowment (top) with the resultant legume options generated by the LC tool for selection (bottom)



		How well this option fulfils functional needs						How well this option fits the context							Summary		
Legume name	Type	Food	Feed	Income	Erosion control	Fuel	Soil fertility	Land	Labour	Seed supply	Inputs and services	Knowledge and skills	Water	Markets	Functional fit_rank	Context rank	Agro-ecological rank
Pigeon pea	Grain	2.7	0.9	0.8	1.5	0.3	1.2	4.0	3.9	4.0	4.0	3.8	4.0	3.0	1	3	1
Climbing bean	Grain	2.7	0.9	1.1	0.3	0.0	0.8	4.0	4.0	4.0	3.8	3.8	1.3	3.0	13	12	1
Soybean	Grain	2.1	0.9	1.1	0.5	0.2	0.8	0.0	1.7	2.0	1.3	1.3	3.8	0.0	20	41	19
Cowpea	Grain	2.7	0.2	1.1	0.3	0.0	0.8	2.0	1.7	2.0	1.3	3.8	4.0	3.0	24	27	19
Field pea	Grain	2.7	1.4	1.1	0.5	0.0	0.8	0.0	3.9	2.0	4.0	3.8	1.3	4.0	4	13	37
Desmodium silverleaf	Herbaceous	0.0	1.9	0.6	1.5	0.0	1.2	0.0	4.0	0.0	4.0	3.8	3.8	1.0	23	21	19
Calliandra calothyrus	Tree	0.0	1.9	0.6	2.0	0.5	1.2	4.0	4.0	0.0	4.0	3.8	3.8	1.0	9	21	1
Gliricidia sepium	Tree	0.0	1.4	0.1	2.0	0.6	1.7	2.0	3.9	0.0	4.0	4.0	4.0	0.0	16	26	1
Leucaena leucocephala	Tree	0.0	1.9	0.0	2.0	0.6	1.7	2.0	3.9	4.0	3.8	3.8	4.0	1.0	8	4	19
Sesbania sesban	Tree	0.0	1.9	0.6	2.0	0.5	1.2	4.0	3.9	4.0	3.8	3.8	3.8	1.0	9	11	1

Site 2: Nyaribari Chache North

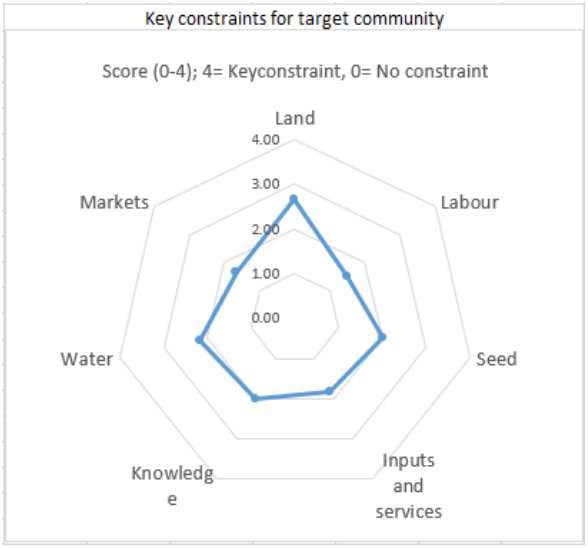
The farming communities understood legumes as crops that improve soil fertility and can be used as food, animal feed, medicine, shade, income and as a source of fuel. Legumes grown in the area included grain and tree legumes which are grown for food, livestock feed, staking and fuel (Table 2). Farmers highlighted several challenges associated with growing legumes such as high input costs, pests, diseases and lack of improved seed among others (Table 2).

Table 2 Legumes grown, their benefits and challenges to production in Nyaribari Chache North

Legume grown	Benefits	Challenges
Bush bean, pigeon pea, cowpea, groundnut, field pea, lablab, Desmodium, Calliandra, Sesbania and Leucaena	Food Livestock feed Income Soil fertility improvement Staking Mulching Soil erosion control Fuel wood	High farm input cost Pest and disease attack Lack of planting materials especially herbaceous and tree legumes Inadequate knowledge and skills on legume production Lack of information on quality (certified) seed and supply Tired soils Small land sizes Weather variability (excess rainfall in some seasons cause water logging)

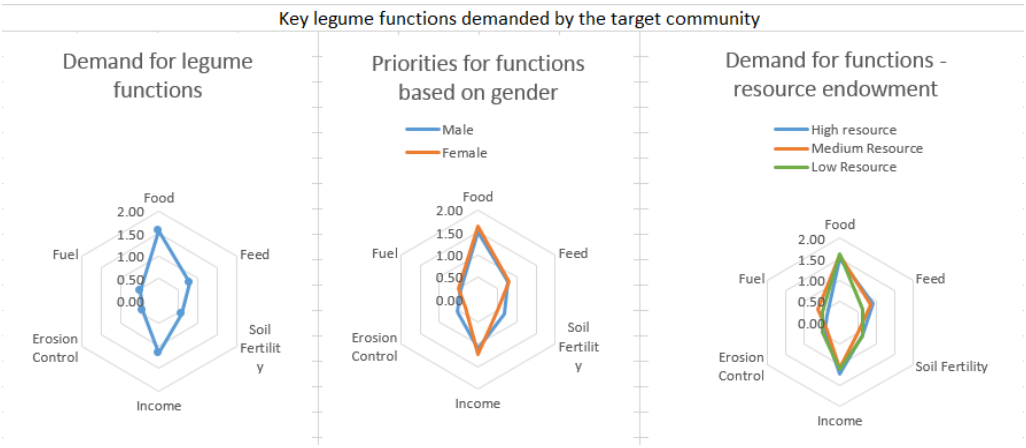
Results from scoring of the major constraints for legume production that were incorporated in the LC tool indicate that land, water, seed, knowledge and inputs and services are all issues faced by farmers in Nyaribari Chache although land availability seems to be a particular constraint (Figure 8). However, farmers cited knowledge and skills (information) on such matters as effective land management, market information and inputs as potential solution to low productivity as the communities can be equipped to better utilize the available land.

Figure 8 Scores for the major constraints of legume production in Nyaribari Chache North



In Nyaribari Chache, food and income were the most prioritized legume functions, followed by provision of livestock feed (Figure 9). Pigeon pea, climbing bean, Calliandra, Gliricidia and Sesbania are agro-ecologically suitable for growing in Nyaribari Chache. This list of the selected legumes was based on the outputs of the LC tool (Figure 9) and formed the basis for discussions with farmers as possible legume interventions.

Figure 9 Legume priority needs as demanded by the farming communities in Nyaribari Chache (Ibeno and Kerera) based on gender and resource endowment (top) and list of legume options generated by the LC tool for selection (bottom)



		How well this option fulfils functional needs						How well this option fits the context							Summary		
Legume name	Type	Food	Feed	Income	Erosion control	Fuel	Soil fertility	Land	Labour	Seed supply	Inputs and services	Knowledge and skills	Water	Markets	Functional fit_rank	Context rank	Agro-ecological rank
Pigeon pea	Grain	3.0	0.8	1.7	0.6	0.4	1.1	3.8	4.0	4.0	4.0	3.9	4.0	3.8	3	2	1
Climbing bean	Grain	3.0	0.8	2.3	0.2	0.0	0.7	3.8	3.0	4.0	2.3	1.7	1.7	3.8	7	37	1
Soybean	Grain	1.1	0.8	2.3	0.4	0.2	0.7	0.7	3.0	4.0	2.3	1.7	3.9	0.7	17	40	19
Cowpea	Grain	3.0	0.2	2.3	0.2	0.0	0.7	2.7	3.0	4.0	2.3	3.9	4.0	3.8	10	22	19
Field pea	Grain	3.0	1.2	2.3	0.4	0.0	0.7	0.7	4.0	4.0	4.0	3.9	1.7	4.0	2	16	37
Desmodium silverleaf	Herbaceous	0.0	1.6	0.6	0.6	0.0	1.1	0.7	4.0	2.0	4.0	3.9	3.9	2.7	34	24	19
Calliandra calothyrus	Tree	0.0	1.6	0.6	0.8	0.5	1.1	3.8	4.0	2.0	4.0	3.9	3.9	2.7	21	24	1
Gliricidia sepium	Tree	0.0	1.2	0.3	0.8	0.7	1.5	2.7	4.0	2.0	4.0	4.0	4.0	0.7	27	27	1
Leucaena leucocephala	Tree	0.0	1.6	0.0	0.8	0.7	1.5	2.7	4.0	4.0	3.9	3.9	4.0	2.7	23	7	19
Sesbania sesban	Tree	0.0	1.6	0.6	0.8	0.5	1.1	3.8	4.0	4.0	3.9	3.9	3.9	2.7	21	14	1

Site 3: Rongo

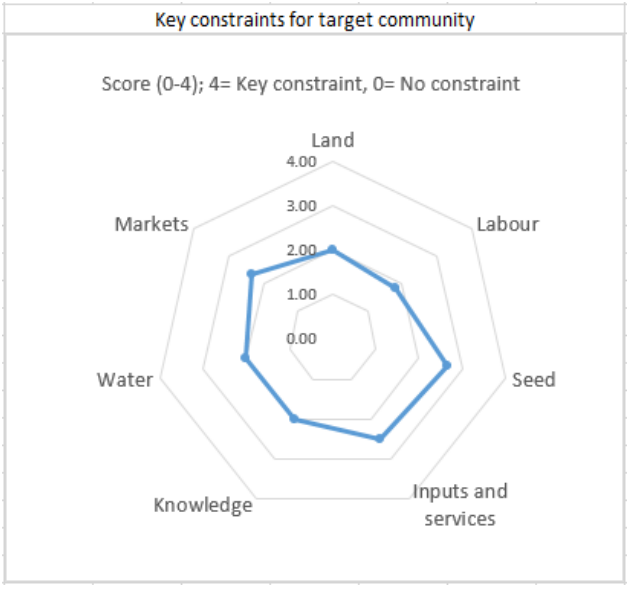
This site consisted of Kamagambo East and South locations. Preliminary conversations with farmers indicated that they perceived legumes to be crops that contribute to soil fertility improvement and provide other benefits such as food, fodder, soil erosion control and have medicinal properties (Table 3). Farmers indicated that information concerning legumes, their supply and market information are among the challenges they face in production of legumes (Table 3).

Table 3 Legumes grown in Rongo, their benefits and challenges to their production

Legumes grown	Benefits	Challenges
Bush bean, cowpea, lentils, green grams, soybean, groundnut, field pea, Desmodium, Calliandra, Leucaena, Sesbania and Tephrosia	Food Fodder Source of income Soil fertility improvement Fuel wood Fencing Farm and field demarcation Soil erosion control Windbreakers Traditional soap (Sesbania leaves) Disinfecting livestock (Tephrosia leaves) Shade (trees) Construction poles (Leucaena) Medicinal benefits (e.g. Lentils treat stomach ache)	Knowledge and skills Pest and disease attacks Lack of planting materials especially for Desmodium and Calliandra Labour intensive farming activities Inadequate quality seed supply Weather variability

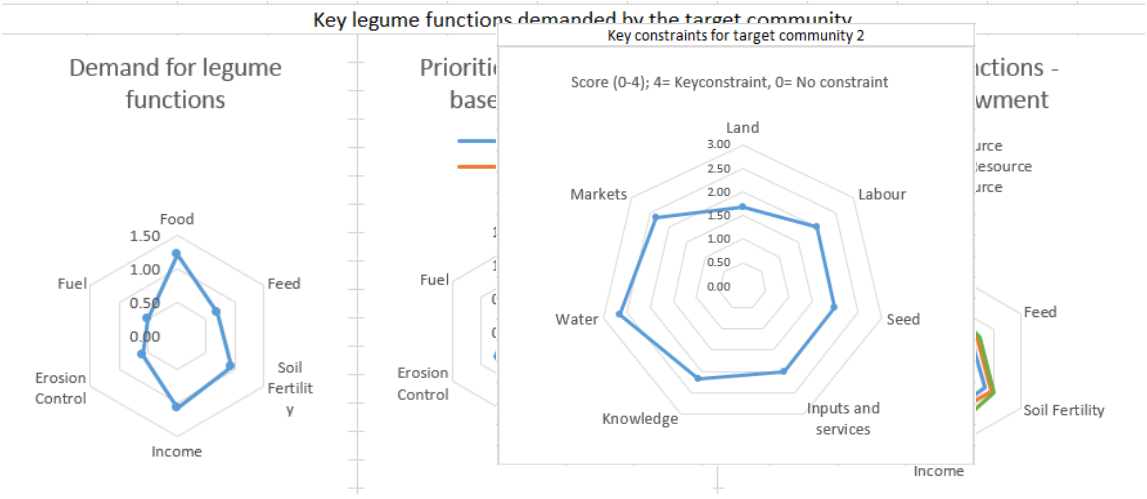
The results from scoring of the key legume functions in the LegumeCHOICE tool show that availability of improved seed and inputs and services are the key constraints to production of legumes (Figure 10).

Figure 10 Scores for the major constraints of legume production in South and East Kamagambo (Rongo)



Food, income and soil fertility were the most demanded legume functions as indicated by farmers in Rongo (Figure 11). Pigeon pea, climbing bean, groundnut, Calliandra, Gliricidia and Sesbania are agro-ecologically suitable for growing in Rongo (Figure 11).

Figure 11 Legume priority needs of farming communities in Rongo (South and East Kamagambo) based on gender and resource endowment (top) and list of potential legumes to be tried out in the site (bottom).



Pigeon pea	Grain	3.1	0.3	1.9	1.0	0.5	1.1	4.0	3.9	3.8	4.0	4.0	4.0	3.8	1	1	1
Climbing bean	Grain	3.1	0.3	2.5	0.2	0.0	0.8	4.0	4.0	3.8	3.0	4.0	2.0	3.8	7	5	1
Groundnuts	Grain	1.2	0.3	2.5	0.6	0.1	1.1	0.0	0.3	3.8	1.0	2.0	4.0	4.0	15	29	1
Soybean	Grain	1.2	0.3	2.5	0.6	0.1	0.8	2.0	2.3	2.7	1.0	2.0	4.0	0.0	17	41	23
Field pea	Grain	3.1	0.4	2.5	0.6	0.0	0.8	2.0	3.9	2.7	4.0	4.0	2.0	4.0	3	6	37
Desmodium silverleaf	Herbaceous	0.0	0.6	0.6	1.0	0.0	1.1	2.0	4.0	0.7	4.0	4.0	4.0	1.3	35	21	23
Calliandra calothyrus	Tree	0.0	0.6	0.6	1.3	0.8	1.1	4.0	4.0	0.7	4.0	4.0	4.0	1.3	25	21	1
Gliricidia sepium	Tree	0.0	0.4	0.3	1.3	1.0	1.5	4.0	3.9	0.7	4.0	4.0	4.0	0.0	21	27	1
Leucaena trichandra	Tree	0.0	0.6	0.6	1.0	1.0	1.1	4.0	3.9	3.8	3.0	4.0	4.0	1.3	27	8	1

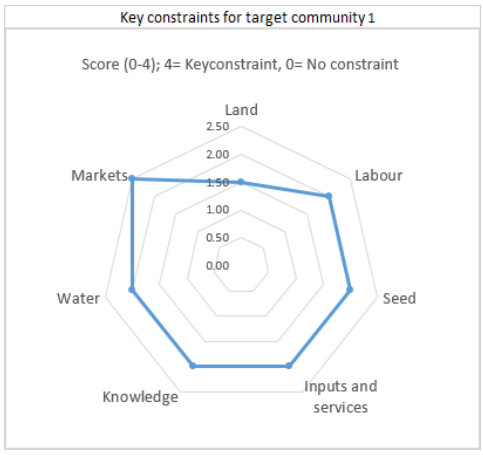
Site 4: Suna West

Suna West consisted of Sagero and Wasweta II locations. Farmers understood legumes as plants which produce pods, contribute to soil fertility improvement and have additional benefits as given in the summary in Table 4.

Table 4 Legumes grown in Suna West, their benefits and challenges to their production

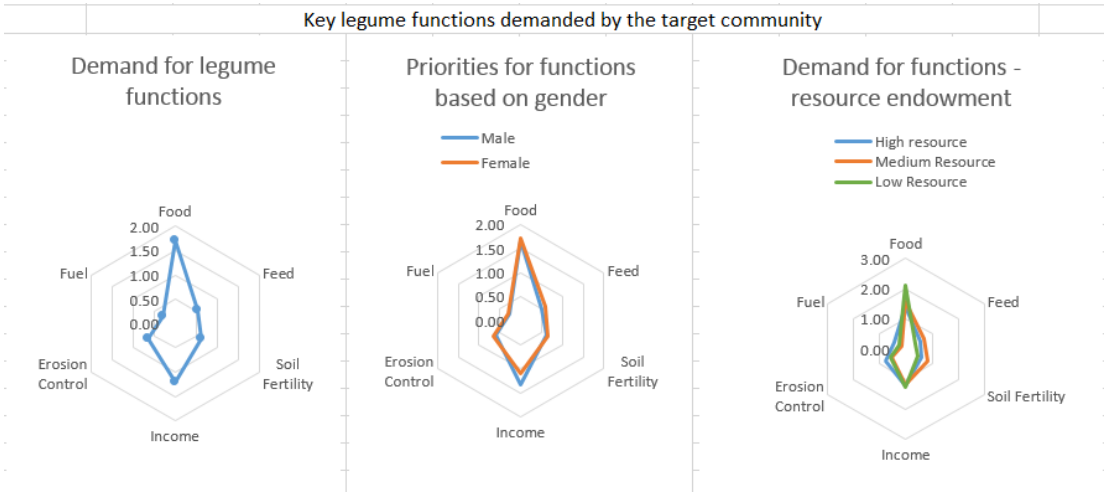
Legumes grown	Benefits	Challenges
Bush bean, groundnut, cowpea, green grams, soybean, Desmodium, Leucaena and Sesbania	Food Fodder Income source Soil fertility improvement Fuel Shade Windbreak Maize preservative (ash from burned bean stalks) Vegetable for cooking	Pest and disease attacks Chicken and rodents uproot planted materials Inadequate knowledge and skills Inadequate quality (certified) seed supply, Lack of planting materials for herbaceous and tree legumes, Inadequate market information Weather variability especially prolonged droughts

Figure 12 Scores for the major constraints of legume production in Sagero (left) and Wasweta II (right) farming communities in Suma West



The farming communities cited information concerning legume types and functions, seed and planting material supply, technical capacity required for legume production and water availability as key constraints in their farming efforts (Figure 12). Market access seemed to be a particular issue in Sagero and was attributed to failure in previous legume intervention projects to create demand for legumes, leaving may farmers discouraged from taking up new legume technologies.

Figure 13 Legume priority needs of farming communities in Suna West (Sagero and Wasweta II) based on gender and resource endowment (top) and list of legumes generated by LC tool for selection (bottom)



		How well this option fulfils functional needs						How well this option fits the context							Summary		
Legume name	Type	Food	Feed	Income	Erosion control	Fuel	Soil fertility	Land	Labour	Seed supply	Inputs and services	Knowledge and skills	Water	Markets	Functional fit_rank	Context rank	Agro-ecological rank
Pigeon pea	Grain	3.3	0.3	1.7	1.2	0.3	1.2	4.0	4.0	4.0	4.0	4.0	4.0	3.0	1	1	1
Climbing beans	Grain	3.3	0.3	2.3	0.2	0.0	0.8	4.0	4.0	4.0	4.0	4.0	2.0	3.0	7	5	1
Groundnuts	Grain	1.3	0.3	2.3	0.8	0.1	1.2	1.0	0.0	4.0	2.0	2.0	4.0	4.0	15	29	1
Soybean	Grain	1.3	0.3	2.3	0.8	0.1	0.8	3.0	2.0	4.0	2.0	2.0	4.0	0.0	17	39	25
Cowpea	Grain	3.3	0.1	2.3	0.2	0.0	0.8	4.0	2.0	4.0	2.0	4.0	4.0	3.0	10	18	1
Desmodium silverleaf	Herbaceous	0.0	0.5	0.6	1.2	0.0	1.2	3.0	4.0	2.0	4.0	4.0	4.0	1.0	35	18	25
Calliandra calothyrus	Tree	0.0	0.5	0.6	1.6	0.4	1.2	4.0	4.0	2.0	4.0	4.0	4.0	1.0	25	18	1
Gliricidia sepium	Tree	0.0	0.4	0.3	1.6	0.6	1.6	4.0	4.0	2.0	4.0	4.0	4.0	0.0	23	27	1
Leucaena trichandra	Tree	0.0	0.5	0.6	1.2	0.6	1.2	4.0	4.0	4.0	4.0	4.0	4.0	1.0	29	5	1
Sesbania sesban	Tree	0.0	0.5	0.6	1.6	0.4	1.2	4.0	4.0	4.0	4.0	4.0	4.0	1.0	25	5	1

Feedback and legume selection

After data collation and discussions about the outputs generated by the LC tool, a feedback and legume selection exercise was conducted with farmers in all sites. The focus of this exercise was to present a list of potential legume options that sought to deliver the desired benefits in line with farmers' aspirations, are compatible with farm and non-farm activities (culturally and socially acceptable), point to an existing or likely market demand for the products, address the production challenges and willingness of farmers to try out new options in addition to the known legumes in their farms.

Farmers who participated in the FGDs invited other farmers who were either their friends, relatives or neighbors to participate in the activity. New farmers were briefed on the objectives of the project and the reasons for initially working with just 18 representative farmers were explained. The legume options generated by the tool were presented to the group (Table 5). The team adopted the approach of discussing the grain legume options first, one at a time while highlighting;

i. the different benefits/uses of the legume

ii. productivity (bags per acre)

iii. market pricing (per kilogram or gorogoro, a unit of measurement equivalent to 2 kgs)

iv. agro-ecological requirements (soil pH and rainfall)

v. seed sourcing (certified/quality seeds)

vi. management practices (planting spacing, weeding, fertilizer and pesticide application)

The team then invited the farming community to select two grain legumes from the remaining four from which each farmer was encouraged to make one selection. The same approach was maintained for the herbaceous and tree legumes. Soybean was part of a government program and was selected to be promoted at all sites by the extension officers and the research team. The project also promoted Desmodium silverleaf, as it was the only herbaceous legume option generated by the tool and was also familiar to the farming communities. Ultimately, each farmer received two (2) grain legumes, one (1) herbaceous and one (1) tree legume to try out on their farms.

Figure 14 The team during feedback sessions with farmers in different venues

Photo credit: ICRAF/Julius Njoroge

Table 5 List of legumes selected by farmers in all the venues where feedback sessions and discussions were conducted after the FGDs and with more participants attending per site (than the 18 invited for each FGD)

County	Site	Location (venue)	Legume selected
Kisii	Kitutu Chache	Marani	Soybean Climbing bean/Field pea Desmodium Calliandra/Leucaena
		Metembe	Soybean Climbing bean/Field pea Desmodium Calliandra
	Nyaribari Chache	Nyabisabo	Soybean Climbing bean/Field pea Desmodium Calliandra
		Rigena	Soybean Climbing bean/Field pea Desmodium Calliandra
Migori	Rongo	Kamagambo East	Soybean Groundnut/Field pea Desmodium Calliandra/Calliandra
		Kamagambo South	Soybean Groundnut/Field pea Desmodium Leucaena/Calliandra
	Suna-West	Sagero	Pigeon pea Groundnut/Cowpea Desmodium Calliandra
		Wasweta II	Pigeon pea Groundnut/Soybean Desmodium Calliandra

Niches and opportunities

During the discussions with farmers, it was evident that legumes are understood differently and contribute multiple benefits or uses to the livelihoods of smallholder farmers (Muoni et al. 2019). Having determined the diversity in form and function among legumes, part of the exercise involved brainstorming on new innovations and potential niches (spatial or seasonal) related to legumes either in the farms or in the markets. Some of the suggested niches and opportunities arising from the discussions include:

- Marketing or exploring the value chain for legumes produced in large quantities and of high quality. Farmers observed that information and technical capacity development (training) particularly in legume production (e.g. agro-ecological suitability, legume varieties and management) as critical in realizing this opportunity
- Relay planting – a type of intercropping where the second crop is planted into the first crop before harvesting to avoid any intermittent or terminal drought
- Testing to grow Calliandra trees under Eucalyptus – farmers noted this as a viable option that would make use of the area since other crops do not perform well under Eucalyptus trees
- Growing Desmodium under coffee or on rocky/degraded land where other staple crops do not perform optimally
- Delay vegetative harvesting of cowpea to allow for grain development which attracts higher prices, thereby, likely to be more profitable than the former practice
- Use of certified seeds in place of local varieties or seed stocks from previous harvest which have reduced vigor and which are more susceptible to pest and disease attack
- Adopting Desmodium and Napier grass as part of the push-pull technology particularly in maize systems affected by Striga weed
- Diversifying income sources by adopting use of Calliandra for apiculture owing to the abundant nectar-rich flowers that sometimes last throughout the year and the high quality of honey produced which present business opportunities
- Adoption of intercropping especially where land sizes are small and limiting to expansion of legume production
- Planting tree legumes in field margins and using the stakes for crops not limited to legumes e.g. climbing beans, tomatoes, passion fruits and bananas.

Conclusions and way forward

- The findings from the concluded LegumeCHOICE exercise showed that most farmers had limited understanding of the technical definition of legumes. This activity sought to improve, through the various discussions, the understanding of legumes, the diverse types and functions and benefits/uses of legumes. It also presented a learning platform where the project team learnt of additional uses/benefits of legumes (captured in text) which speaks to the importance and diverse use of legumes in the livelihoods of smallholder farmers.
- It was also encouraging to observe the engagement of youth in farming, although this was more evident in Migori than Kisii. A probable reason for this would be the contextual difference particularly in land size, with Kisii having a greater percentage of sub-divided land, prompting the youth to seek alternative sources of income. However, this observation was inspiring and an important aspect in agricultural sustainability efforts.
- Despite the various constraints mentioned by farmers in their efforts to optimize legume production, we found that knowledge and skills (information) in the different facets of legume production and beyond is key in addressing the challenges. For example, for communities with small land holdings, farmers indicated that knowledge and skills in proper land management would help to overcome the challenges while in communities where land is not limiting, information on 'the right' crop (drought adapted), market (dynamics) information and agro-ecological suitability of crops is considered important. The exercise was, therefore, crucial in laying the foundation for scenario testing which would contribute to strengthening the LC tool for use across scales and as a capacity building platform for extension officers to impart the necessary skills and knowledge to farming communities in matters related to legume production.
- Last but not the least, the exercise acted to cement the good working relationship between the implementing partners (KALRO and ICRAF). The synergistic effect of the collaboration was observed throughout the implementation of activities, coordination and brainstorming on new approaches of arriving at the desired outcome.

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