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LANDSCAPING STUDY

Legume Value-Chains in Ethiopia

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RESILIENCE

SHAYASHONE

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Table of Contents

Abbreviations **4**
Executive Summary **5**

1 Introduction **12**

2 Methodology **14**
2|1 Legume mapping and zone selection 14
2|2 Literature review 15
2|3 Value-chain analyses and business model canvas 15
2|4 Synthesis workshop and national market players 16
2|5 Economic analyses 16

3 Legumes in Ethiopia **17**
3|1 The rationale for supporting legume value-chains 17
3|2 Legume production in Ethiopia 19
3|3 Legume exports 19

4 Legume strategies and projects **20**
4|1 Strategies 20
4|2 Legume programs and projects 21

5 The legume value-chains of Ethiopia **23**
5|1 Faba beans 23
The farm perspective 24
The faba bean value-chain 25
Economic analysis 28
Conclusions and recommendations 29
5|2 Haricot bean 30
The farm perspective 31
The white pea bean value-chain 33
The red haricot bean value-chain 35
Economic analysis 36
Conclusions and recommendations 37
5|3 Chickpea 38
The farm perspective 39
The chickpea value-chains 39
Economic analysis 42
Conclusions and recommendations 43
5|4 Field pea 44
The farm perspective 45
The field pea value-chain 45
Economic analysis 47
Conclusions and recommendations 48
5|5 Grass pea 49
The farm perspective 50
The grass pea value-chain 50
Conclusions and recommendations 51
5|6 Lentils 52
The farm perspective 53
The lentil value-chain 53
Economic analysis 56
Conclusions and recommendations 57
5|7 Groundnuts 58
The farm perspective 59
The groundnut value-chain 60
Economic analysis 62
Conclusions and recommendations 63
5|8 Soybean 64
The farm perspective 65
The soybean value-chain 66
Economic analysis 68
Conclusions and recommendations 69

6 Conclusions and recommendations **70**
6|1 Conclusions 70
6|2 Recommended activities 71
6|3 Crop choice 75

References **77**

Abbreviations

AGP	Agricultural Growth Project
AMDe	Agricultural Marketing Development project (implemented by ACDI-VOCA)
ATA	Agricultural Transformation Agency
BMGF	Bill and Melinda Gates Foundation
CGIAR	Consultative Group on International Agricultural Research
CSA	Central Statistical Authority
ECX	Ethiopian Commodity Exchange
ERCA	Ethiopian Revenue and Customs Authority
EIAR	Ethiopian Institute of Agricultural Research
FCU	Farmers' Cooperative Union
FTC	Farmers Training Centre
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
ISSD	Integrated Seed Sector Development
IVCD	Integrated Value-Chain Development
MoA	Ministry of Agriculture
MoFED	Ministry of Finance and Economic Development
PICS	Purdue Improved Crop Storage
PVS	Participatory Variety Selection
SNNPR	Southern Nations Nationalities and Peoples Region
TL1/2	Tropical Legumes 1 and 2
WFP	World Food Program

Executive Summary

Introduction

The landscaping study investigates eight (non-fodder) legume value-chains in Ethiopia, namely: chickpea, faba bean, field pea, grass pea, groundnut, haricot beans, lentils and soybean. The study analyzed the value-chains in terms of: the key players, farming systems, business models and profit margins. The study followed the integrated value-chain development concept, taking up a systems approach that focuses on the entire value-chain, including: R&D, crop management, input and business services, markets, finance and policy interventions.

Research was undertaken in eleven leading legume production zones. The methodology used is a combination of CIAT's LINK value-chain methodology and standard quantitative economic analyses for farm production, chain margins and comparative profitability. The study deliberately included a large number of local Ethiopian consultants from regional and national knowledge institutes, ensuring local embedding and promoting awareness of the integrated value-chain development approach.

Rationale for legumes

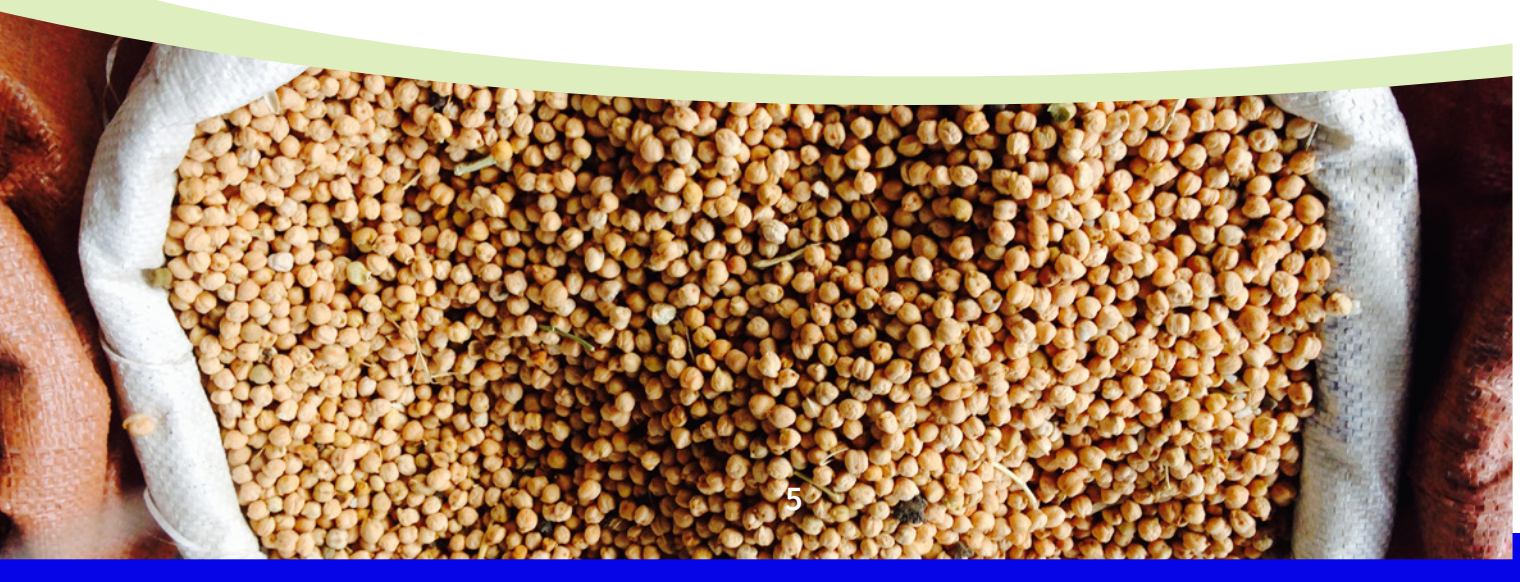
Legumes occupy approximately thirteen percent of cultivated land and are critical to smallholder livelihoods in Ethiopia. Legumes are grown for a number of reasons:

(1) household consumption and human nutrition
(2) household income
(3) export value (hard currency) and
(4) soil health.

Apart from the ability to fix nitrogen from the air, legumes often take up a special position in the farming system as an intercrop or second crop, increasing the overall cropping intensity.

Legume strategies and projects

No detailed legume strategies have been developed so far, except for chickpea. The Agricultural Transformation Agency has developed a National Chickpea Working Strategy. In line with this working strategy the AGP-AMDe (Agricultural Marketing Development project) is working on a wide range of value-chain activities, supporting breeding, seed multiplication, production, postharvest management, marketing, processing and exports. In addition, the N2Africa project has prioritized chickpea in its second phase, exploring business partnerships to expand the availability of quality seed of improved varieties, inoculants and fertilizer products.



Faba bean

The faba bean is Ethiopia's biggest legume crop. It is cultivated in the highlands often in rotation with wheat, barley or teff. Total production in the 2012–2013 growing season was more than 940,000 tons, which accounts for one-third of the total legume production in Ethiopia. The export market of horse bean (faba bean) is growing rapidly and reached close to US$35 million in 2013 (from US$2.5 million in 2005), especially to Sudan.

Our calculations show that wheat and barley are more profitable than faba bean. However, this mainly had to do with the high incidence of diseases during the 2013–2014 growing season. Due to excess rain the crop was affected by the fungal disease, chocolate spot which destroyed great parts of the harvest. Based on other studies and interviews, faba bean ranks higher than cereals in terms of profit margin. At the same time, the relative labor intensive nature of the crop is mentioned as a disadvantage compared to wheat and barley. The analyses show that margins in the chain are relatively low and that farmers receive close to 90% of the retail price.

Haricot bean

The haricot bean (*Phaseolus vulgaris*) or the common bean has reached 360,000 ha while production hit 463.008 tons in 2012. The haricot bean is the major pulse crop used for export and it supplies about 60% of the total export of pulses. The crop is one of the few legumes traded through the ECX (Ethiopian Commodity Exchange). In 2013 alone, Ethiopia exported for US$210 million mainly to Europe and the Middle East. Currently, the white pea beans from the Northern Rift Valley dominate the export market, though an increasing number of traders are sourcing red (kidney) beans for export to Kenya. Farmers refer to haricot bean as a 'First Aid Crop' due to its early harvest. Farmers use the bean to sell and pay the most urgent bills of school fees and credit taken from MFIs or informal money lenders.

The economic analysis confirms that haricot bean has a high profit margin compared to maize and especially potato, though yields are much lower. The overall profitability is mainly because of the high farm gate price. In general labor requirements are lower than faba bean due to a less intensive process of harvesting and threshing. In the case of the kidney bean, the farm gate price is less than 80% of the wholesale price. Overall, the prices for kidney bean are set by the exporters who take the Kenyan market as a reference point. Prices in Kenya have increased gradually over the last two years, from US$580 to US$660 per ton, and also 2013 is reportedly higher. Interviews confirmed that substantial quality problems exist in the chain. Pea beans commonly contained 20% impurities and moisture content was high, necessitating further cleaning and causing a reduction in shelf-life.

Chickpea

In 2013, Ethiopia ranked fifth in world production of chickpea with more than 400,000 metric tons. Ethiopia is by far the largest chickpea producer in Africa, with close to 40% of total production in 2011. Exports have increased gradually over the last five years from US$40 million in 2008 to more than US$60 million in 2013. Production of chickpea has four distinctive advantages:

(1) it is little labor intensive
(2) the crop can be grown as a second crop using remaining residual soil moisture
(3) it is highly nutritious and
(4) the growing demand in the domestic and export markets provides an important source of cash to farmers and foreign exchange to the country.

Chickpea is an important household food security as well as a cash crop. It is estimated that 40% of the product is consumed by the rural community itself, around 50% is marketed to the regional and central markets, while 10% is reserved as seed for the next season.

Chickpea, though often used as a second crop, still competes well with the main season crops teff and maize in terms of profitability. This is partly due to lower costs in terms of land preparation and weeding and also because yields are still relatively high. Farmers benefit from an increasing export market price that grew from around US$540 in 2010 to US$735 in 2012. Farm gate prices are around 80% of the retail price for chickpea. Chickpea production has grown by 30% over the last five years. A specific trend that can be observed for most legumes is visible in the chickpea chain, that of increased processing through local and regional processors (the so-called *baltenas*). In earlier times, each family prepared its own sauces at home. Nowadays more and more urban and rural consumers turn to *baltenas* which produce the split chickpea (*kike*), processed hot pepper (*berbere*) and mixes like *shiro*. It has become an industry that includes both household businesses and larger companies, spreading from rural towns to the major cities.

Field pea

In 2012 Ethiopia produced more than 325,000 tons of field pea, making it the fourth most important legume of the country. Field pea is grown in the wheat, barley and *teff* farming systems. The national average of field pea productivity is around 13 quintal per hectare and the crop is considered as a rotation crop with cereals. On average farmers take 75% of the produce to the market of which 45% goes to local collectors, 20% to wholesalers and 10% directly to consumers.

The economic analysis shows that field pea was not profitable during the 2013–2014 growing season, which was influenced by a stem disease and a worm outbreak. In other years field pea would be more profitable than *teff* but less profitable than faba bean. Production costs for field pea are relatively low, as farmers hardly use improved seed, fertilizers or crop protection products. Field pea has been a more or less 'forgotten crop' in the Ethiopian pulses sector. Still, it contributes to 300,000 tons of production each year and 1.8 million farmers plant 0.10 hectare or more of the crop. The fact that it is often a third or fourth priority crop for the farmer and the limited exports, have caused limited attention for the crop.

Grass pea

Grass pea (*Lathyrus sativus* L.) is the fifth most important pulse crop in Ethiopia. It is a particularly important crop in areas that are prone to drought and famine, and is thought of as an 'insurance crop', as it produces reliable yields when all other crops fail. Consumption of *Lathyrus sativus* is associated with the disease neurolathyrism. The neurotoxic amino acid present in the crop can cause irreversible nervous disorders, such as paralysis and can leave patients crippled for life when consumed as a major portion of the diet.

At the same time grass pea has huge advantages compared to other legume crops: yields are relatively high; labor requirements are low; it can be grown as a relay crop; and it is resistant to droughts and floods. However, all these advantages pale in comparison to the detrimental health impacts of the crop. The neurological illnesses that the crop can cause by far outweigh its benefits and any recommendation should focus on developing and introducing low or zero ODAP content containing varieties.

Lentils

More than 150.000 tons of lentils were produced in 2012. Lentil is one of the heavily consumed pulse crops domestically as it is popular during the fasting days (more than 200 days per year for Ethiopian Orthodox Christians). The demand for this commodity, both in local and international markets, has increased significantly in recent years. Its local price is higher than most pulse crops and this probably caused the sharp increase in production between 2006 and 2012 of more than 60%.

Lentil is a popular crop, mainly for four reasons:

(1) it is drought resistant
(2) prices are high and there is an increased market demand
(3) it has a low labor and input requirement and
(4) lentil stalks fetch a good price as cattle feed.

Current market price are at ETB1500 per quintal, which is almost double that of field pea. This is directly reflected in the percentage of marketed product, which is at 90% indicating that almost all is sold. Margins in the chain are relatively low, leaving an ETB100 per quintal margin between farm gate and Addis Ababa wholesaler. Attention for the crop has been marginal, though still around 1 million households have lentil in their cropping system (on an average of 0.15 hectare).

Groundnuts

The current production of groundnuts stands at close to 125,000 tons per year. The produce is mainly consumed within Ethiopia and a small portion, around US$1.5 million, was exported in 2011. In the last five years groundnut production has increased rapidly by 165% mostly through area expansion and a modest productivity increase. Crucial in groundnut production is the postharvest handling (drying and storage), which, if not done properly, can lead to fungal infestations causing *aflatoxin*. Recent research shows that Ethiopian groundnuts exceed internationally standards substantially.

The value-chains indicate that most trade is going through the regular (non-cooperative) trade channels of: local traders (aggregators); regional traders and wholesalers; and central markets (60–65%). Some 5% of the produce runs through the cooperative-union channel. During the 2013–2014 growing season groundnuts did not particularly perform well in the comparative analysis with other crops. The main reason for this was the incidence of disease and adverse weather conditions. However, at a price of more than ETB1,000 per quintal and at yields of 1.1 to 1.5 tons, groundnuts remain a competitive crop. Groundnuts are an important cash crop and around 80% is marketed. The production cost graph shows that the harvesting and threshing are major cost components. This has to do with the laborious nature of the groundnut harvesting and drying, as well the subsequent shelling.

Soybean

The production of soybean has grown rapidly over the last years, doubling in production every year since 2010. Currently Ethiopia produces around 60,000 tons. Soybean scores high in terms of relative profitability. It performed both better than maize and sorghum in 2013. This is mainly due to the high yields for soybean (compared to sorghum) and lower costs (compared to maize). The analyses show that soybean is a typical cash crop with 95% sold to the market. Also, export prices have increased significantly in the 2010–2013 period, contributing to the boom in soybean exports from Ethiopia in 2013.

Soybean is a relatively new product in the Ethiopian market, doubling in production almost every year. This has created some serious demand-supply issues as the major Addis Ababa based processors cannot keep up with supply. The market potential for soy is huge given the enormous growth in dairy, animal fattening and the health food sector. It is expected that this bumpy road of supply-demand corrections will flatten out over the next years as more market players step in and soy becomes a more important ingredient in the Ethiopian diet.

Conclusions

The study found that the legume processing industry, both small-scale and large-scale, is joining in the production boom and overall economic growth of Ethiopia. A number of food products are now being processed by small and bigger factories where formerly these were produced at home or imported. Most notable are: *shiro* (the combination of milled peas, spices and salt), *kike* (split peas), baby food, soy milk (powder), soy chunks, corn-soy blends and plumpy nut (both for emergency, supplementary food), as well as peanut butter and peanut snacks.

A second conclusion is that the supply chains of most legumes (especially more centrally located) are relatively well organized and products move quickly at low transaction and transport costs between the different trade levels. In addition, farmers often only sell a small portion in the first two months after harvest (around 30%) and gradually sell the remainder over the next three to seven months (70%). These findings contradict the often heard notion that the middlemen are squeezing out farmers and that farmers enter into rapid sales of most of their produce directly after harvest.

One of the main issues in the trade are related to the quality of the product (moisture content, level of admixture and impurity) price transparency and trust in the chain. There is still much to be gained from more transparent grading systems, with clear quality standards and related pricing. This can increase the overall value of the chain benefiting farmers, traders, and wholesalers, processors and exporters.

The role of the cooperative-union system is important for the input supply of fertilizers and to a lesser extent seed. In terms of output marketing the cooperatives and unions play a marginal role in the legumes sector. In ten of the eleven studied zones the role of the cooperatives was minimal and when active their role was confined to input supply. Our study found that the more important trade channels are: local traders (60%), consumers and other farmers (20%), and household use and farm saved seed (20%).

The formal seed system for legumes is poorly developed. Most farmers rely on their own farm saved seed (harvest of the last season), neighboring farmers or the local grain markets. Only for haricot bean in SNNPR a more sophisticated system has been set up. Legumes often are less interesting for the private seed sector as they are relatively bulky (100–200 kg seed is required per hectare) and farmers only buy occasionally.

Legumes often came out as one of the most profitable crops in the farming system. This was the case for faba bean, haricot bean, chickpea, grass pea and soybean. It reflects the strongly changed role of legumes in the domestic and export market, as well as in the Ethiopian diet. At the same time, in all legumes farming systems, the high labor requirements and the strong yield fluctuations due to the high disease pressure are two of the greatest bottlenecks for further growth.

Recommendations

The following recommendations are provided for follow-up activities:

- To increase the availability of quality seed of improved varieties, two pathways can be taken:
  (1) support for large-scale private farms engaging in seed multiplication of especially soybean, chickpea and haricot bean and
  (2) multiplication through seed producer groups for faba bean, field pea, lentils and groundnut.

- To further boost productivity the inputs (seeds, fertilizer, inoculants, plant protection products) need to be available and accessible to farmers. For accessing these inputs, we recommend three models:
  (1) the cooperative model
  (2) the private agro-dealer model and
  (3) the chain integration model.

- To address the issue of improved agronomic practices, we provide two options:
  (1) leverage the extension system through dedicated legume specialists and the establishment of informal legume commodity groups and
  (2) agronomic advice through chain integration with larger processors and exporters.

- To decrease the labor requirements of the crop, both at production and processing level, we recommend to support the development, introduction and outscaling of low-cost, small-scale technologies. A fair number of these are already available and are described in the report.
- To improve the quality of the different legume products clear incentives in the chain are necessary. It is proposed that clear and specific legume grades are developed that provide transparency to farmers on prices, related to moisture content, admixture, impurity, seed color and seed size.
- To improve the credit possibilities for local traders, smaller wholesalers and processors. Support could be developed to entice commercial banks and MFIs to set up shop in key legume clusters.
- To improve packaging and storage. It is recommended to increase availability of better packaging materials (e.g. the PICS bags) and provide trainings on good warehouse management to traders and wholesalers on: drying, sorting, warehouse design, and judicious use of pesticides.
- To enhance chain integration with the larger processors and exporters. It is advised for this activity to go beyond the 'usual suspects' and include a number (5–10) of potential, emerging medium sized, Ethiopian processors and exporters.
- To reduce the level of β-ODAP content in grass pea. Internationally, varieties with lower β-ODAP content are available which could be tested and popularized in Ethiopia. The relative importance of the crop, both in overall production and as an essential part in the diet of food insecure households, justifies action.
- To reduce the proliferation of aflatoxin in groundnut. The toxin can be contained through proper drying and storage.
- To improve coordination in the chain. Business Platforms have been successful in bringing together value-chain players, development of joint agendas and implementing chain interventions. Business Platforms can be envisaged at (zonal) cluster level or at national level.

Crop choice

Based on the criteria of volume, production growth rate, priority crop in the farming system; market demand; opportunities for local processing; food security situation; women involvement; and potential linkages to other projects and programs, the following crops were selected:

- ***Faba bean***, because of its sheer size, good market outlook (both domestic and international), opportunities for local processing and potential linkage to N2Africa's activities.
- ***Haricot bean***, as second biggest pulse crop in Ethiopia, with a good market outlook which can significantly impact the food security situation while strong linkages can be developed with N2Africa.
- ***Groundnut***, though a relatively small crop, has the advantage of being confined to specific hotspot areas, with rapid production growth (30% per year) and good opportunities for local processing. The crop can make substantial impact on the livelihoods of the involved farmers.
- ***Soybean***, with its strong geographic concentration can facilitate cluster formation, the nutritional impacts can be large and it can easily link to existing initiatives like N2Africa. In addition, its growth rate is enormous, doubling every year since 2009.

- We deliberately do not recommend chickpea. This is because we feel already many programs and projects are focusing on this crop, including substantial value-chain activities.

1 Introduction

Resilience and Shayashone *have been requested by the* ***Bill and Melinda Gates Foundation*** *to undertake a Landscaping study for the Ethiopian legumes sector. The landscaping study investigates eight (non-fodder) legume value-chains in Ethiopia, namely: chickpea, faba bean, field pea, grass pea, groundnut, haricot beans, lentils and soybean. The value-chain landscaping study focuses on the in-depth analysis of a number of value-chains in terms of the key players, farming systems, business models and profit margins.*

Rationale

Legume crops are Ethiopia's second most important group of crops, after cereals, and together they provide food and income to more than 10 million households. The overall acreage of production is close to 2 million hectares and overall output is almost 3 million tons. At the same time, attention for legumes, both from government and development partners, has been limited. Currently, a number of initiatives are implemented for breeding (EIAR, TL1, TL2, CCRP-McKnight) and agronomic practices (N2Africa), however limited activities exist on the wider adoption of technologies and market development. Only for chickpea substantial value-chain work is undertaken, especially by ATA and the AGP-AMDe program. Therefore, an additional value-chain project is foreseen, funded by the Bill and Melinda Gates Foundation (BMGF) that will fill the gap. The envisaged project should ensure that the developed technologies are being spread sustainably through new and existing markets and institutions. In addition, it wants to ensure that surplus production, boosted by increased productivity, finds a ready market with higher returns for all chain actors.

The IVCD Approach

Important elements of the BMGF Integrated Value-Chain Development approach that distinguishes it from other value-chain development approaches are:

- A systems approach: focusing on the entire value-chain, including R&D, crop management, input and business services, markets, finance and policy interventions.
- A focus on innovation and learning, through different cycles, aiming at up- and outscaling of new technologies.

In ***Chapter 2***, Methodology, more attention will be given to the operationalization of the IVCD approach and the specific methodologies used for this study.

Specific objectives

More detailed objectives of the study are to:

- Promote awareness of the IVCD approach.
- Conduct a market and mapping assessment of eight legume target crops including information at the regional and *woreda* levels.
- Delineate characteristics of existing legume value-chains, including for each value-chain significant information on all stakeholders and market players.
- Analyze production dynamics, with a focus on small-scale farmers, trends over the last years, and forecasts for the next years based on data and expert intelligence.
- Quantify market flows (including household consumption) for the main geographical legume production areas.
- Prioritize the respective legume value-chains in terms of chain structure, power and influence, and cost/benefits to market development, economic viability, and nutritional impact.
- Understand and identify farmer organizations, both male and female, currently or potentially interested in legume value-chains.
- Conduct a mapping of existing initiatives (including TLII, N2Africa, CCRP/McKnight, and others) promoting improved practices in legume seeds, production, crop management, marketing and/or general legume value-chain strengthening.
- Identify and document key strategies and programs of the federal (including ATA) and regional governments relevant to legume value-chains.
- Compile data on legume production and markets.
- Define a number of recommendations for future interventions and business opportunities in the selected legume crops value-chains.

Outline

Chapter 2 describes the methodology of the study, including the value-chain analysis, business model canvas, cropping system methodology and economic analyses. ***Chapter 3*** describes the existing plans and initiatives in Ethiopia's legumes sector, both from government and non-government partners. Next, ***Chapter 4*** provides a general outline of Ethiopia's legumes sector, the production areas, size and exports. In ***Chapter 5*** the value-chain, farming systems and economic analyses are described, for each of the eight legumes separately. Lastly, ***Chapter 6*** provides the main conclusions and recommendations for follow-up activities. It also provides recommendations for the legume crop choice and geographic areas.

2 Methodology

The methodology describes the way in which the data were collected and processed. This applies to the different activities undertaken for the production of maps and graphs, the literature review, interviews with national programs and projects and the value-chain analyses.

2|1 Legume mapping and zone selection

The first phase concerned the selection of specific legume production zones for in-depth research. Both primary and secondary data were used to this end. The primary data was collected for eleven leading production zones of the specific legumes. The zones were selected on the basis of major production areas of the respective legumes. In the specific crop chapters these zones are presented. Below a list is provided for the top three biggest production zones of the eight selected legumes. Out of these, eleven zones were selected (in bold). The final selection was made by also including other criteria than production volume, like: legume type (e.g., white and red haricot bean), as well as regional spread (e.g., North Showa, Oromiya instead of North Showa, Amhara for faba bean).

Information was gathered from different actors starting from *kebele* to national level, using one-to-one interviews and focus group discussions. Three major sources of data were used: the Central Statistical Agency (CSA) of Ethiopia for production data, the Ethiopian Revenue and Customs Authority (ERCA) for export data and IFPRI for the shape files of the maps. To a lesser extent data was collected from the Zonal or Woreda Offices of Agriculture.

The CSA publishes annual production data for the *Meher* (June–November) and *Belg* (February–June) seasons. The *Meher* is the main production season that accounts for over 95% of the national annual crop production. The analysis for this report was, therefore, based on the *Meher* season production. Another reason for not using *Belg* data was that these were often incomplete for the majority of the legume crops. Generally, the *Meher* season gives a good overall picture of the hotspots for legume production and could sufficiently guide the production area selection. One exception has been the haricot bean, which has a relatively high volume of production (35%) during the Belg season. This has been incorporated in the final analysis and selection of chains (especially for SNNPR).

	1	2	3
Faba bean	North Showa (A)	**North Showa (O)**	**Arsi**
Haricot bean	**East Showa**	West Hararghe	**Sidama**
Chickpea	**North Gonder**	**West Showa**	East Showa
Lentil	**North Showa (A)**	East Showa	South Wollo
Field pea	**South Wollo**	Arsi	West Showa
Grass pea	**South Gonder**	North Wollo	West Showa
Groundnut	**East Haragehe**	**Metekel**	West Hararghe
Soybean	**Metekel**	Illuababor	Horoguduru

Table 1 *Selection of zones for in-depth value-chain analyses*

Legumes have gradually become a key export commodity for Ethiopia, generating an export value of over US$340 million for 2013. As such the export value-chain is an important component of this study and ERCA data are used for this. For some legumes, especially faba bean, red haricot bean and chickpea, a relative large volume of 'informal' cross-border trade was reported, however, it was difficult to get more quantifiable information on these flows. Estimations are provided in the detailed crop reports.

2|2 Literature review

The literature review of the eight legumes revealed that relatively much information is available for the chickpea and haricot bean value-chains, while limited information is available for faba bean, groundnuts and soybean. Hardly any specific information could be found for field pea, grass pea and lentils. The literature review reconfirmed the necessity for the detailed value-chain crop reports.

In the literature review specific attention was paid to the value-chain organization in terms of the composition of: chain actors, chain supporters and stakeholders in the enabling environment. This analysis further informed the field work in which the major value-chain stakeholders were invited for a one-day workshop to map and analyze a specific value-chain, and describe product flows and current marketing channels and business models.

2|3 Value-chain analyses and business model canvas

The initial literature research and interviews provided some general information on the different farming systems and value-chains. For most legumes we were able to get at least a general picture on the chain actors, service providers and stakeholders in the enabling environment. Furthermore, the literature provided some indication of the position and relative importance of the legumes in the farming system and livelihoods of the (smallholder) farmer. At the same time, the literature and interviews indicated that much information was lacking. To fill these gaps we undertook field research in the selected areas. Before the field research started the field consultants were trained during a two-day training in Addis Ababa. During the training, common understanding was developed on the methodology, its approach and definitions. As part of the training the three components of the LINK methodology: the value-chain mapping, business model canvas and farming system analysis, were discussed. The teams also got hands-on practical experience through interviews with national market players (FAFA and AgroProm).

We used an adapted version of the LINK value-chain methodology. The first version of the LINK methodology was developed in 2012 with support of the Bill and Melinda Gates Foundation. CIAT developed the methodology to assist NGOs, researchers and farmers to improve linkages between (small-scale) primary producers and the market. The LINK methodology has proved most effective when implemented in combination with a start-up value-chain multi-stakeholder workshop. Therefore, the value-chain analysis always started with a one-day workshop of key value-chain stakeholders. The selected local consultants, with the support of one of the national consultants, organized and facilitated these one-day workshops. After the workshop follow-up interviews with key stakeholders and informants were undertaken to triangulate the information. Key data gathered included: yields, production practices, household consumption, local marketing, local processing, prices, and challenges and opportunities.

The LINK methodology consists of an extensive toolkit and for this report we used the following elements:

- ***Value-chain stakeholder mapping***
  After completing the visual mapping, the structure and governance of the value-chain is written out. This exercise was already done before organizing the workshops, so as to ensure the most important stakeholders were selected. These included the value-chain operators, service providers and actors in the enabling environment. During the workshop the actors were asked to improve, reduce or add on the value-chain maps.
- ***Business canvas modeling***
  During the one-day workshop in-depth information was gathered on the reasoning of the stakeholders, including information on the company's networks, business risks and opportunities. An adapted version of the Ostenwalders' business model canvas was used for this.
- ***Value-chain in-depths interviews***
  After the one-day workshop, the local teams had sufficient insight in the general functioning of the value-chain and the business models of the key stakeholders. The results were evaluated and additional interviews with key stakeholders were planned.
- ***Farming system analysis***
  Considering the objectives of the project more information was needed on the socio-economic situation, consumption patterns and the production systems of the (smallholder) farmers. Therefore, a number of additional interviews were undertaken with key legume farmers and their families. These interviews were undertaken in a (semi) structured manner. The consultants have used the cropping calendar to get more insights in the activities and the cost of producing the pulse and the position it has in the farming system.

For all the components of the fieldwork, standard output sheets and checklists were developed and filled in. All local consultants returned to Addis for the synthesis workshop during which all the individual reports were discussed and follow-up work was agreed upon. Based on the inception report and the individual reports the final report was compiled.

2|4 Synthesis workshop and national market players

The synthesis workshop was organized to synchronize the regional teams' analyses and discuss on the major value-chain findings. During the workshop each team presented its value-chain maps and business model canvasses. The results showed a relative high degree of variation in the findings but the teams had the opportunity to rework their analyses and reports on the basis of the feedback from the other teams (especially where it concerned similar crops) and from the national team. Assignments were given to elaborate further on specific issues, do follow-up interviews and further substantiate some key findings. Accordingly, the teams worked on that for an additional two weeks after which the final value-chain reports were submitted.

In addition, at national level, interviews were undertaken with major market players engaged in: the processing industry, exports and wholesale business. These market players were: two regional market centers, Guts Agro-Industry, Hilina Health Foods, Pramukh Agro-Industry, FAFA Foods, WFP, ECX and ACOS Ethiopia.

2|5 Economic analyses

After the synthesis workshop additional research was undertaken with a special focus on the quantitative value chain, farm production and profitability analyses. This research was undertaken with a focus on seven of the main legumes; all except for grass pea. Before commencing with the fieldwork two extensive (semi) structured questionnaire and output sheets were developed. The questionnaire was tested in the field and finalized based on the experience.

The first questionnaire and output sheet focuses on the farmers; including farm profitability and the position of the legume in the farming system. The analysis compared the cost of production of the legume with the cost of production of competing crops in the farming system. In addition, the analysis quantified all aspects associated with the cost of production, including: labor, inputs and marketing costs. Besides the cost of production the revenues and the fluctuation of the farm gate price during the year and over the last three years were collected. The data informed the comparative advantage of the crops, the productivity impact of the inputs, and the weight of the different production cost components. For each legume at least three representative farmers were interviewed.

Besides farmers also other stakeholders along the value-chain were interviewed to get more insight in the price differences along the value chain and over the year. For each of the value-chains, traders at different levels of the value-chain as well as processors were interviewed. Information on market prices was compiled at three levels: local, regional and national. The local market is the market in which farmers are selling their products, e.g., Borecha for common bean, Gibe for chickpea and Jiru for lentils. The regional market is where there is an aggregation of products from nearby woredas, e.g., Assela for faba bean, Shashemene for haricot bean, Deber Berhane for lentil and Wolkite for chickpea. The Addis Ababa and Adama markets are the national markets where exporters and processors are based.

In total 22 farmers and 10 value-chain actors were interviewed and the research was conducted with a focus on the value-chain and production of faba bean in Arsi, lentils in North Showa (A), chickpea in West Showa, soybean in Metekel, haricot bean in Sidama and field pea in South Wolo.

Three different methods were used to validate the data from respondents: observation, expert views and secondary data. The team of field researchers went to different market places to have an idea about the prevailing prices and market performance. Also an interview was conducted with agricultural experts on selected crops, namely: soybean, haricot bean and lentils. This was done in order to substantiate the production data from farmers.

3 Legumes in Ethiopia

3|1 The rationale for supporting legume value-chains

Legumes occupy approximately 13 percent of cultivated land and are critical to smallholder livelihoods in Ethiopia. Legumes are grown for a number of reasons:

(1) household consumption and human nutrition
(2) household income
(3) export value (hard currency) and
(4) soil health.

In terms of household consumption legumes score well as a cost-effective source of protein that accounts for approximately 15 percent of protein intake (IFPRI, 2010). A recent study by the Monitor Group (2012) shows that legumes are much more cost effective than other protein sources like beef or chicken (***Table 2***). Especially soybean ranks well in this respect with 918 grams of protein for 1 dollar. Also the protein quality, the types of available amino acids, are well represented in legumes, making it an excellent ingredient for combating malnutrition. For example WFP's 'super cereal,' used a lot in emergency relief, consists of maize, soybean and chickpea; and is very high in both energy (380 kCal/100 g) and protein (at least 14%) (WFP, 2013).

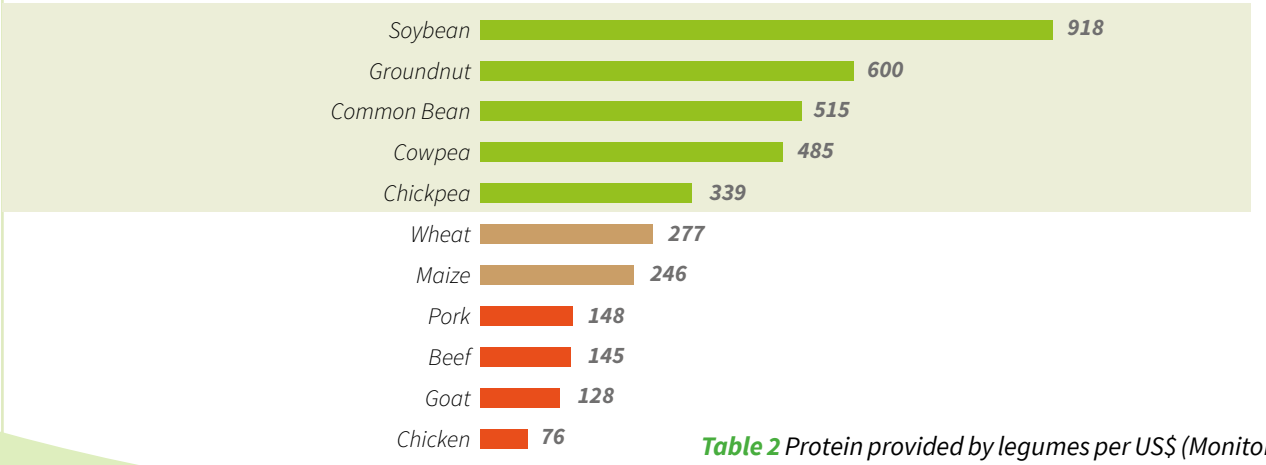


Table 2 *Protein provided by legumes per US$ (Monitor Group, 2012)*

Increasingly, also, legumes have become a cash crop for Ethiopian farming households. Specific gross profit analyses show that legume production is more competitive or at least similar to cereal production, without even taking into account the additional benefits of nitrogen fixation or double cropping (***Table 3***, IFPRI, 2010). Both faba bean and chickpea score high in this respect.

Item	Wheat	Barley	Teff	Faba bean	Chickpea, Desi
Gross returns	3,486	2,656	2,961	2,521	6,204
Total costs	2,761	2,473	2,366	1,235	5,484
Net profit	725	183	595	1,286	720

Table 3 *Gross margin analysis for selected crops (US$ per hectare)*

Thirdly, legumes have become an important export crop, contributing significantly to Ethiopia's balance of payments. They are the third-largest export crop after coffee and sesame. ***Chapter 3.3*** elaborates further on the export trends and dynamics.

Lastly, legumes have a number of very specific agronomic benefits. The most renown of these is the capacity to fix nitrogen from the air, whereby replenishing soil fertility. ***Table 4*** gives an overview of the nitrogen fixation capacity of a number of selected legumes. In addition, some legumes perform well under very dry circumstances (chickpea and lentils) or under very hot conditions (groundnuts and soybean).

The table also indicates that legumes not automatically contribute to the overall nitrogen balance of the soil. E.g., in the case of haricot bean it is often the case that the nitrogen removed in the crop is more than the nitrogen fixed in the soil. The table also shows that especially faba bean and soybean score well in terms of biological N fixation. Combining this with soybean's nutritional characteristics and relative high productivity, it makes it the 'miracle crop.'

Apart from the ability to fix nitrogen from the air, legumes often take up a special position in the farming system as an intercrop or second crop, increasing the cropping intensity. Especially chickpea and grass pea are known for utilizing the residual soil moisture that remained after the main cropping season still producing a regular yield. In turn, the fast growth of legumes can improve the soil-protective land cover (protecting the soil from wind and water erosion) and helps to break pest, disease and weed cycles in cereal cropping systems (CGIAR, 2012).

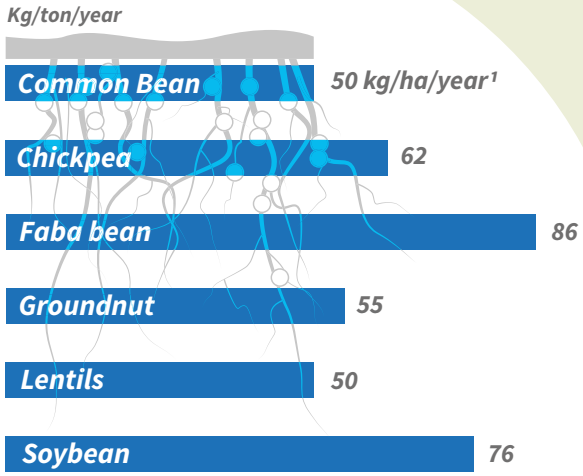


Table 4 *Biological nitrogen fixation of a number of legumes (CGIAR, 2012)*

3|2 Legume production in Ethiopia

The eight main legumes widely grown in Ethiopia are: faba bean (*Vicia fava* L.), chickpea (*Cicer arietinum* L.), field pea (*Pisum sativum* L.), grass pea (*Lathyrus sativus* L.), and lentil (*Lens cultinaris* Medik.) for the cooler highlands and On haricot bean (*Phaseolus vulgaris* L.), groundnut (*Arachis hypogaea*) and soybean (*Glycine max* L.), for the warmer mid and low altitudes of the country. More information will be provided in the individual crop chapters (***Chapter 5***).
The following table shows the national production of these eight legumes for the last years:

	2007	2008	2009	2010	2011	2012
Faba bean	688,667	695,984	610,845	697,798	714,796	943,964
Haricot bean	241,418	329,775	362,890	340,280	387,802	463,008
Chickpea	286,820	312,080	284,640	322,839	400,208	409,733
Field pea	231,934	267,093	235,872	257,031	263,266	327,378
Grass pea	166,000	165,000	202,000	174,000	305,000	325,581
Lentil	94,103	94,773	123,777	80,952	128,009	151,500
Groundnut	44,685	46,887	46,425	71,607	103,479	124,419
Soybean	8,401	7,899	4,279	15,824	35,880	63,653

Table 5 *Total production volumes (tons) by small-scale farmers for eight selected legumes (CSA, 2013)*

Overall, faba bean is the largest leguminous crop in Ethiopia followed by haricot bean and chickpea. Field pea and grass pea serve as an important food security crop in many areas and still account for more than 300,000 tons each. In total, Ethiopian legume production accounts for almost 3 million tons. At present, virtually all legume production in Ethiopia is undertaken by smallholder farmers with limited external inputs on plot sizes of up to 1.5 ha. Only for soybean large-scale farming is quickly picking up with major investors focusing on the crop, especially in the regions of Beneshangul-Gumuz and Gambella. Given the high population pressure, farm sizes are small and 56% of farming households farm on less than one hectare.

3|3 Legume exports

Exports of legumes have boomed over the last years and legumes are now the third most important group of export commodities, after coffee and sesame. The following table shows the trend of the last years:

Especially haricot bean, faba bean and chickpea have contributed to the share of the overall export value of almost US$350 million. A relative 'new kid on the block' is soybean. Especially higher world market prices for soy and the fact that all Ethiopian soybean is non-GMO, have significantly contributed to this sharp increase.

	2007	2008	2009	2010	2011	2012	2013
Haricot bean	76,291	84,583	81,308	84,012	111,813	150,764	209,111
Faba bean	41,051	47,258	48,853	54,743	39,640	40,867	34,599
Soybean	1,657	2,120	462	357	1,004	4,221	36,555
Chickpea	43,890	41,592	37,579	54,129	49,499	74,005	61,624
Field pea	3,006	2,766	2,668	600	680	464	266
Lentil	6,390	10,813	12,947	17,640	1,152	0	40
Groundnut	41	97	134	144	2,130	23,450	3,395
Total	**172,326**	**189,229**	**183,951**	**211,625**	**94,105**	**293,771**	**345,590**

Table 6 *Export (in 1,000 US$) for the seven legumes (ERCA, 2013)*

4 Legume strategies and projects

4|1 Strategies

The Growth and Transformation Plan

The overall agricultural strategy for Ethiopia is laid out in the Agricultural Growth and Transformation Plan (A-GTP, 2011–2015), which is currently under review for the second phase (2015–2020). The A-GTP focuses on three intervention approaches in particular (MoFED, 2010):

- scaling up model farmers' practices to all farmers
- improving agricultural water use and expanding irrigation development
- transforming farmers to producing high value agricultural commodities.

Especially approaches number one and three are important for the legume subsector. The extension objective indicates that through selecting model farmers and further supporting them, agricultural productivity will be increased. The third focuses on further supporting the adoption of high-value cash crops. Though it can be debated whether pulse crops fall into the latter category, often they are included especially where it concerns the export legumes (haricot bean, chickpea, faba bean and soybean). Though specific objectives have been formulated in the A-GTP for the coffee, livestock and horticulture sector, the legumes sector is relatively absent from the document.

ATA's Chickpea Strategy

No detailed legume strategies have been developed so far, except for chickpea. The Agricultural Transformation Agency has developed a National Chickpea Working Strategy. The vision of the chickpea strategy is to:

> Have an efficient and well-functioning chickpea value-chain that contributes to improved food security, smallholder incomes, and environmental sustainability in Ethiopia, through a sustainable increase in on-farm productivity and strengthened marketing channels, enabling reliable and profitable access to domestic and international markets (ATA, 2013).

Important interventions are described that follow six components of the value-chain:

- ***Research and technology development:*** Targeted research programs are in place to develop and verify improved varieties, improved agronomic practices, and mechanization technologies to address issues specific to each chickpea-producing agro-ecology.
- ***Inputs production and distribution:*** Farmers have access to affordable and high-quality inputs, including improved varieties and appropriate fertilizers and pesticides, leading to substantial yield increases.
- ***On-farm production:*** Farmers have knowledge of and adopt proven agronomic practices and mechanization technologies, leading to substantial yield increases.
- ***Post-harvest processing:*** Farmers have knowledge of, and access to, post-harvest techniques and machinery, as well as storage capacity and management practices, reducing post-harvest losses and improving product quality.
- ***Trade and marketing:*** The marketing chain is streamlined for improved transparency and efficiency, and farmers are able to capture a significant share of the final price of grain.
- ***Demand sinks:*** Sufficient high-quality product is available to satisfy local demand, with a view to increasing domestic processing opportunities and competitiveness in export markets.

The strategy and its components are currently being implemented by a wide range of organizations, amongst others: MoA, EIAR and AGP-AMDe program (see also 3.2).

The Ethiopian Commodity Exchange

The Ethiopia Commodity Exchange (ECX) commenced trading operations in April 2008, firstly focusing on maize and wheat but quickly changing its direction to export crops like coffee and sesame. ECX is the marketplace that aims to serve all market actors, from farmers to traders to processors to exporters to consumers, for selected crops.

ECX aims to assure all commodity market players a level of trading security and transparency through providing a secure and reliable end-to-end system for handling, grading, and storing commodities, matching offers and bids for commodity transactions, and a risk-free payment and goods delivery system to settle transactions. ECX intends to create trust and transparency through a wide dissemination system of market data to all market actors. In addition, they have established clearly defined rules of trading, warehousing, payments and delivery and business conduct, and also have embedded an internal dispute settlement mechanism within the institution.

About 700 people currently work at the ECX or their warehouses. The cost of operations are recovered by withholding a 0.4% transaction fee on each transaction. To trade at the ECX you need to have a seat at the trading floor. Currently there are 346 members that represent about 12,000 clients (both buyers and sellers). The holders of the seats charge a percentage for their services. The ECX further supplies the following services to improve trade conditions: warehousing for temporary storage, market data dissemination (e.g., on-demand through SMS services and television programs), capacity building programs and finally grading and certification services. Currently the ECX facilitates the trade in: coffee, sesame, wheat, maize and white pea beans.

In addition, the ECX plans to include red haricot beans and chickpeas to the list of tradable commodities in 2015. The latter commodities however, will, initially, not be mandatory to ECX trade (like e.g., in the case of coffee, sesame and white pea bean). For the mandatory ECX commodities an exception exists for cooperatives and unions, they are allowed to export directly. In general, the ECX has made it more difficult to promote specific value-chain integration, as all products need to go through the ECX system (e.g., Ferris et al, 2012). However, for farmers it has created price transparency and for bulk commodities the system seems to work well.

4|2 Legume programs and projects

Below a summary is provided for the six national organizations and projects involved in the legume value-chains: ACDI-VOCA, CCRP-McKnight, IFDC, N2Africa and TL2. Some important intervention approaches and value-chain observations are also mentioned. In addition, a new initiative of PICS (Purdue Improved Crop Storage) will be highlighted as well.

AGP-AMDe/ACDI-VOCA

The Agricultural Marketing Development project is an AGP (Agricultural Growth Program) aligned project that focused on six commodities: coffee, wheat, maize, sesame, honey and chickpea. With respect to chickpea they focus on end-2-end value-chain work, supporting breeding, seed multiplication, production, post harvest management, marketing, processing and export. They also support the PepsiCo initiative for chickpea exports as well as other joint ventures in the processing sector. They have offered a number of innovation grants for the chickpea sector and they have established two chickpea platforms in Oromiya and Amhara.

CCRP-McKnight

CCRP McKnight is a BMGF supported project that focuses on neglected and underutilized species (finger millet, *enset, teff* and cowpea). They mainly work through the Ethiopian Institute of Agricultural Research. In the legume sector they focus on cowpea, which was not selected as a priority crop for this study.

IFDC-2SCALE

IFDC is working with a number of business clusters promoting productivity increase and market linkage. They are currently working on nineteen clusters in the sesame sector (working together with the Sesame Business Network), four clusters in the potato sector and three clusters in the soybean sector. For these clusters diagnostic and design workshops have been conducted, action plans have been developed, and applications for grants have been submitted. In addition, they provide business advice and trainings for the clusters, and they facilitate overall cluster coordination. The soybean clusters are located in Ilubabor (Oromiya) and Metekel, where they mainly work with cooperative unions (e.g. Chewaqa in Ilubabor). In Pawe (Metekel) they work closely together with the Pawe Agricultural Research Center.

N2Africa

N2Africa has prioritized five legume crops for its interventions: faba bean, common bean (haricot bean), chickpea, groundnut and soybean. With respect to groundnut, activities are currently not focusing on Ethiopia, but on Nigeria and Ghana instead. Still lessons from these two countries could be extended to Ethiopia. The project in particular focuses on testing and upscaling new varieties of legume crops, improved soil inputs (e.g., inoculants and fertilizers) and agricultural practices. N2Africa provides financial and technical backstopping for breeding and scaling up technologies at Farmers Training Centers (FTCs). The backstopping takes place through the national and regional agricultural research centers. These are Bako, Debre Zeit, Melkassa and Sinana Agricultural Research Centers for Oromiya; Adet, Farxa and Jama for Amhara; Borecha-Hawassa University and the South Agricultural Research Institute for SNNPR and Pawe Agricultural Research Centre for Beneshangul-Gumuz.
N2Africa is currently also exploring specific business partnerships to expand the availability of quality seed of improved varieties, inoculants and fertilizer products. Organizations they consider working with are:

- Menagesha Laboratory (inoculants)
- Guts Agro Industrial (all inputs)
- ISSD
- 2SCALE
- AMDe
- Agri-Ceft Ethiopia (all inputs)
- Pioneer Seeds (seed)
- Rumpstad (small-scale machineries)
- cooperatives and unions (all inputs)
- the regional fertilizer blending plant (fertilizer) and
- the national and regional seed enterprises (seed).

TL2

The Tropical Legumes 2 project, supported by BMGF, focuses on: variety development (breeding), adaptation trials, participatory variety selection (PVS) and support for the variety release process. In addition, TL2 supports the uptake of the new varieties through the provision of starter packs to farmers and technical backstopping to seed producers. Priority crops are haricot bean and chickpea, but also other dryland legumes like cowpea, pigeon pea and mung beans. The project is embedded within the Agricultural Research Centers, in particular the federal centers of Melkassa (MARC) and Debre Zeit (DZARC). For haricot bean, MARC has supplied basic seed (Awash 1, Awash Melka and Nasir varieties) on credit basis to selected farmers and national and regional seed multipliers. TL2 monitors the quality of the seed as well as provides coaching to farmers on improved agronomic practices. Implementing partners are: cooperatives and unions (e.g., Adami Tulu FCU), farmer producer groups (e.g., Gemechu), the Ethiopian Seed Enterprise and Regional Seed Enterprises, private farmers (Alemayehu Makonnen, Boset Wereda), ACOS Ethiopia, and Soretti International Trading PLC.

PICS—Purdue Improved Crop Storage

The PICS III phase has included Ethiopia as priority country. The PICS project aims to increase the income of farming families in Africa through the use of inexpensive, plastic grain-storage bags. Currently, researchers from Purdue University are exploring possibilities for outscaling its triple layer bags in collaboration with private sector parties. The PICS technology can enhance the storage time of legumes substantially.

5 The legume value-chains of Ethiopia

5|1 Faba beans

The faba bean is Ethiopia's primary legume. It is cultivated in the highlands often in rotation with wheat, barley or teff. Total production in the 2012–2013 growing season was more than 940,000 tons which accounts for one-third of the total legume production in Ethiopia (CSA, 2013). By far the most important production areas can be found in Amhara and Oromiya. These two regions account for more than 80% of the production. Three zones stand out in terms of production: North Showa (Amhara), North Showa (Oromiya) and Arsi (Oromiya). Together these three zones produce close to 200,000 tons. Faba bean saw a rapid increase of production in the last years, especially in the North Showa Zone of Oromiya and in Arsi (almost doubling).

The below figures show the production statistics of the crop:

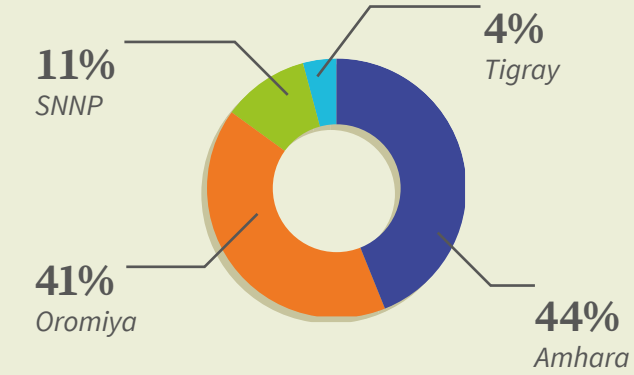


Figure 2 Faba bean Production—Regional Share

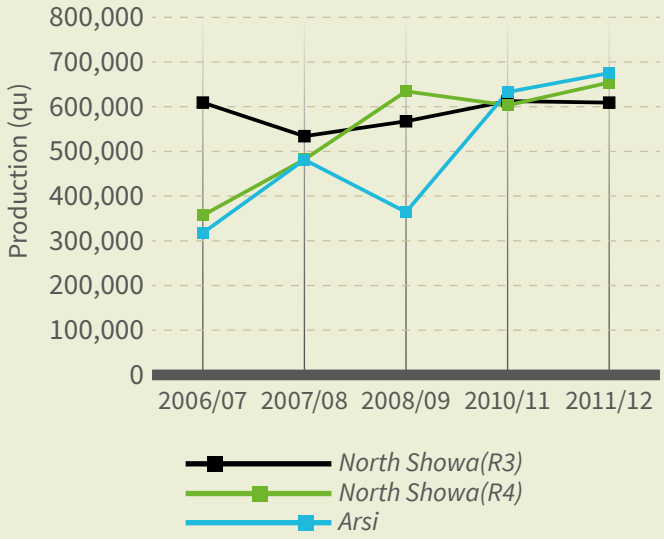


Figure 3 Faba bean Production Trend for Top 3 Zones

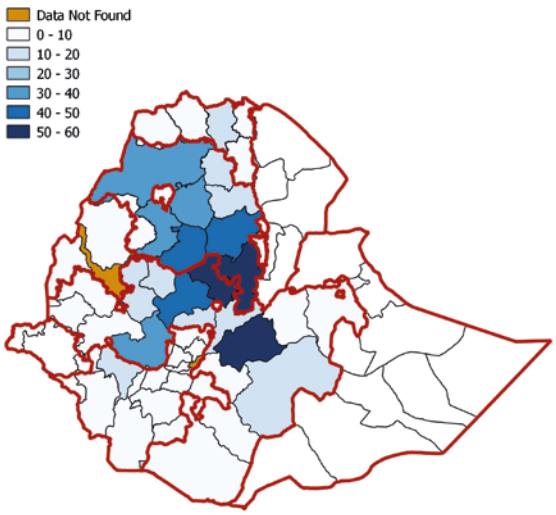


Figure 1 Average Annual Faba bean Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons

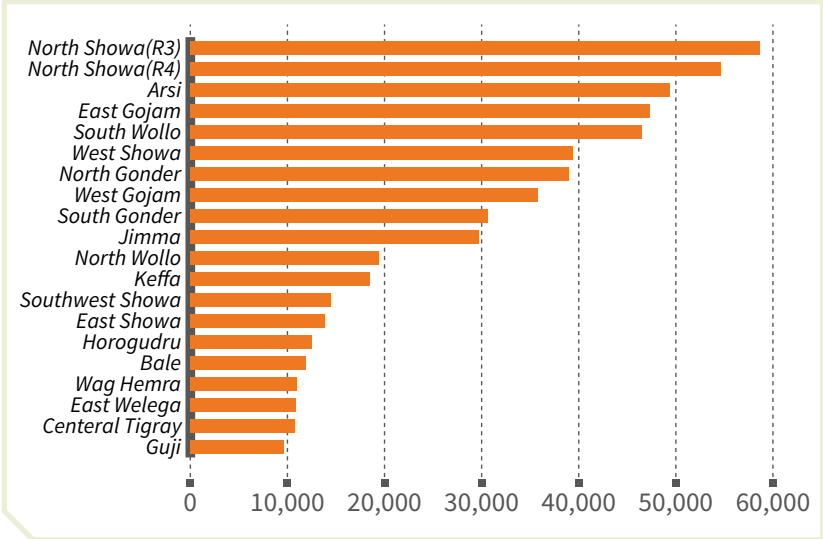


Figure 4 Top 20 Faba bean Producers (Average Production in Tons)

For detailed analysis two zones were selected, North Showa (Oromiya) and Arsi (Oromiya). It has been assumed that production and value-chain dynamics between the two North Showas (Amhara and Oromiya) are relatively similar.

The farm perspective

Faba bean is often part of the teff, wheat or barley farming system. As such faba bean is produced for three distinctive motives: as a source of food, as a rotation crop and as a cash crop. Most farmers in the area produce faba bean alternatively with cereals with a purpose of breaking disease and weed cycles, hence, it contributes to a better yield in cereals. Secondly, almost all farmers use faba bean for home consumption, in the form of green pods, *shiro* and as boiled grain. Still, most of the produce is sold to the market, after deducting the seed needed for the next cropping season and grains needed for home consumption. As such, faba bean plays an important role for generating cash income.

With respect to households' utilization of faba bean, most farmers allocate about 15% of the total production to farm saved seed. In addition, about 25% is allocated for home consumption depending on family size and the existence of expected social events that require food preparation from faba bean. The remaining 60% is sold to the market in the form of seed and grain depending on the local grading scale, which takes in to account seed size, color and uniformity. The export market of horse bean (faba bean) is growing rapidly and reached close to US$35 million in 2013 (from US$2.5 million in 2005), especially to Sudan.

Faba bean is well grown at altitudes from 1,800 to 3,000 masl, at a maximum day temperature of 20–25°C, and at minimum night temperatures of 5°C, in the months from June to October. If the altitude is higher than 3,000 masl the crop can be easily attacked by frost and below 1,800 masl disease and moisture stress can reduce yields. A rainfall of 700–1,100 mm with a uniform distribution is optimal for the proper growth and yield of faba bean. It is well productive on clay loam soils with no water logging and at a pH of 6 to 8. If the pH is lower than 6 acidity can inhibit the root nodules from fixing nitrogen.

With respect to varietal selection, farmers in the area mainly produce local cultivars and some older, improved varieties as *CS20DK* and *Degaga*. To a smaller extent the recently released varieties of *Gebelcho* and *Moti* are also taken up by farmers. Of these improved varieties *Gebelco* is highly preferred for market purposes due to its larger seed size, while *Moti* (small seeded) is preferred for home consumption and for selling directly to consumers for shiro and boiled grain purposes. This division is reflected in many legumes systems (e.g., chickpea and field pea): the bigger seeded varieties are produced for the market while the more tasty smaller seeded varieties are used for home consumption.

The relative lack of a well-functioning input supply system limits the spread of new varieties to farmers. As faba bean is a self-pollinating crop with a low multiplication factor (of 6–8), the formal seed system most likely will not be interested to get more strongly involved. The main vehicle for rapid adoption of new varieties should be sought in local seed multiplication groups that work closely together with the Ethiopian Agricultural Research Centers. Recently, faba bean productivity has been seriously affected by fungal diseases like botrytis or chocolate spot, leaving the risk farmers will switch to other crops.

Most farmers tend to classify their faba bean produce into two or three grades depending on seed size, uniformity in shape and deformations. This classification takes place after the threshing and before storage. The ***first grade*** is the large seeded type with no deformations and this product is usually used for farm saved seed as well as for market sales. The grade fetches the highest price in the local market. The ***second level*** is the medium/small seeded type with some level of deformation and this type is usually used for home consumption and sometimes for direct sales to consumers. The ***third level*** exists when serious pest attacks or excess rain during the maturity stage is experienced. In this case seriously attacked/affected faba bean grain is assigned to third grade and this is mostly used for livestock feed (mainly for small ruminants and equines) and rarely for human consumption. Disadvantages of faba bean production include its sensitivity to diseases (particularly chocolate spot), high labour requirements and the high seed rate (200 kg/ha) (IFPRI, 2010b).

The faba bean value-chain

The two following figures show the value-chains of faba bean in North Showa (Oromiya) and Arsi. The value-chains include the important flows of home consumption and farm saved seed that account for more than 35%. The two value-chains for North Showa and Arsi are presented on the next page.

Overall, the value-chains are rather short. Often the notion is that Ethiopian value-chains are long with many middlemen and relatively high margins for intermediates. In the case of North Showa the faba bean arrives at the consumer within four steps. The amount of produce taken to the market is irregular and can range from 10 kgs up to 1–3 quintals at a time. Farmers do not sell all their produce at a time but rather sell at different times anticipating price increase and taking into account the cash needed for the daily consumption of salt, sugar, soap, and cooking oil. This causes that overall farmers' supply of faba beans to the market is relatively stable throughout the year. This contradicts with the widespread conception that farmers are being squeezed out by the middlemen and sell all their produce directly after the harvest.

Cooperatives play a relatively small role in the marketing of faba bean. In Arsi this accounted for 5% while for North Showa this was even less, at 2%. Cooperatives do play an important role in the input supply of fertilizers and to a lesser extent seed. For output marketing, however, their role is limited. This is further evidenced by a recent study of IFPRI (Bernard et al, 2013) on the teff value-chain, where in depth research showed that cooperatives are only responsible for around 1% of all marketed teff. By far the most important channel is the local trader or aggregator channel often supplying regional and national wholesalers.

With respect to the aggregator and wholesale level the main issues expressed are the quality of the product, storage and working capital. All licensed local traders have a warehouse of their own. The traders store the product for between one and seven months anticipating price increases in the market. Those with limited working capital sell more frequently. The traders have better warehouse management than the smallholder farmers and the loss in the warehouse is minimal compared with that of farmers. With respect to quality, traders and wholesalers complain about the high level of impurity (admixture of stones, stems and weeds) and high moisture content of the produce they receive from farmers. The level of admixture can go up to 20%. In addition, the storage of high moisture faba beans can lead to quality deterioration. There is a specific phenomenon in place here that causes the faba bean to color darker (see ***Box 1***). The two mentioned quality issues are serious value-chain issue that can benefit from price incentives for beans with high purity and low moisture content. Lower levels of admixture will also reduce transport costs. In addition, improved storage conditions (both at farm and trader/wholesale level) keeping humidity and temperature down, can improve the quality of the product. Possible solutions have been developed by Purdue University in the form of the Purdue Improved Crop Storage bags. The PICS bags have triple layers improving aeration and can preserve the quality of legumes for a longer time.

Storage temperature and duration influence the faba bean testa colour. It changes from beige (initial color) to medium brown in seeds stored at lower temperatures (<250°C) but changes to dark reddish-brown and almost black in seeds stored at higher temperatures (>370°C) after 12 months. It is possible to store faba beans without substantial darkening. Empirical results show that postharvest seed coat color darkening in faba bean was slow at moderate to low temperatures (<250°C) and it was slowest and therefore had best colour retention after 12 months at 50°C.

Seed moisture content (SMC) was also recognized as an important factor in color darkening of faba bean. Seeds with higher seed moisture content darkened at a faster rate than those having lower SMC at a given temperature. Seeds with 8% SMC were very resistant to color darkening as compared to those with higher SMC. High SMC and/or high relative humidity in the storage environment were identified as major factors responsible for the deterioration of faba bean.

Box 1 *Color change in Faba bean*

The provision of services for local traders is limited. In terms of finance, the procedures at the banks to obtain short-term loans is lengthy and the requirements are stringent. This causes traders to use their own capital or obtain loans from informal money lenders. Also wholesalers, though to a lesser extent, have similar difficulties in obtaining formal credit.

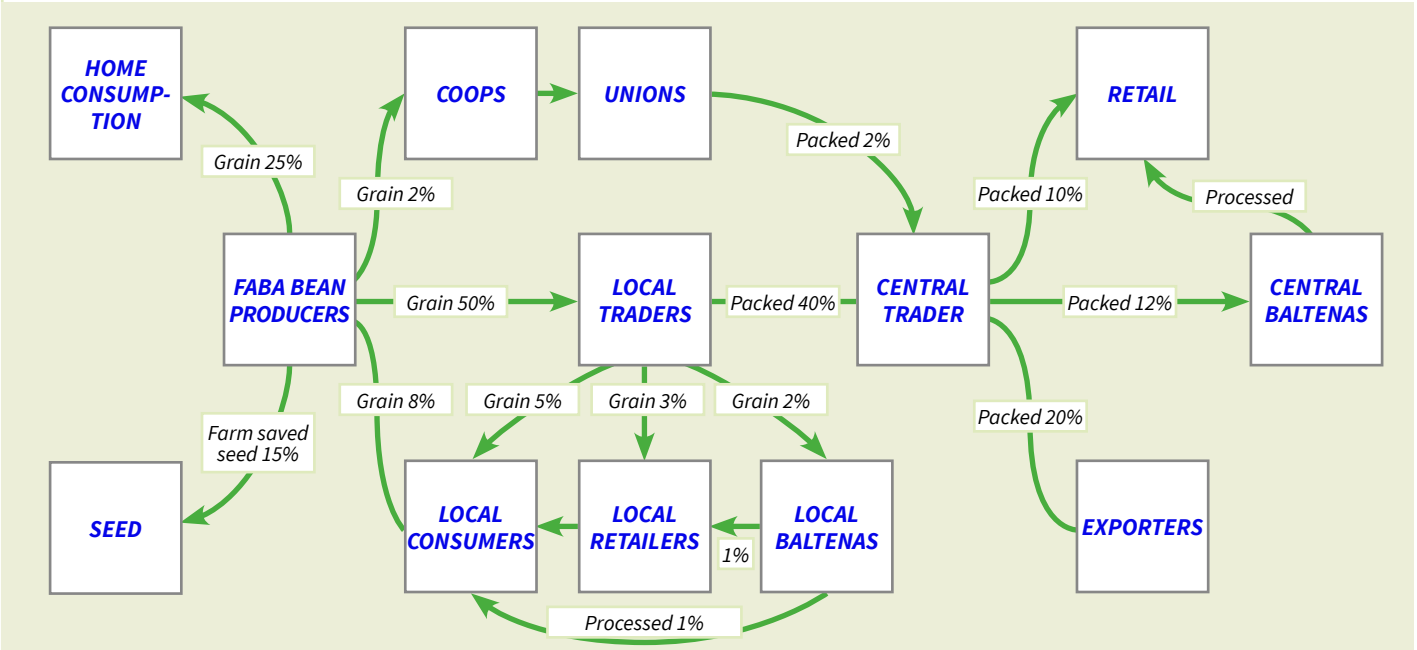


Figure 5 The faba bean chain of North Showa (Oromiya)

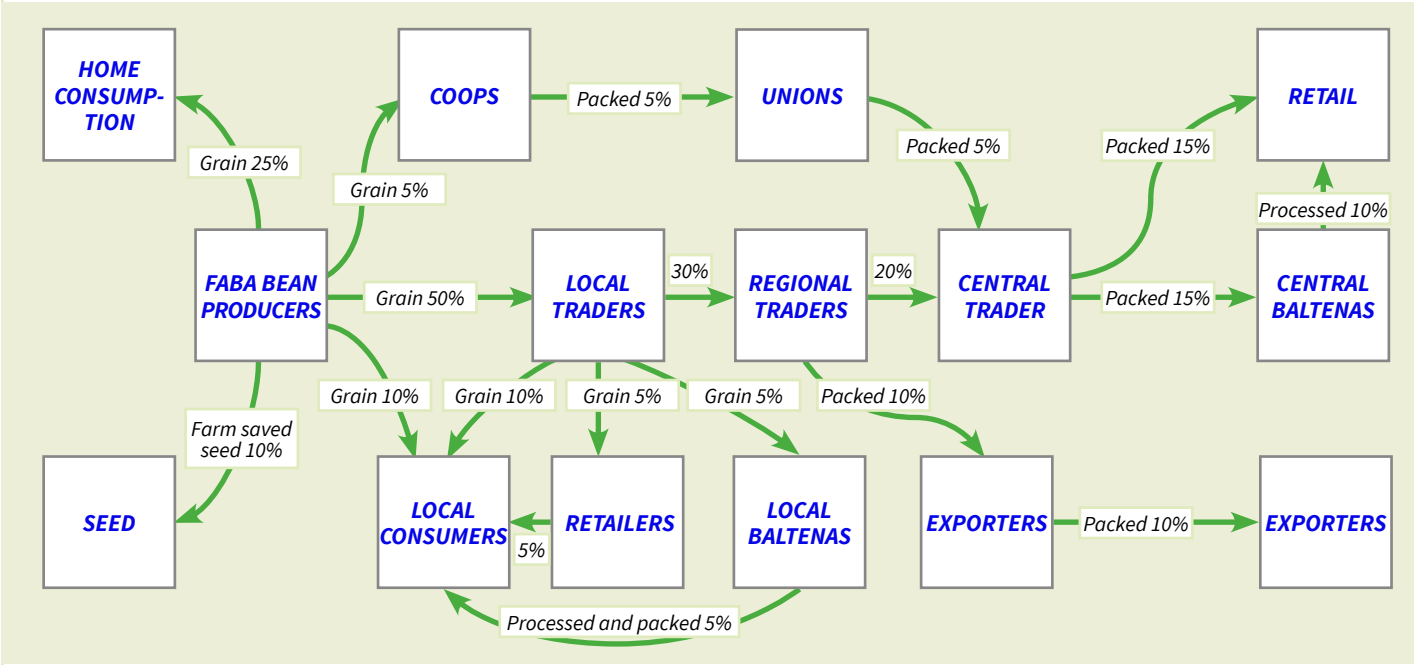


Figure 6 The faba bean value-chain of Arsi

A recent development in the faba bean value-chain is the emergence of so-called *baltenas* or local processors and packagers. The *Baltenas* process the faba bean into flaked (or split) beans for the purpose of fool (an important arab breakfast dish), as well as roasting and grinding (or milling) the beans for *shiro*. They currently are making up around 5% of all faba bean marketed in the study areas and this percentage is growing fast. Companies such as Selam, Abysinia and Etsub have become a household name for supply of *shiro* and spices that were traditionally prepared at home. Given Ethiopia's urbanization trend and continued economic growth, consumers increasingly buy finished products. The end market of the local processors are hotels, consumer cooperatives, small-scale traders and individual consumers. The key activities of the local processors are the purchase of faba bean, transportation, cleaning, roasting, flaking, and washing, spicing, grinding and packing. The processes involved are very labor intensive. Important costs in the *shiro* making are: raw material purchase (faba bean grain), salaries for employees, fuel wood, transport, spices, grinding/peeling cost. All in all, this requires quite some working capital and credit is not always available. Some *baltenas* interviewed indicate that access to finance is the main factor limiting further growth. Given the high labor requirements and the specific type of work, the *baltenas* are often run by individual women or women groups. ***Figure 7*** shows the Business Model of a typical baltena from North Showa.

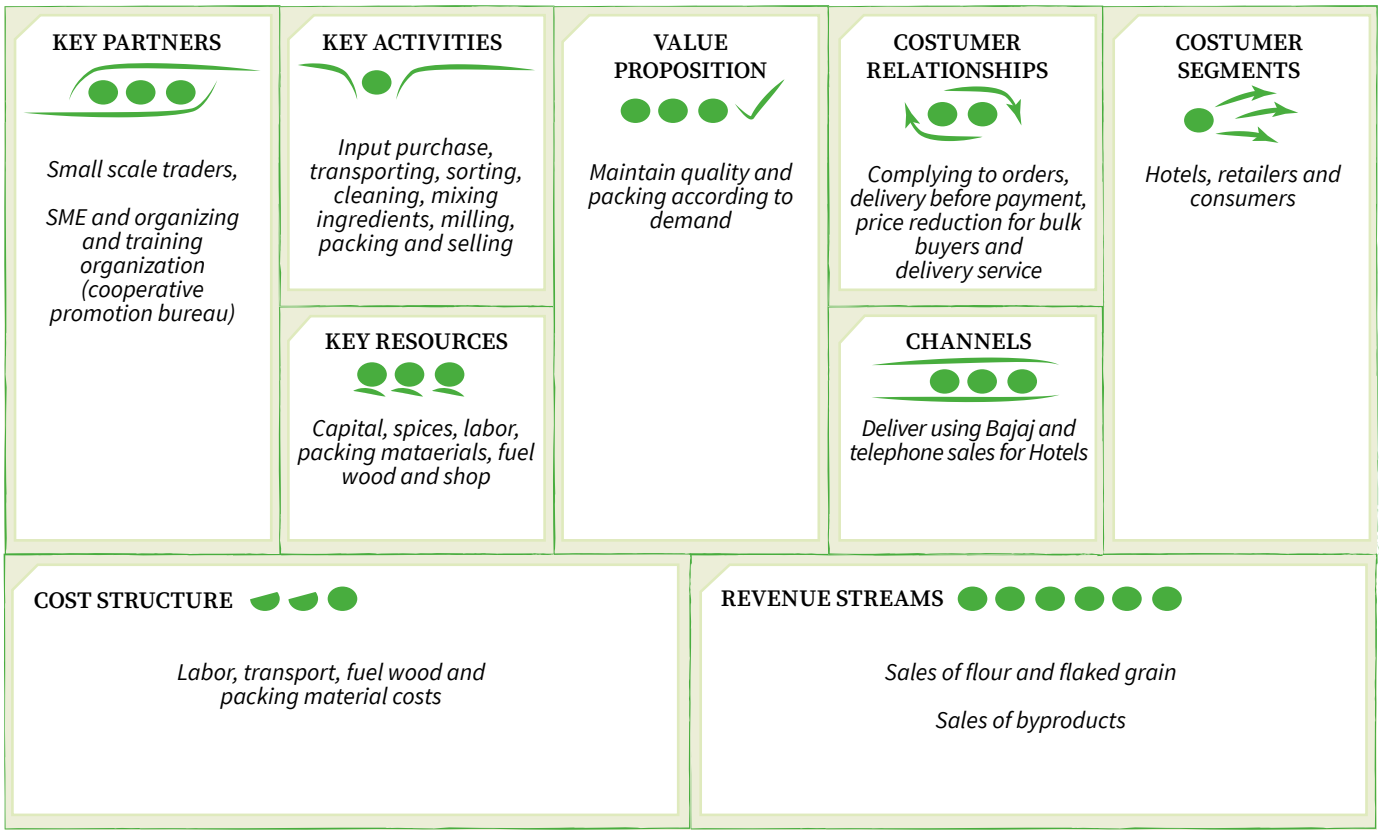


Figure 7 *Business model canvas for local processor in Arsi*

The last group of value-chain actors are the exporters. Ethiopia exports around US$30 million per year of faba bean. At the moment large flows of exports exist, mostly illegally. One story of a trader in North Showa (Oromiya) informed us that transport is mostly organized at night, trucking the faba beans directly through Oromiya region and Beneshangul-Gumuz to Sudan. Checkpoints close to the border and the border itself can be dodged through paying small 'facilitation fees' and within 12 hours the produce can enter Sudan. Export traders also export faba beans to Libya and Kenya. For export, the main criterion is size; at least 70% of the beans need to be the bigger sized type.

Economic analysis

The following figures provide some more in-depth information on the margins and comparative advantage of faba bean in the farming system.

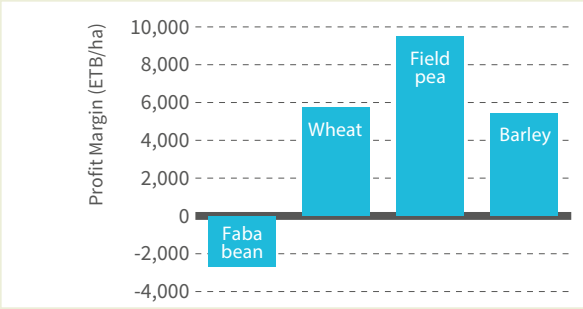


Figure 8 *Profit Margin*

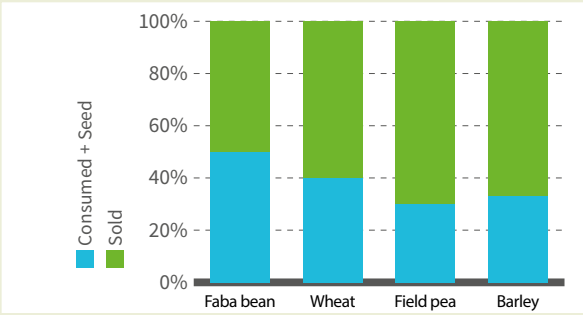


Figure 9 *Consumed vs Marketed*

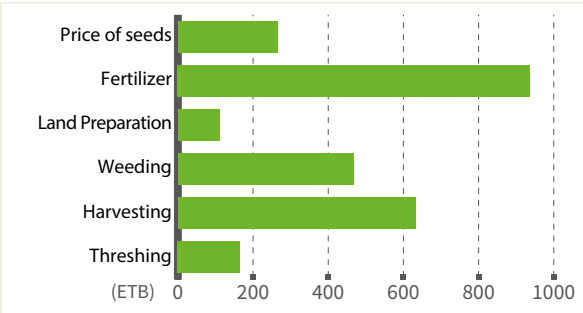


Figure 10 *Production Cost Components*

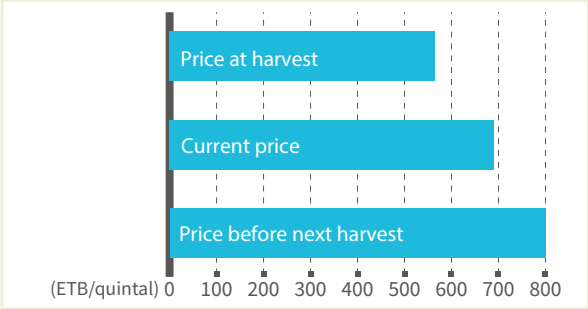


Figure 11 *Price Variation Within a Year*

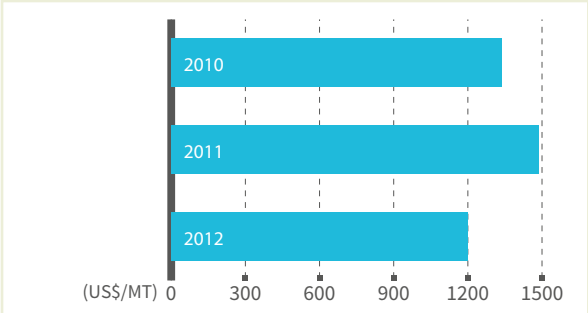


Figure 12 *Export Price Trend (US$/MT)*

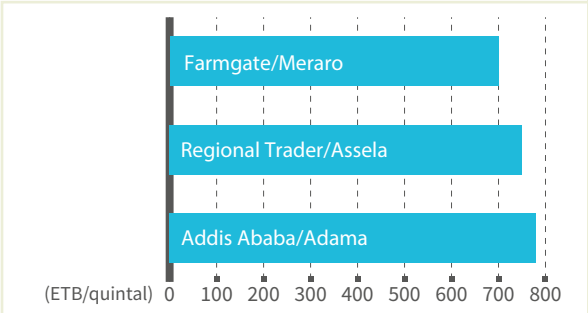


Figure 13 *Price Across Chain*

The calculations show that wheat and barley are more profitable than faba bean. However, this mainly had to do with the incidence of diseases during the 2013–2014 growing season. Due to excess rain the crop was affected by the fungal disease, chocolate spot which destroyed great parts of the harvest. Based on other studies and interviews, faba bean ranks lower than cereals in terms of the profit margin. Important cost components include: fertilizer and labor (manual weeding, harvesting and threshing). Especially the relative labor intensive nature of the crop is mentioned often as a disadvantage compared to crops like wheat and barley. Still, the crop is appreciated for other characteristics like soil fertility and home consumption. The latter is illustrated by the figure on home consumption, which is greatest for faba bean.

The analyses further show that margins in the chain, between the different value-chain actors, are relatively low. The analysis shows that farmers receive almost 90% of the retail price. The high percentage is influenced by the study zone's relative proximity to Addis Ababa. However, even for the teff value-chain, with calculation from all over the country, farmers received, on average, 80% of the final retail price (Minten et al, 2013). Also, other market visits to the Oromiya Commodity Exchange at Burayehu (Addis Ababa) confirmed that for faba bean there is less than ETB50 price difference between Assela (Arsi) and Addis Ababa. This contradicts the often heard complaint that farmers are squeezed out by middlemen and receive only a fraction of the final retail price. It also puts the potential advantages of joint output marketing through cooperatives in perspective.

Still, the figures do show that price fluctuations throughout the year are substantial, ranging from less than ETB600/quintal just after harvest to ETB800 before the next harvest. This indicates that improvements in storage, both the physical structures and packaging, can lead to better prices for farmers. Price fluctuations over years (using the export value as a proxy) have been limited.

Conclusions and recommendations

The above analyses indicate that any intervention in the upstream part of the value-chain should take into account the potential labor requirements at field level. In addition, activities need to focus on improving the overall competitiveness of faba bean in the farming system, focusing on increasing yields through improving the availability of quality seed of improved varieties, availability of appropriate herbicides and low-cost land preparation and threshing technologies.

In summary we propose the following recommendations ***for value-chain activities***:

- Improve the availability of quality seed of improved varieties with higher yield and better resistance to disease (in particular chocolate spot), probably through the support of seed producer groups in close collaboration with Koluumsa and Holetta Agricultural Research Centers.
- Test and develop a supply chain of appropriate herbicides and pesticides, possibly through the co-operative system in partnership with ATA and MoA.
- Develop low cost technologies for weeding, harvesting, threshing and cleaning. Specialized (private) companies such as Selam Technology and TVET schools like Alage or Ardaita could be supported to develop or test technologies. Agent distributor systems can be supported in key production areas, either private or through the cooperative model.
- Improvements can be made in storage technology both in packaging (PICS bags) and warehouses.

At trader and wholesaler level the main opportunities are:

- Setting up a transparent grading system, with quality parameters as: seed size, moisture content, level of admixture/impurity and color. Traders and wholesalers should communicate these standards widely to brokers and farmers. This will also benefit the exporters.
- Improving warehouse design and management to ensure limited quality loss (including coloring) and a higher level of turnover.
- The bigger traders and regionally based wholesalers could play a role in the provision of inputs (in kind support) to farmers.
- Improving access to finance for the larger traders and wholesalers, through linkage to banks and business planning.

For the local or regional baltenas the main opportunities are to:

- Provide technical support in order to reduce the labor requirements of cleaning, sorting and flaking (splitting) of faba bean.
- Support simple electrical roasting machines that save labor and firewood (hence deforestation) by working with agricultural technology suppliers such as Selam Technology and TVET Schools, as well as private agents.
- Support in business planning, enabling the *baltenas* to directly target markets or set up own shops, as well as access to formal credit at lower interest rates.
- Also the bigger *baltenas* can facilitate access to finance for farmers through a value-chain financing system (the bigger baltenas agree on contract with farmers and farmers receive inputs based on the contract).
- Support new and export standard products for faba splits and *shiro*, similar to Yanet Shiro of Guts Agro-Industry. In general there seems room in the market for five to ten large-scale legume processors, both for domestic and export markets.

5|2 Haricot bean

The haricot bean (*Phaseolus vulgaris*), the common bean, string bean, field bean, flageolet bean, French bean, pop bean, or snap bean, is an herbaceous annual plant grown worldwide for its edible fruit, either the dry seed or the unripe fruit, both of which are referred to as beans. The leaf is also occasionally used as a vegetable, and the straw can be used for fodder. The bean was introduced to Ethiopia in the 16th century by the Portuguese and is, since then, under production. Currently, the annual acreage has reached 360,000 ha (CSA, 2013).

There are three main haricot bean types grown in Ethiopia, based on their color: the red (kidney), speckled or white pea bean and within each color a further classification is made based on size. For example red beans are subdivided into small red, medium red and large red beans. The red bean types are typically produced in the southern Rift Valley, whereas the white (pea) beans are produced in the Central and Eastern Rift Valley (Upper Awash).

The crop is used for different types of household food and is an important source of proteins, carbohydrates, vitamins and minerals. The haricot bean is boiled and mixed with maize and sorghum or sometimes with other pulse crops like faba bean. Other types of dishes are: *shiro, sambusa* and soups. The straw of the haricot bean is used for animal feed.

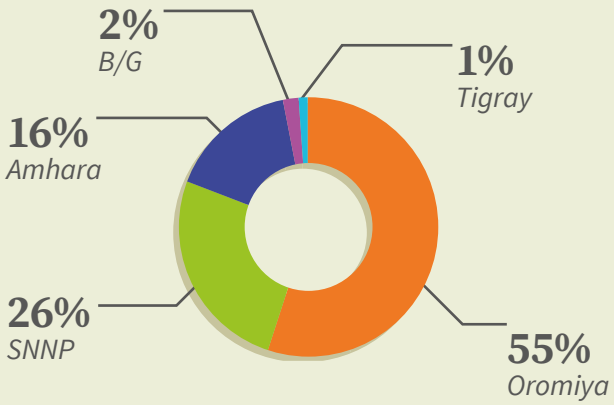


Figure 15 *Haricot bean Production—Regional Share*

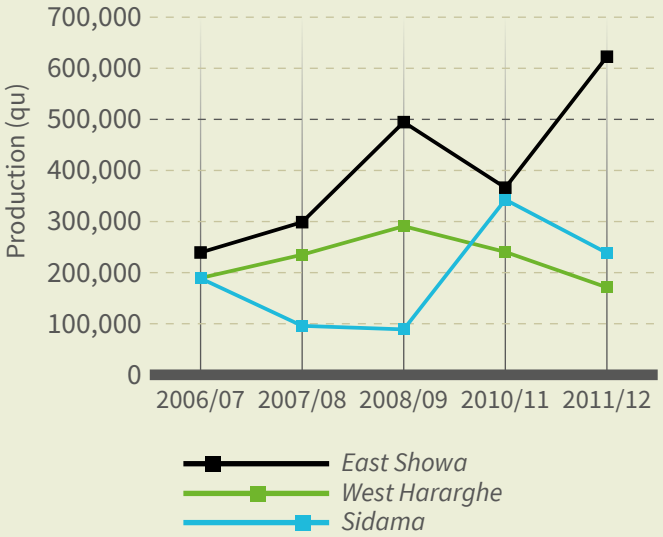


Figure 16 *Haricot bean Production Trend for Top 3 Zones*

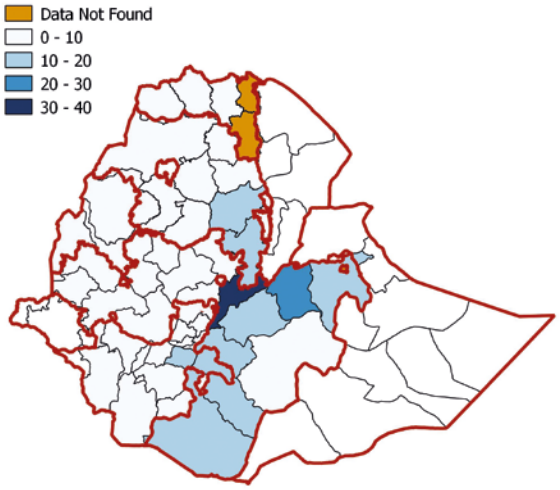


Figure 14 *Average Annual Haricot bean Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

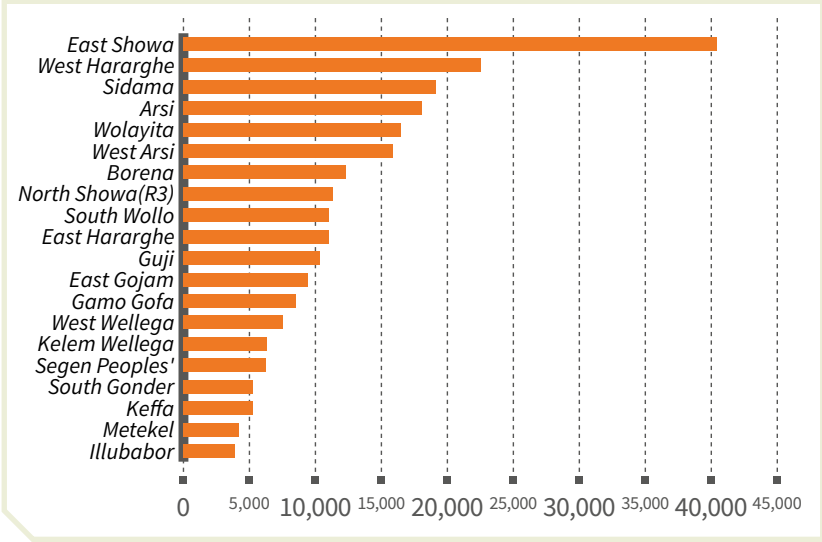


Figure 17 *Top 20 Haricot bean Producers (Average Production in Tons)*

Farmers indicate that their yield in the short rainy season (*Belg*) was approximately 800–1200 kg/ha, while yields increased to 2400–3200 kg/ha in the *Meher* or long rainy season (Ferris, 2010). Haricot bean is important for improving soil fertility as it fixes nitrogen from the air, though on a net basis more nitrogen is removed from the soil than brought back especially when the straw is used for animal feed. Sometimes haricot bean is also intercropped with maize, which increases the overall productivity per hectare. In addition, haricot bean can resist moisture stress well and reaches to maturity in a short period of time. Haricot beans are strategic crops in tackling transitory food insecurity problems during September and October, as well as important cash crops for sales throughout the year.

Haricot bean is the major pulse crop used for export and it supplies about 60% of the total export of pulses. The crop is one of the few pulse crops traded through the ECX (Ethiopian Commodity Exchange). In 2013 alone, Ethiopia exported for US$210 million mainly to Europe and the Middle East. Currently, the white pea beans from the Northern Rift Valley dominate the export market. Some years ago, also in the Southwestern Rift Valley, white pea beans were on the increase. However, farmers have now shifted to growing the red (kidney bean) varieties. Farmers in the Southern Rift Valley prefer the red beans as they are more popular in the local diet and have lower production costs. Also, an increasing number of traders in this area demand the red beans for export to Kenya. In a number of *woredas* of Sidama Zone haricot bean is now the second biggest crop after maize and followed by teff.

Based on the CSA data of 2012/13, the biggest producer of haricot bean is the Oromiya region, and within Oromiya, East Showa Zone is the biggest producer. In East Showa the main haricot bean variety is the white pea bean, and the land allocated to the crop is increasing every year. Most of the woredas in East Showa are located in the warmer midlands and most are food insecure with low and erratic rainfall. In SNNPR, Sidama is the biggest producer of haricot bean, which is mainly the red kidney bean type. For these reasons East Showa and Sidama were selected for in-depth value-chain research (see ***Figures 18–20***).

The farm perspective

The altitude suitable for the growth of haricot bean ranges between 600 and 2,200 m. Planting needs to be properly planned so that the harvest period falls during the dry season and at least before the next rainy period. Suitable rainfall is between 450 and 700 mm. The duration from planting to harvesting, for areas with altitudes of 1,000 to 1,700 m is 85–95 days, while for areas with altitudes of 1,500–2,200 m the duration is 110 days. Concerning the white pea bean, it is sown from the end of June to mid-July, usually not intercropped, and harvested after three months in October.

Though the farmers interviewed produce other crops next to haricot bean, most attention was given to haricot bean because of its high demand in the market and potential to resist moisture stress. The haricot bean canopy is relatively wide and can protect the soil from evaporation. E.g., much more than for example maize, which has a longer maturing period and needs more water.

Haricot bean can be intercropped with other crops like sorghum and maize to help increase production per unit of land. Its role in the crop rotation is also one of the advantages and farmers usually rotate cereal crops with pulses to protect pest and disease development. The haricot bean breaks the cycle of diseases in addition it improves soil fertility.

The white haricot bean is not used for home consumption but is fully marketed, except for the part that is used for next year's seed. The red and speckled types are widely consumed at home and are preferred by local consumers. Due to the limitations in the seed market farmers usually save seeds from their harvest. From the total white haricot bean produced by smallholder farmers, about 10% is saved for seed. The haricot bean growing season begins with land preparations in the May, often followed by a second ploughing in June or July depending on the rains. Most of the farmers plough the land once or twice before sowing. The sowing period depends on the beginning of the rain and usually takes place at the end of June up to mid-July. But if the rains are late, sowing may continue till the end of July.

The standard sowing method is through broadcasting around 120 kg/ha, though row planting can reduce seed rate to 70 kg/ha. The high seed rate results in increased competition for light, moisture and nutrients and hence reduces yield. At the same time, row planting is more labor intensive and no appropriate technologies have yet been developed to reduce labor requirements. The use of chemical fertilizers, like DAP and urea, is irregular, especially when compared to cereal crops. Few farmers use the recommended rate of 100 kg/ha of DAP and most apply 25 kg/ha or less. The use of inoculants has not spread yet, though some demonstrations have been initiated by research centers and the government's extension system.

Weeding does not take place at all, or only once, 20–30 days after sowing. Harvesting is done manually, uprooting the plant, without leaving any residue on the field. The haricot bean straw is used widely for animal feed and is sometimes also sold for this purpose. This practice reduces the overall organic matter status of the soil, which already is quite low in these areas. Threshing is also done manually and is completed in the month of November. After the harvest farmers clean the beans by removing foreign matter and they remove the beans that have impurities, like broken or damaged seeds. In addition, they dry the beans in the sun, reducing moisture content and increasing shelf life.

Post-harvest management is a serious issue in haricot bean production, given the relatively high temperatures and humidity in the production areas. The crop can be easily damaged by weevils. There are very few farmers who can store for longer periods than three months. Overall better storage management (both in terms of storage structure and pest and disease management) could increase the shelf life of the bean. Women play a leading role in cleaning, sorting and grading.

Smallholder farmers in East Showa are increasingly turning to haricot bean due to better market prices and, hence, larger portions of land are dedicated to the crop. In East Showa farmers refer to haricot bean as a 'First Aid Crop' due to its early harvest. Farmers use the bean to sell and pay the most urgent bills of school fees and credit taken from MFI's or informal lenders. The average land holding size per individual household is less than one hectare and from this 10–50% is allocated for haricot bean. Access to land is a serious issue in the Rift Valley. Often land is rented from other farmers or farmers enter into a share cropping arrangement.

In East Showa farmers' access to quality seed of improved varieties is limited. According to the zonal Bureau of Agriculture and Farmers Cooperative Union, less than 10% of the seed demand is met. In addition to the shortage of seed, the number of varieties being multiplied is only one: Awash 1. Due to the improved seed shortage farmers rely on farm saved seed and farmer-to-farmer exchange. In SNNPR the seed system is more developed and it is estimated that farmers buy more than 20% of quality seed through the formal system. In general, 10% of the red haricot bean is used for home consumption, around 10% is used as farm saved seed and more than 80% is sold to the market. The white haricot bean is mainly produced for the export market while the red haricot bean is both sold domestically and exported. In general, Ethiopian consumers prefer the red over the white haricot bean because it is easier to mill and more palatable.

The haricot bean value-chain

The value-chains of the white and red haricot bean differ substantially, therefore they are presented separately in the two figures below. The first value-chain is the white pea bean value-chain of East Showa and is presented on the next page.

The white pea bean value-chain

In this analysis emphasis is paid to the role of the local traders and brokers, as they are important aggregators and a bridge between farmers and consumers. All licensed local traders have their own warehouse with a capacity of 500 quintals or more. Traders store the product for up to seven months anticipating future price increase. Those with limited working capital sell more frequently. In general, traders have better warehouse management than smallholder farmers and the loss in the warehouse is minimal compared to farmers' storage. But if the beans have not been properly dried, there may be a weight loss as well as weevil damage. Still, the loss at the trader's warehouse is often not more than 5% of the total. Local traders are active in adding value by cleaning and sorting and mixing together products of different quality to get optimal prices. They employ additional manpower for cleaning and sorting and pay them on a daily basis. Most employees are women. In addition, local traders also buy rejected haricot beans from the ECX and re-clean, sort and mix these with better quality beans, after which they sell them back to the ECX at a better price. ***Figure 19*** presents the business model canvas for a typical white pea bean trader.

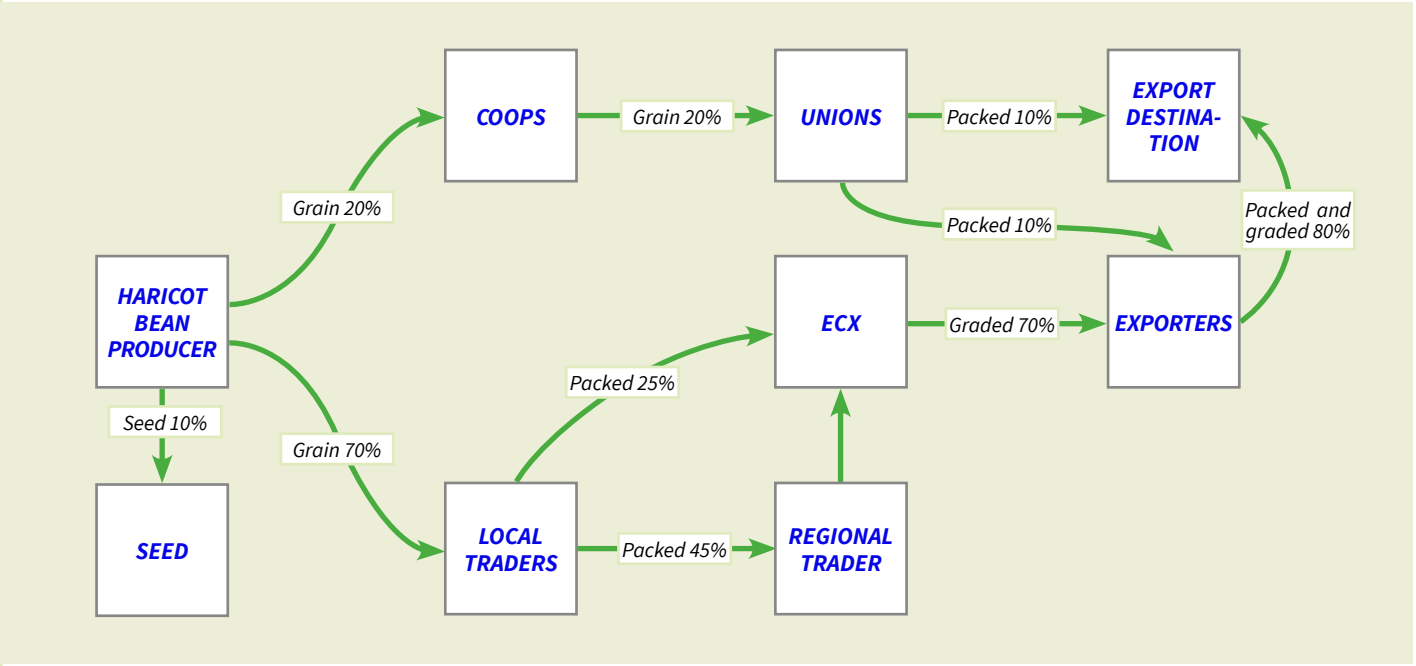


Figure 18 *The white pea bean value-chain of East-Showa*

The local traders have their own agents or brokers who assist in informing them on the daily market price, e.g., from the ECX (Adama Branch). Brokers can assist with credit as well. They are well organized and licensed by the government. The brokers' commission is usually in the range of ETB 10 to 15 per quintal. Traders and brokers have frequent communication through mobile phone and also meet in each other in person once or twice a week, to exchange information and guide future purchase decisions. In terms of finance, the procedures at the banks are lengthy and their requirements are strict, causing most traders to turn to own capital or work with informal money lenders.

After the local traders sold their produce it often ends up at the bigger warehouses of the exporters. The exporters buy directly from the ECX or work directly with traders or cooperatives. The white pea bean exporters are the most specialized operators involved in large-scale procurement, cleaning, grading, re-bagging and organizing finance. They have contracts with either the largest exporters or directly with overseas buyers. Virtually all of the export houses for white pea bean are located in Adama, which is the major market en route to Djibouti. At present most are small to medium sized export companies, with some larger exceptions like the AWAD Brothers, Soretti and ACOS.

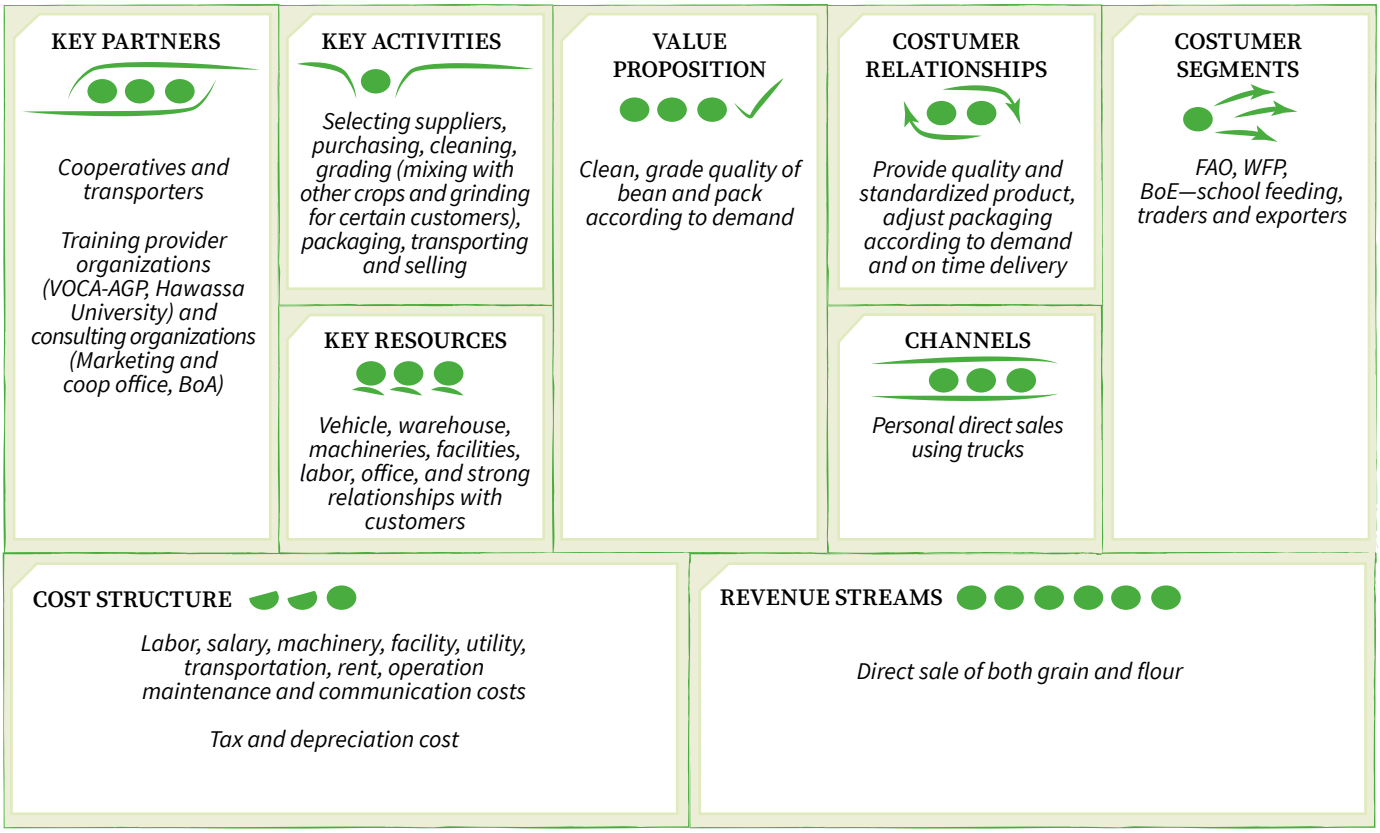


Figure 19 *Business Model Canvas of a white pea bean trader*

The example of Guts Agro is provided here:

Guts Agro Industry is one of the major buyers of red haricot bean in SNNPR. Its major activities are cleaning, grading, milling, and packing of bean flour. It has bought haricot bean from Elto Union and Chawaka Cooperative Union in Wollega. The end product is haricot flour, which is sold to the Ministry of Education for the regional School Feeding Program. When purchasing beans, it checks for purity and moisture content and pays accordingly. According to the company's standards an acceptable moisture content for haricot bean is at maximum 12.5%. After the purchase they clean the beans extensively, in three stages up to a purity level of 99%. After cleaning the company packs into 25 and 50 kg bags according to the buyer's preference. The company is ISO certified.

The red haricot bean value-chain

Particularly interesting in the red haricot bean value-chain (***Figure 20***) are the relatively well functioning formal seed system and the different export directions. In SNNPR farmers buy more than 20% of certified seed through this system. Especially the South Seed Enterprise (SSE) plays an important role and supplies about two-thirds of the seed. The SSE works in collaboration with private seed multipliers. Another important player is the Southern Federation of Farmers' Cooperative Unions (SFFCU) which works through seed producer cooperatives. Still, more than 70% of the haricot seed supply is covered by the informal seed system. In general, for legumes, the cooperative system is well developed in SNNPR.

The Federation (SFFCU) is engaged in both input and output marketing. It buys white pea bean and red bean seed from specialized seed producer cooperatives and individual farmers. The SFFCU cleans the seed, packs it and certifies it after checking for germination at the Durame Seed Laboratory. Before distributing the seed to primary and secondary cooperatives, it packs the seed according to the need of the buyers in 25, 50, and 100 kg bags. The Federation also supplies other input packages such as fertilizers and herbicides. Further, the federation is involved in financial service provision in the form of input credit. The Federation in turn sells grains and peas to the WFP, ECX and exporters. The WFP buys 90% of the peas which is then distributed to food insecure households and to the School Feeding Program. The Federation also sells to local traders when grain size and purity are substandard. In total the SCFC exported 276 tons of red haricot beans in 2013.

In the focus group discussions and interviews it came out that only an estimated 30% of the red haricot bean is traded legally. And from the legal trade channels about two-thirds is traded through the cooperative-union channel. The rest, one-third, goes through the certified traders' channel. Out of the total illegal trade, 80% takes the Moyale-North Kenya route. The rest, 20%, goes to Addis Ababa and Nazareth, and then to Djibouti. Illegal trade is popular as no taxes have to be paid and networks with North Kenya are strong.

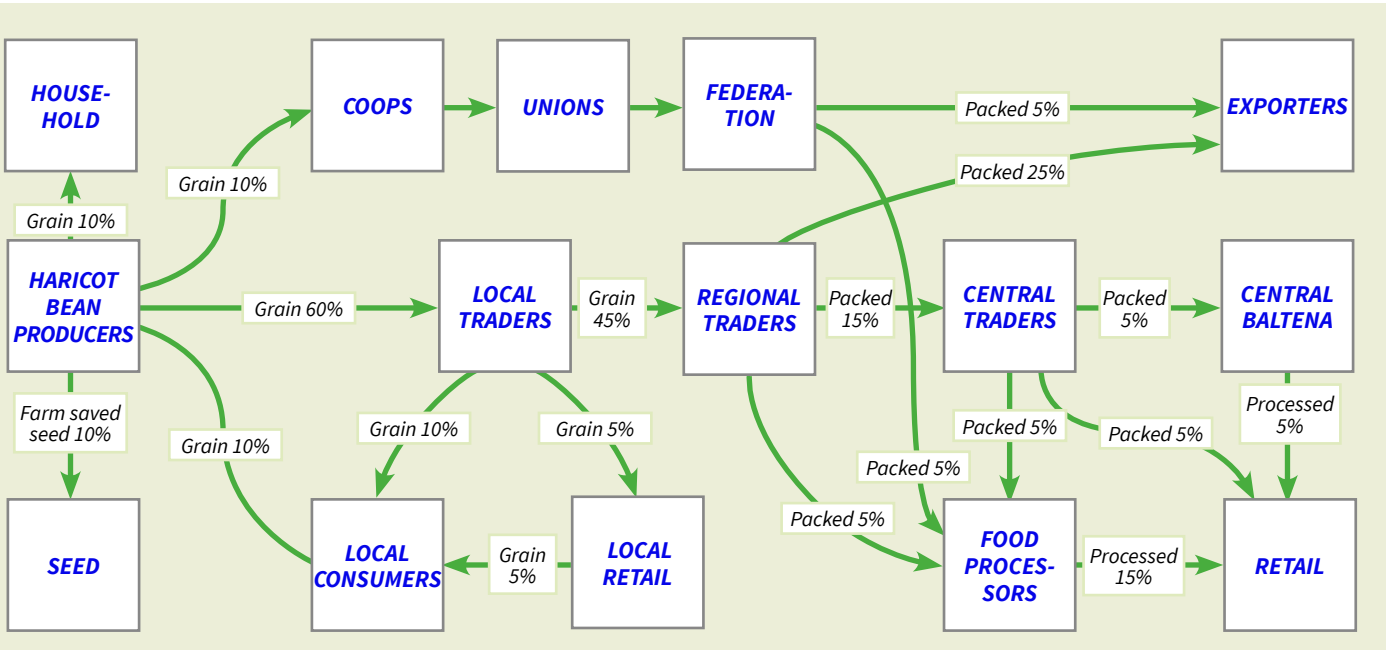


Figure 20 The red haricot bean value-chain of Sidama

Economic analysis

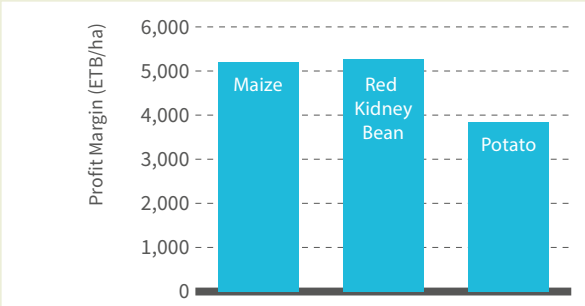


Figure 21 Profit Margin per ha

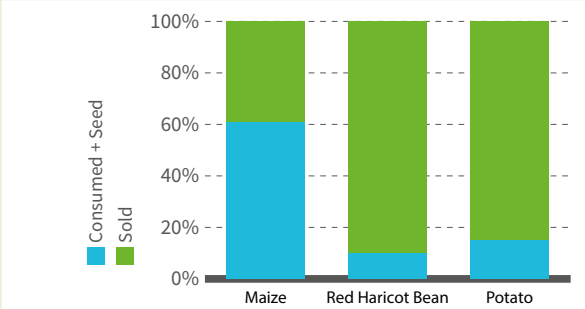


Figure 22 Consumed vs Marketed

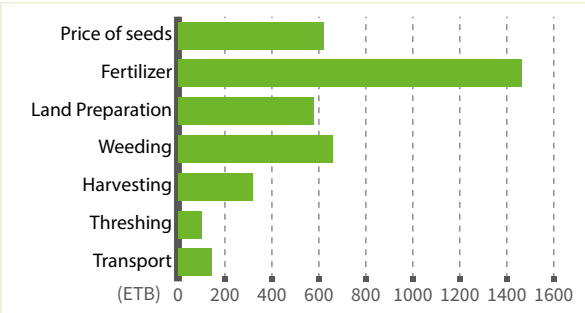


Figure 23 Production Cost Components

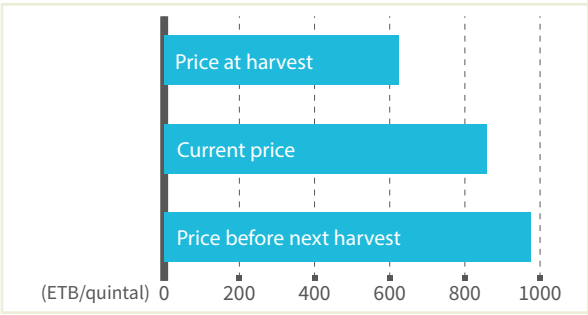


Figure 24 Price Trend within a Year

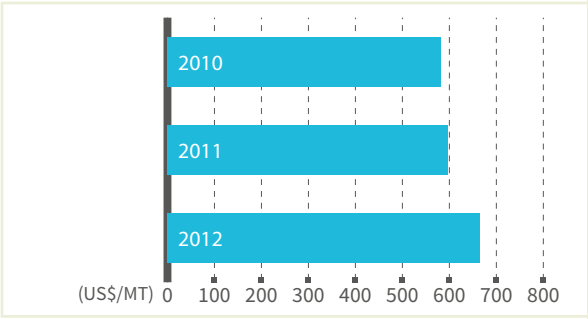


Figure 25 Export Price Trend (US$/MT)

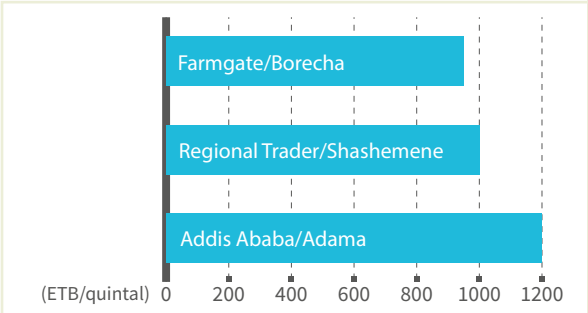


Figure 26 Price Across Chain

The economic analyses confirm that red kidney bean has a high profit margin compared to maize and especially potato, though its yield is much lower (1.6 tons compared to 4.8 tons for potato and 2.7 tons for maize). This is mainly because of the high farm gate price per quintal (at ETB950 per quintal mid-season). Like with faba bean, costs are relatively high, with high costs for inputs (seed and fertilizer) and land preparation. In general the labor requirements, however, are lower due to less intensive harvesting and threshing.

In the case of the kidney bean, the farm gate price is less than 80% of the wholesale price. This is less than for faba bean and can partly be explained by the greater distance between Hawassa and Addis Ababa. Another reason is the higher impurity levels. These can be as high as 20% at the regional markets. As indicated earlier, the red haricot bean is a real cash crop and 90% is sold to the market. Overall, the prices are set by the exporters who take the Kenyan market as a reference point. Prices in Kenya have increased gradually over the last two years, from US$580 to US$660 per ton, and also 2013 is reportedly higher. Again, here, the price fluctuation within the year is relatively high, with a farm gate price of around ETB600 just after harvest and close to ETB1,000 just before the next harvest, reflecting the high demand and poor packaging and storage practices.

Conclusions and recommendations

The main issues in the white and red haricot bean chains are confined to increasing productivity. The market does not seem to be a problem, and the low labor requirements and versatility of the crop makes it popular with farmers. Increasing productivity especially through the use of better inputs (seed, inoculants, fertilizers, fungicides) will be key in increasing its productivity. In addition, intercropping the bean with maize is promising.

- Several strategies can be laid out to better link the farmers to the necessary inputs: private chain integration, the cooperative model and/or the establishment of commercial farmers service shops (or agrodealer system). E.g., ACOS PLC, a major white pea bean exporter, has experimented with directly linking farmers to improved inputs, providing pre-financed quality seed and extension support for good agricultural practices. The model seems cost effective and if supply can be guaranteed (e.g., through building long-term partnerships or through contract farming) this model can revolutionize the production system. Also, the Cooperative Union model can be followed. Already strong Unions are present in the South and these are supplying high amounts of seed to farmers. This could be expanded by providing other inputs as well. In general, the cooperative-union system has focused more on input supply than on output marketing, making it easier to expand this service by including inoculants and fungicides as well. Another model has been recently piloted in the CNFA Commercial Farm Services project. A number of input shops (also providing extension advice) are set up in the Oromiya Region. This model could be expanded to more *woredas* where bean production is high (the indicated haricot bean hotspots). Overall, the Rift Valley has relatively good accessibility which could be at the advantage of the farm service shops. The ISSD pilot of direct seed marketing in Arsi Negele proves this; as five seed companies showed interest to directly market their seed in this Rift Valley *woreda*.

- Though the ECX has introduced grades for white pea bean and will introduce red haricot bean to its system next year as well, at farmer level the benefits of this system have not yet been clearly understood. Still our study shows that substantial quality problems exist in the chain. Pea beans observed at the Oromiya Grain Trade Exchange commonly contained 20% impurities and moisture content was high. If incentives could be improved in the chain, farmers could gain by reducing moisture content (longer drying period), lowering impurities (by better cleaning and sorting) and better packaging (other bags). This typically requires a value-chain approach whereby farmers, local traders and wholesalers and exporters work together, developing transparency and trust. Zonal business platforms (also inviting the banks, the ECX and the Zonal Bureau of Agriculture) could broker such deals and assist in setting up transparent grading systems.

5|3 Chickpea

Chickpea (*Cicer arietinum* L.) is the world's second-largest smallholder-cultivated food legume and is believed to have originated in present-day South-Eastern Turkey and neighboring Syria. The major chickpea growing countries in the world are: India, Pakistan, Turkey, Iran, Myanmar and Iraq in Asia, Ethiopia in Africa, as well as Australia, Canada and Mexico (FAO, 2012). In 2013, Ethiopia ranked fifth in world production of chickpea with more than 400,000 metric tons. Ethiopia is by far the largest chickpea producer in Africa, with a share of 39% of total production in 2011 (FAOStat, 2014). Exports have increased gradually over the last five years from US$40 million in 2008 to US$61 million in 2013.

There are two types of chickpea varieties produced in Ethiopia, namely *Desi* and *Kabuli*. *Kabuli* chickpeas have a larger cream-colored seed with a thin seed coat whereas the *Desi* type has a smaller, reddish brown-colored seed with a thick seed coat. In general, the small seeded (*Desi*) chickpea varieties are grown for local consumption whereas the large seeded (*Kabuli*) varieties are exported. Ethiopia traditionally produces the *Desi* type though recently the *Kabuli* has been promoted and is expanding rapidly. Also hybrids between the *Desi* and *Kabuli* types have been developed, which have a medium seed size and are tastier than the *Kabuli* type.

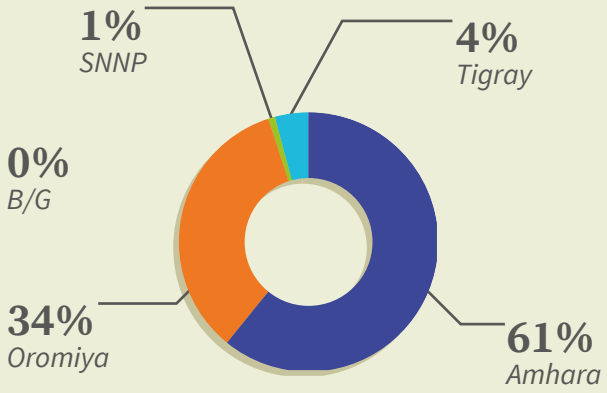


Figure 28 *Chickpea Production—Regional Share*

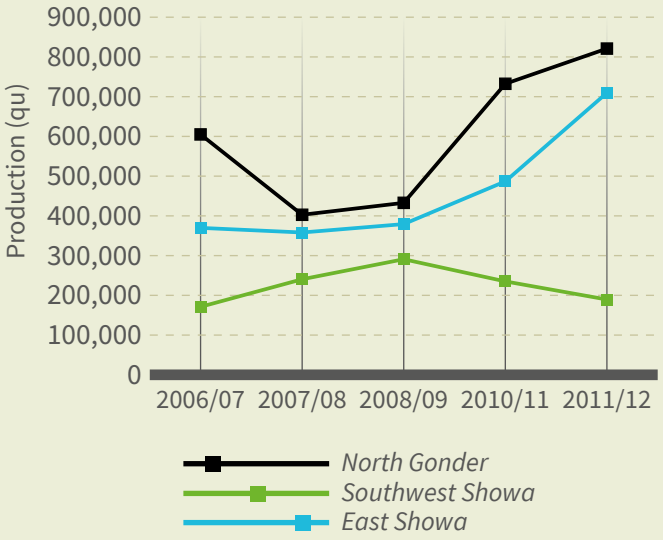


Figure 29 *Chickpea Production Trend for Top 3 Zones*

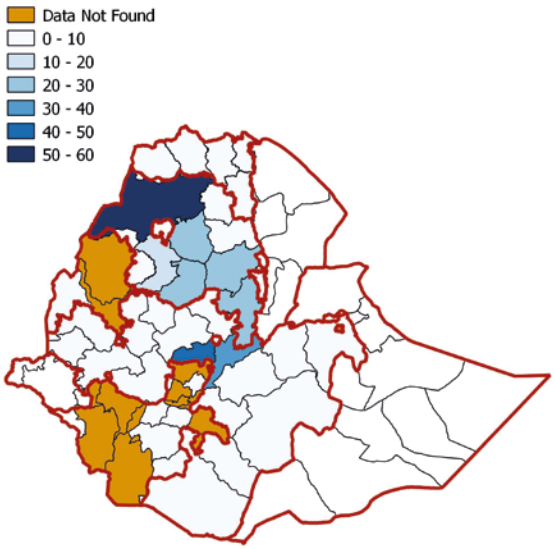


Figure 27 *Average Annual Chickpea Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

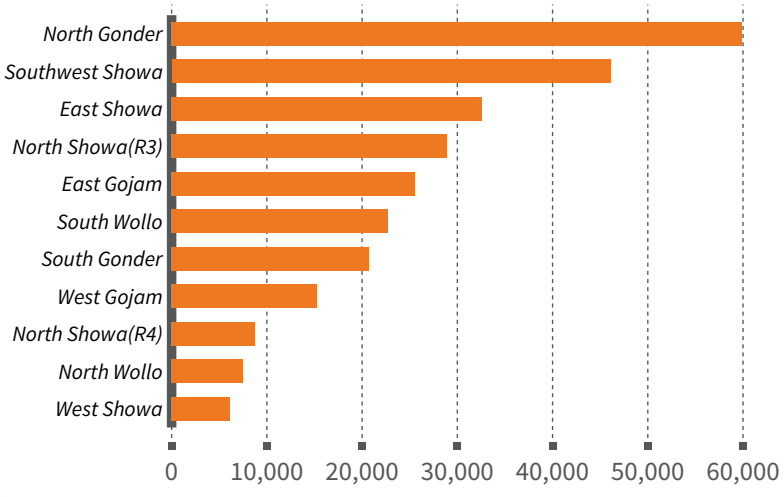


Figure 30 *Top 10 Chickpea Producers (Average Production in Tons)*

Chickpea is grown between altitudes of 1,700 and 2,400 meters above sea level, often as a second crop after the main wheat and teff harvests, utilizing the remaining residual soil moisture. Chickpea is mostly grown on Vertisols (also known as black cotton soils), since it has a good water holding capacity. Chickpea is predominantly produced in the mixed crop-livestock farming systems of the central, north and northwestern highlands of the country. The crop is an important protein source for many households as well as a good cash crop. Another attractive feature of chickpea is its ability to fix nitrogen, reducing the need for fertilizers in the next cropping season.

Hence, the production of chickpea has six major advantages:

- little labor intensive, especially compared to cereal crops
- it fixes nitrogen from the air in the soils, improving soil fertility
- the crop can be grown as a second crop using remaining residual soil moisture
- it is highly nutritious and provides essential proteins to the daily diet
- the growing demand in the domestic and export markets provides an important source of cash
- the straw is rich in digestible crude protein and a very good source of animal feed.

In 2013 more than 1 million households produced more than 400,000 tons of chickpea on around 240,000 hectares (CSA, 2013). This implies that yields are relatively high at 1.7 tons per hectare, compared to other pulses, and that an average farmer cultivates 0.24 hectares of chickpea. The major growing areas of chickpea are: North Gonder, East Gojam, West Gojam, South Wollo and North Showa zones in Amhara and the East and Southwest Showa zones of Oromiya. Overall 95% of all Ethiopian chickpea production takes place in three zones: North Gonder, Southwest Showa and East Showa (ATA, 2013).

The farm perspective

In North Gonder, chickpea varieties are clasified in two types: *Kabuli* and *Desi*. Improved, often hybrids between the two varieties, include: *Arerti, Habru* and *Shasho*. The demand for the *Kabuli* type of chickpea is higher than the *Desi* type. Only four *woredas* in North Gonder take the lion share (around 80%) of all chickpea production: West Belesa, Gonder Zuria, Takusa and Denbia.

Farming households prepare their land for chickpea in June and August and sow in September. Even though chickpea does not suffer from a lot of weeds, farmers weed once or twice in early September. Cut worm and ball worm are the two most important insects that attack chickpea and farmers usually spray pesticides in September and November. Harvesting is usually done in January after which threshing takes place in February. After drying farmers sell their product from April to August and often apply pesticides to control storage pests.

After threshing, almost the entire byproduct of chickpea is used as animal feed. It is especially preferred by horses and mules. The local naming of the byproduct is *Defecha* and the volume ranges from 15 to 40 quintal per hectare. Farm households that don't have horses usually sell to neighbors at an average price of ETB15–25 per quintal.

According to most interviewed farmers there is a great shortage of high-yielding, disease resistant varieties. Especially the new *Kabuli* variety is in high demand but availability is limited.

The chickpea value-chains

The value-chains for both North Gonder (Amhara) and Gurage (SNNPR) are rather similar. Therefore the value-chain of the country's biggest producer is presented here. Where appropriate, specific features of the Gurage chickpea value-chain are highlighted. Both value-chains are presented on the next page.

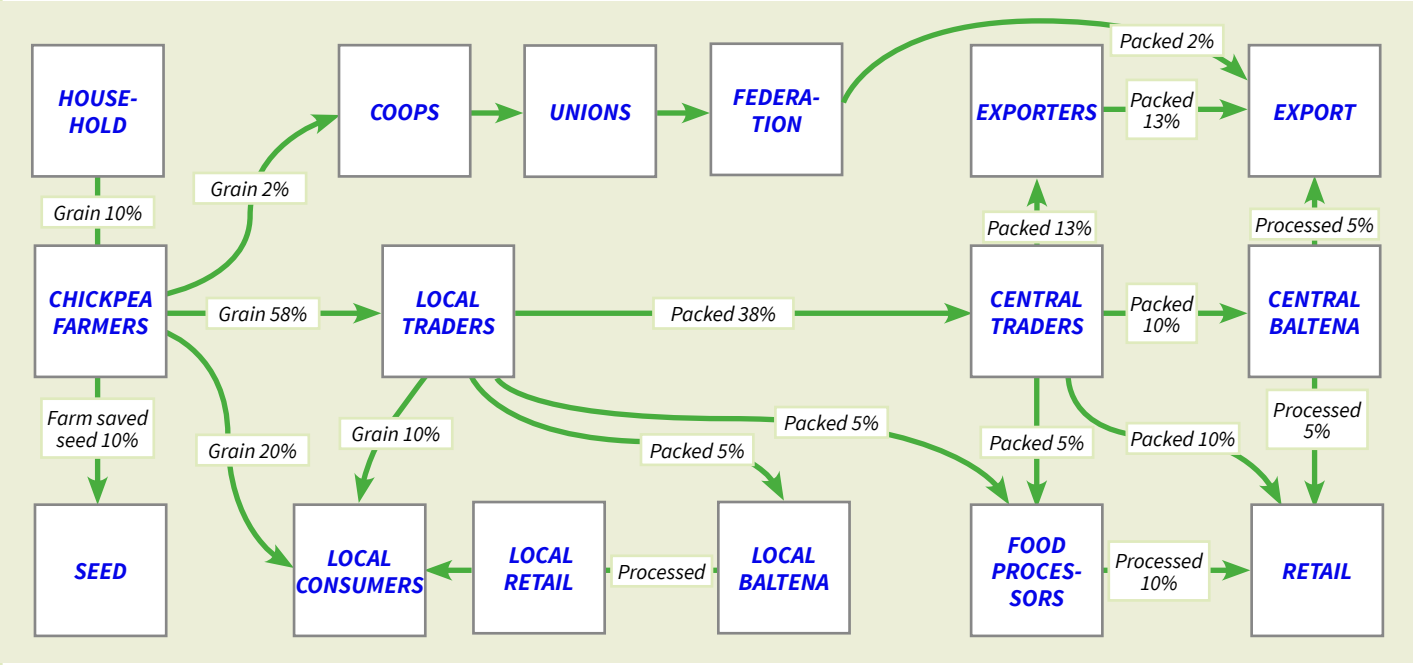


Figure 31 The chickpea value-chain of Gurage

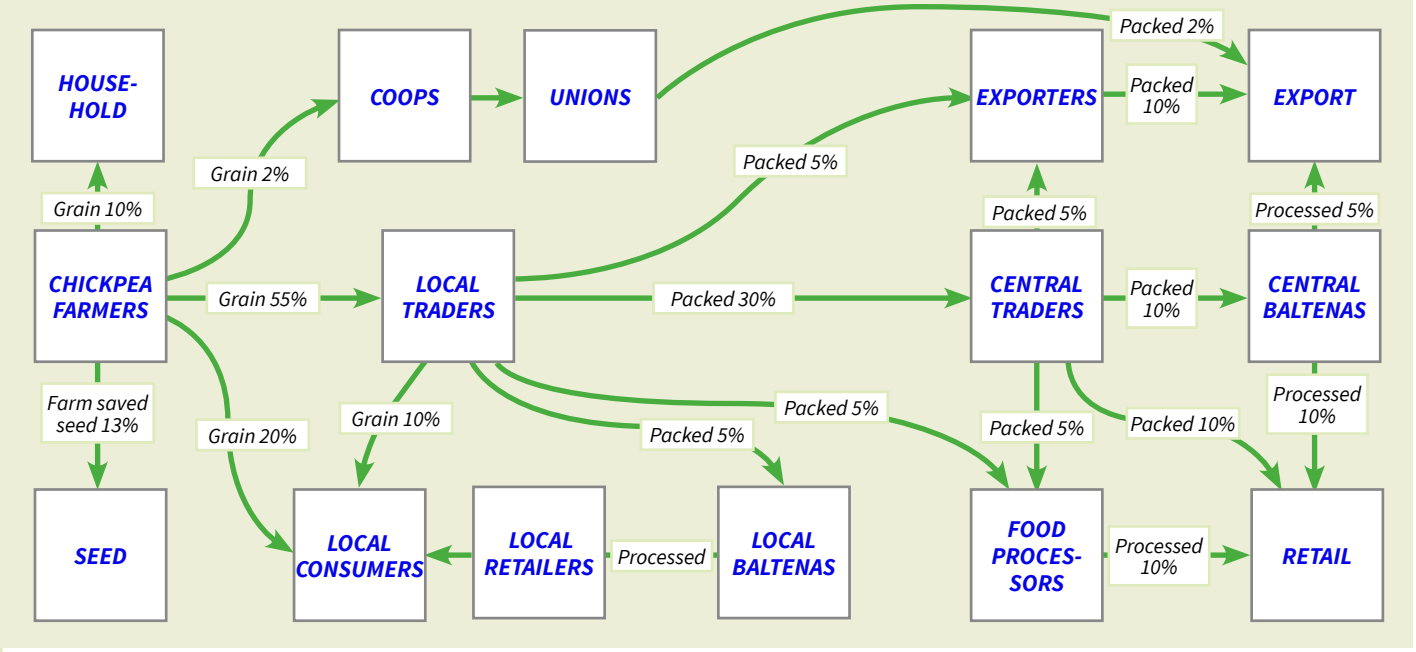


Figure 32 The chickpea value-chain of North Gonder

Chickpea is an important household food security as well as a cash crop. As estimated by the participants of the focus group discussions, 40% of the product is consumed by the rural community itself, around 50% is marketed to the regional and central markets, while 10% is reserved as seed for the next season. The total marketed chickpea is channeled through local traders and assemblers, wholesalers, retailers and cooperatives. Wholesalers take the biggest share (around 38% of the total volume) while the others take up 12% together.

The roles of traders, brokers, wholesalers and exporters are rather similar to the haricot bean value-chain, therefore this description focuses more on the differences in terms of the importance of small-scale processors, local retailers and informal export channels. Processing of chickpea includes splitting (into *Kike*), dehulling and milling. Sometimes the flour is mixed with pepper and spices into *shiro*. In previous days these processing activities were undertaken by households themselves, but recently these finished products are bought from small-scale processors (*baltenas*). There are also large-scale processors of *kike* and *shiro* in Addis Ababa and Nazret. ***Box 2*** provides more insights into the emergence of *baltenas*.

Retailers operate at both local and zonal market centers and sell chickpea in small amounts to consumers and business centers. Retailers can have a wide diversity in chickpea products, from the full pea to the split *kike* or *shiro*. They sell in open markets, warehouses or in small shops. Retailers often are non-specialized businessmen with limited financial capacity or economies of scale. The majority of them are women, running the shop part-time. Retailers can be farmers or urban dwellers. They can retail their own products (*baltenas*), or buy from a producer, wholesaler or processor. New purchases are based on cash flow and limited credit is involved.

During discussions in Gonder, participants mentioned the existence of informal exports to Sudan and Eritrea. Though, everyone agreed on the existence of the informal chickpea exports it was hard to calculate the amount. In the end it was estimated that as much as 10% of all North Gonder chickpea production could be exported to Sudan and Eritrea informally. Important reasons for traders to choose the informal export route are to avoid taxation and to be able to work outside of the ECX.

Apart from input supply some cooperatives and unions are actively engaged in the output marketing of chickpea. Especially the Tsehay Farmers' Cooperative Union in North Gonder plays a considerable part in the marketing of chickpea. In SNNPR one of the strongest Unions is Admas Cooperative Union. It is engaged in agricultural output trading like that of maize, chickpea and wheat. They work together with the Agricultural Transformation Agency (ATA), Overseas Development Institute (ODI), ACDI-VOCA and Agriterra. At the moment it has a 1% market share of chickpea. Admas's customers are: WFP, the South Federation of Cooperative Unions, processors and individual consumers. Admas was recognized by the WFP as a best performer last year.

The emergence of baltenas and pre-packed shiro

In earlier times, each family prepared its own *shiro*. Nowadays more and more urban and rural consumers turn to the *baltenas* that produce split chickpea (*kike*), processed hot pepper (*berbere*) and mixes like *shiro*. The business started with individuals and small shops that prepared the end product and they called themselves *baltenas*. Most are not specialized in only chickpea and use a wide range of ingredients (including grass pea and field pea) to produce *shiro*. Currently, it has become an industry that includes both household businesses and larger companies, spreading from rural towns to the major cities.

Elfu is a woman of 40 years, living and working at Wolkite Town. Her key activities are preparing *shiro*, *kolo* (roasted grain) and *Shimbira Assa* (bread baked from chick pea flour). The major buyers of these products are Wolkite University, and all relatively well-off households in the community. Elfu packs the products in different quantities, uses some additives to improve the color. Elfu is reaching her customers by using agent shops at different locations as well as her own location. Partners that provide her with important services are Omo-Micro Finance and the Wolkite Town Municipality. The former provides financial service for Elfu and the latter facilitated the process of obtaining her current shop. The major costs of her operation are the grain purchase: ETB1200 per quintal, roasting and milling cost (ETB100 per quintal), transportation cost (ETB240 per quintal) and packing cost (ETB320 per quintal), totaling ETB1860 per quintal. From the 100 kg of grain only 80 kg ends up in the final product which is sold for ETB26 per kilo, generating ETB2080. The gross profit hence is ETB220 per 100 kg of grain.

Box 2 *Elfinesh Baltena*

Preparation of shiro

Shiro preparation differs based on the preferred pulse crop, spices and salt level. Common components are the following three:

- ***Kike:*** These are the pulse splits or flakes. The common types of splits are: chickpea, field pea and grass pea. Often *Shiro* is made from a combination of these pulses and grass pea is usually mixed with others. Field observations indicate that grass pea is added in most cases, even though the *shiro* is marketed as pure chickpea or field pea. The grass pea share can be as high as 40%.
- ***Spices:*** These are also classified in two: dry and 'wet' spices. Spices are mixed with the *kike*. Major dry spices are: *Abosede* (Cumin), *Berbere* (red chili pepper), *Korerima, Erde, Zikakibie* and *Timez*. This share is about 8% of the final product. The wet spices are: onion, garlic, ginger and *Tena Adam*. They are first mixed amongst themselves, cut and sun-dried. These spices make up 4% of the final product.
- ***Salt:*** Table salt is added in different volumes quantities can vary much. It can be as high as 4% of the total product. But, often it is less allowing customers to add more themselves if they prefer.

The three components are well dried and mixed together after which they are milled. The percentage of pepper and spices is lower in the *baltenas* compared to the *shiro* prepared by households. This is mainly due to the price and the time needed for the preparation of spices, as well as to allow consumers to add some additional spices according to their preference. The average price of *shiro* by retailers in Gonder town is about ETB30 per kilo. Overall, a gross profit of ETB6 per kilo was estimated.

Economic analysis

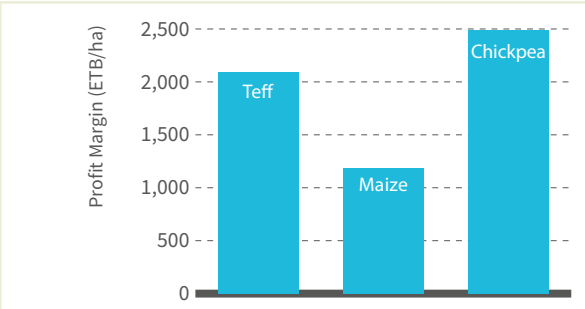


Figure 33 *Profit Margin per ha*

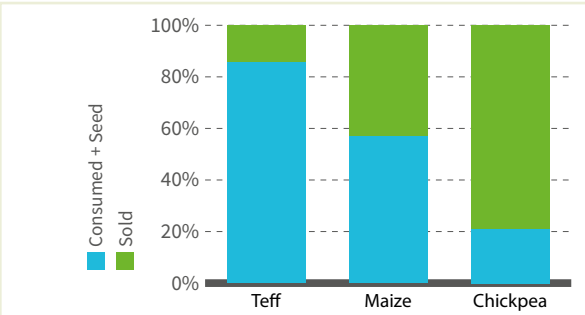


Figure 34 *Consumed vs Marketed*

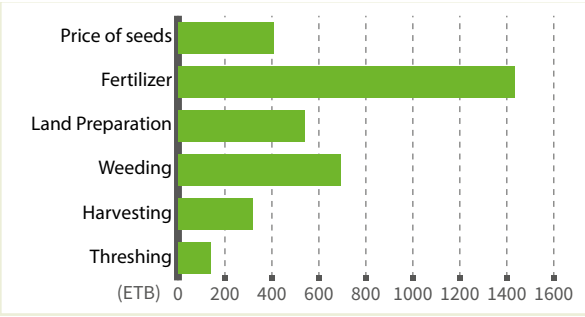


Figure 35 *Production Cost Components*

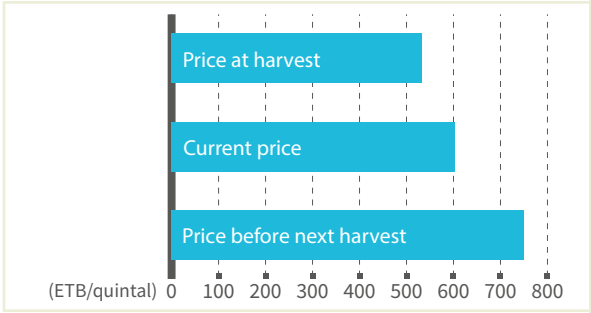


Figure 36 *Price Trend within a Year*

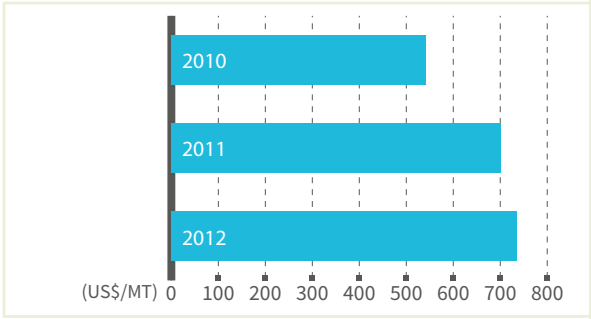


Figure 37 *Export Price Trend (US$/MT)*

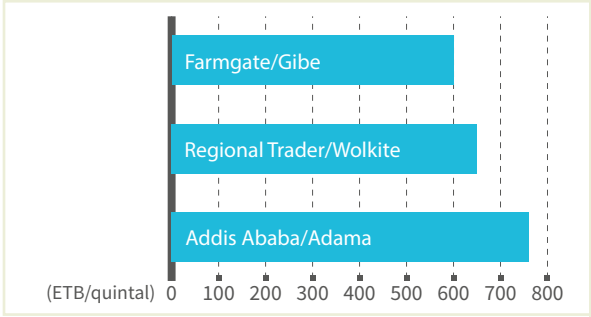


Figure 38 *Price Across Chain*

Chickpea, though often used as a second crop, still competes well with the main season crops teff and maize in terms of profitability. This is partly due to lower costs in terms of land preparation and weeding and also because yields are still relatively high. Farmers benefit from an increasing export market price that grew from around US$540 in 2010 to US$735 in 2012, making chickpea more and more a real cash crop for farmers. The farm gate price is still around 80% of the retail price for chickpea, while also here price trends within the year are strongly upward, reflecting the potential benefits of proper storage, though most is being sold in the first four months after harvest.

Box 3 *Guts Agro-Industry: Industrial shiro processing*

Guts Agro-Industry is established in 2000 E.C. (2006–2007) and has recently started buying chickpea from Debre Zeyt. It has got a processing factory for the production of baby food (Libdel), the Lenbo Snack (a blend of maize, oil, sugar and flavor), CSB+ and CSB++ (a blend of corn and soybean for emergency relief) and recently Guts has started the production of *Yanet Mitin Shiro*, using chick pea as a man ingredient.

According to Ato Ayele G/Tsadik (Administration manager), *Yanet Shiro* is now produced at international standard, using the red chick pea and several types of spices. The target market for *Yanet* is Ethiopians living in England and the United States. In the domestic market, international hotels, the Ethiopian *diaspora* and the emerging middle-income class are interested in *Yanet*. *Yanet* is being packed in one and half kg packs and is entering the market mid-2014. Guts has an advanced quality inspection system, checking the way in which the grain is stored and packed, and checks key quality parameters (moisture, admixture, impurities). After buying it cleans up to 99.5% and roasts and mills the chickpea to produce *Yanet Mitin Shiro*.

Conclusions and recommendations

Chickpea production has grown by 30% over the last five years. The relative ease of production, the role in the cropping system (as a second crop) and the large demand in both the domestic and international market makes it an important driver for further agricultural growth in Ethiopia. Recommended potential interventions include:

Production
The *Kabuli* variety is clearly superior to the small seeded *Desi* type and supply of either crosses or the original *Kabuli* seed can greatly improve chickpea productivity. Probably a mix of seed production schemes, both smaller local and larger private, can be supported to ensure sufficient supply of the new varieties. In addition, specific inoculant strains need to be made available to capture the full potential of the varieties in terms of nitrogen fixation. Already N2Africa and ATA are working hard on this. Again, it will be crucial *how* the necessary inputs are made available to farmers. The recommendations in ***Chapter 3.2*** on haricot bean provide input on this. Probably a mix of models, cooperative, backward integration through exporters and private input suppliers, is best here. For the cooperative model, linkages can be made with ATA's activities (as further elaborated on in their Chickpea Working Strategy).

Processing
The emergence of the *baltenas* justifies further support for the chickpea processing industry. Both smaller and larger businesses are increasingly engaged in the cleaning, splitting, roasting and milling of chickpeas, producing kike, *shiro* or other food products. Low-cost technologies are available to professionalize these industries and a market for their further popularization exists. In addition, companies can be further supported in business planning, warehouse management, financial management (and access to finance), branding and marketing of their products.

Wholesalers and exporters
Larger processors, wholesalers and exporters are currently leading the market for chickpea. They either sell the raw chickpea, split chickpea or further processed chickpea. These companies can both play a role in further chain integration, working together with groups of farmers as well as standalone activities can be developed to improve warehouse management, financial management and further develop specialized export products. Cooperatives or Unions could be involved in this as well, though they are currently already receiving much support and an alternative pathway is worth exploring.

Value-chain coordination
Coordination in the chain will be crucial to link the actors in terms of input supply, market information, cleaning, sorting and grading and processing, as well as linking key value-chain actors to important services as access to finance, agronomic support and business management. A chickpea business platform is recommended, both at national level and zonal level (probably North Gonder).

5|4 Field pea

The field pea (*Pisum sativum,* subsp. *arvense* [L.]) is also known as the dun (grey-brown) pea, Kapucijner pea, or Austrian winter pea. Field peas are one of the oldest domesticated crops, cultivated for at least 7,000 years. Wild field pea can still be found in Afghanistan, Iran and Ethiopia. Field pea is one the cool season crops which requires a mean temperature of 13°C to 18°C. Field pea can grow in a wide range of soil types with good drainage.

Field pea is grown in the wheat, barley or teff farming systems and is the second most important pulse crop next to faba bean in these systems. The national average of field pea productivity around 13 qt/ha. Field peas are cultivated for the fresh green seeds, tender green pods, dried seeds and foliage. In Ethiopia (eastern Amhara region), field pea is grown for both household consumption and as a cash crop. It is eaten whole, split or milled usually fresh, fried, boiled or mixed with other cereals, to make various types of stews and soups. Field peas are commonly used for *shiro* (flour prepared from dried pea after roasting) and *kiki* (split pea after washing and drying). Both are used for preparing stew (the local *wat*), especially during fasting time. It is a source of protein and is considered 'the poor man's meat'.

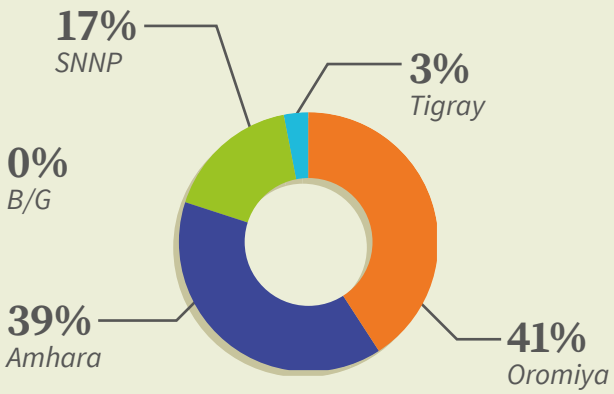


Figure 40 *Field pea Production—Regional Share*

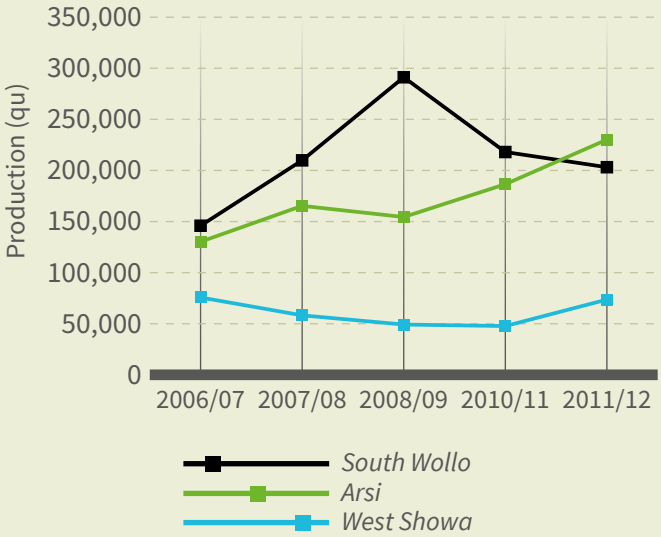


Figure 41 *Field pea Production Trend for Top 3 Zones*

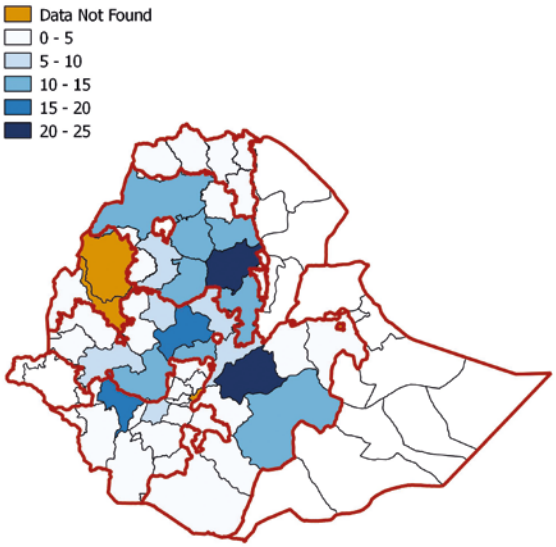


Figure 39 *Average Annual Field pea Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

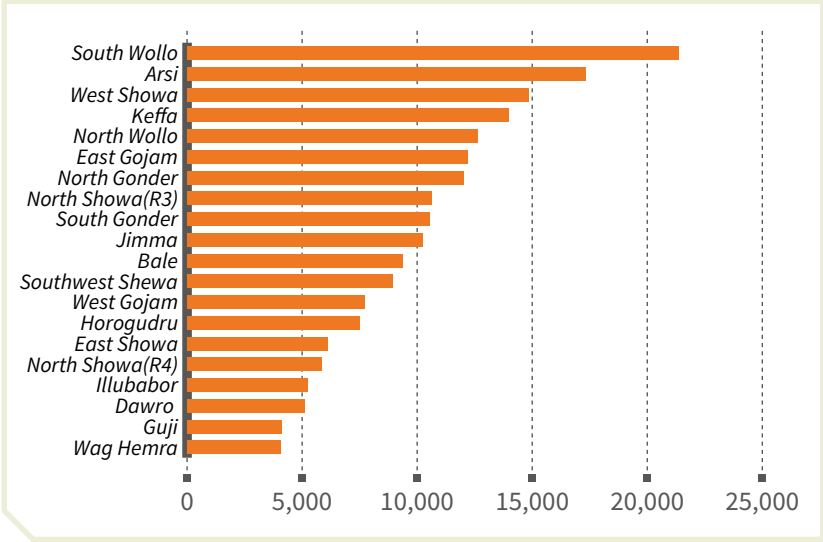


Figure 42 *Top 20 Field pea Producers (Average Production in Tons)*

Field peas serve as a rotational crop. It is considered as an alternative to the cereal production system and provides the basis to break disease cycles in wheat, teff and barley, improving the soil fertility status and weed control. Peas reduced the fertilizer requirements of maize by 20–32 kg/ha in India compared with wheat or fallow, respectively; in France it was estimated that about 50 kg/ha of nitrogen was returned to the soil by peas.

Again Oromiya and Amhara top the list as major field pea producers with a combined 80% of total production. South Wollo in Amhara and Arsi in Oromiya are the two largest production zones of Ethiopia, followed at some distance by West Showa (Oromiya).

The farm perspective

Farmers prepare their land starting from May to June for one to three times. The first ploughing is done in mid-May and second ploughing is done at the second week of June. The planting of field pea is governed by the onset of the main season rainfall. It is usually done when there is effective rainfall (25 mm), before planting cereals in July. Most of the farmers dedicate 0.2 hectares of their land to field pea and produce about two quintals of field pea in a bad season and four quintals in a good season. Farmers utilize 25 percent of the produced grain as family consumption in the form of boiled roasted, processing for *shiro* or *kiki* (stew) and for seed. The other 75 percent of the grain is sold at the local market from January to June.

Field pea is a poor competitor with weeds during the first months after planting. After that period field pea can suppress weed naturally due to the dense coverage of the crop. Since field pea is very sensitive to weeds at seedling time, weeding is done once in the second week of August before the plant develops flowers or pods. Farmers apply chemicals like *roger* and *malathine* if there is pest infestation (aphid and bollworm) in mid-September.

Harvesting of field pea is usually done by hand in November when the crop matures in the field. It then remains in the field for another one to three weeks depending on the availability of labor and urgency. It will be threshed by oxen and sorted by wind and transported to the storage area. Field pea harvesting and threshing is done at the end of November until December, depending on the availability of labor.

The crop is considered as a rotation crop with cereals. Farmers mainly use local varieties or landraces. There is very limited improved technology or extension service developed for field pea. The most limiting factors for field pea production are: aphids (*Acyrthosiphon pisum*), African ball worm (*Helicoverpa armigera*), powdery mildew (*Erysiphe polygone*) and Ascochyta blight (*Ascochyta pisi*). Abiotic factors like moisture stress at critical periods and poor soil fertility (acidity) also influence field pea production significantly.

The field pea value-chain

On average farmers take 75% of the produce to the market from February onwards: 45% goes to local collectors, 20% to wholesalers and 10% directly to consumers. Since all farmers use the local variety or landrace for planting, they will keep 25% for seed and home consumption. Local traders or collectors purchase field pea at ETB800–900 per quintal. This time, special emphasis is paid to the wholesalers, processors and service providers as these play a crucial role in the Eastern Amhara field pea value-chain.

The regional wholesalers are the most organized actors in the chain with relatively large warehouses and diversified products. They sort, grade and pack the field peas and mainly sell directly to the local processors. Since most of the wholesalers have big warehouses and good financial capacity, they can store the peas for longer periods of time and sell at higher prices in May and June. Sometimes the wholesalers also sell the grain back to the collectors when demand is high at the farmers' side. The number of wholesalers in towns like Dessie is few in number but there is sufficient competition amongst them. They have better market information and networks than any other value-chain operator. Also, their revenue (and risk) is higher than the local collectors or aggregators as well as the processors.

Unlike in the more centrally located lentil areas, field pea processors are often groups of poor women groups or individuals. They purchase field pea from collectors or wholesalers, every week, in small amounts and process these within three to four days. They will soak the peas in water and wash it. The soaked and washed peas are sundried for two days in the open field and sorted for splitting. After the grain is split and sorted, it is mixed again and sold to consumers directly or through retailers.

Processors often lack capital and don't have a warehouse or processing area. The big processors collect the product from local traders or collectors and process (cleaning, sorting, packing and transporting) for sales to the capital or export market. Some big processers (e.g., MSA) have a better capacity and can produce up to 20,000 tons of pulses. The *baltena* business is growing rapidly and provides income to a lot of (poorer) households. Also roasting can be an important element in field pea processing. Currently this is done by the small-scale *baltenas*, using firewood. Some low-cost technology is available to alleviate this process. ***Box 4*** provides an example of this.

Important service providers are Bureau of Agriculture, Regional Research Center, a number of NGOs and the Amhara Credit and Savings Institute. The South Wollo Bureau of Agriculture provides trainings for farmers on e.g., land preparation, planting, weeding and harvesting. It also demonstrates new production technologies, predominantly in cereals. In addition to this, the bureau of agriculture does quality certification for exporters as delegated to the local bureau of agriculture. The process of certification, however, is not very efficient and the wholesalers complain about bureaucracy and delays.

The Agricultural Research Center at Sirinka and Wollo University introduce new technologies like quality seed of improved varieties, improved packaging materials and training on good agricultural practices. Wollo University provides training to the Bureaus of Agriculture, NGOs and cooperative promotion office and directly to farmers.

Legumes go through several stages before they are ready to use. These stages include: cleaning, drying, sorting, splitting and milling. Depending on the pulse and its intended use, other steps can be included like dehulling (decorticating), puffing and roasting. Dehulling or decorticating the field pea consists of two steps, loosening the hull by drying and removing the hull, and cleaning. This process is time consuming and labor intensive.

The objective of introducing field pea roasting and splitting machines is to reduce the labor requirements of processors and at the same time reduce deforestation and environmental pollution through low-cost technologies. One machine can serve many processors once organized in a group or company. This can especially benefit resource poor women.

Box 4 *Introducing a field pea roasting and splitting machine*

Non-governmental organizations (Concern and EOC) further capacitate and assist farmers in providing small grants for inputs (seed and livestock) in the form of a revolving fund. They also develop the farmer's skills through trainings. The main financial institutions are micro-enterprises like the Amhara Credit and Savings Institute (ACSI) and the office of small scale enterprise promotion. They provide credit to farmer groups (5–7 farmers) for input purchase.

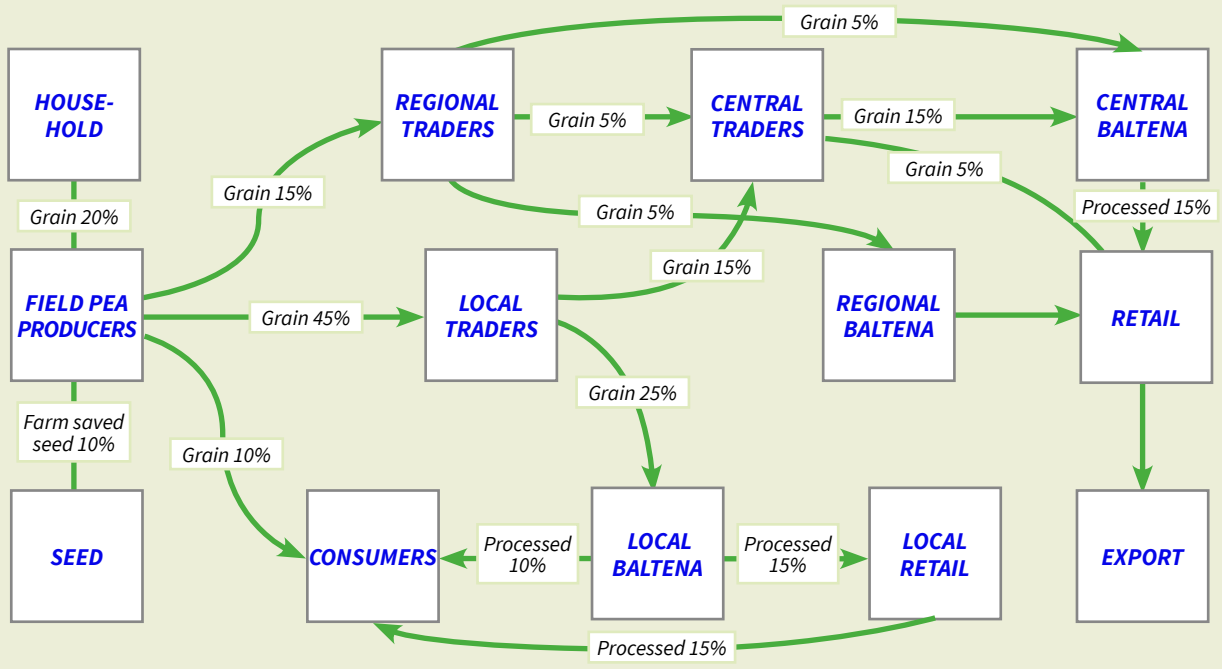


Figure 43 *The field pea value-chain of South Wollo*

Economic analysis

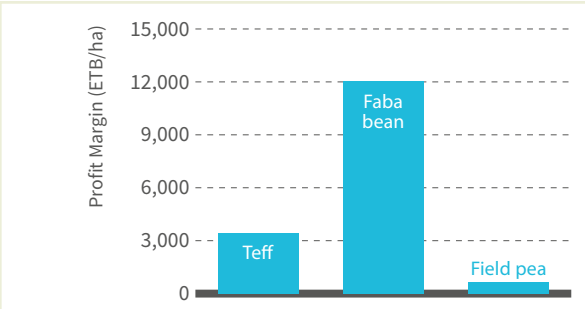


Figure 44 *Profit Margin per ha*

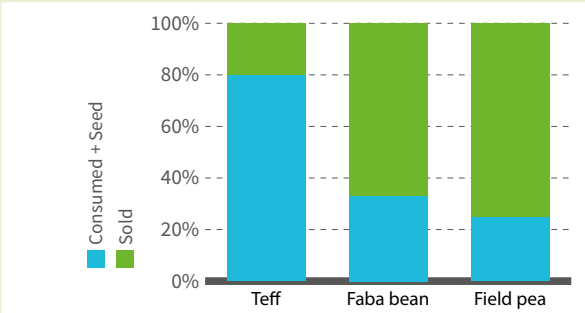


Figure 45 *Consumed vs Marketed*

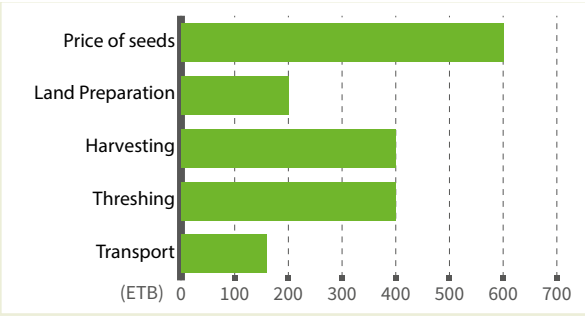


Figure 46 *Production Cost Components*

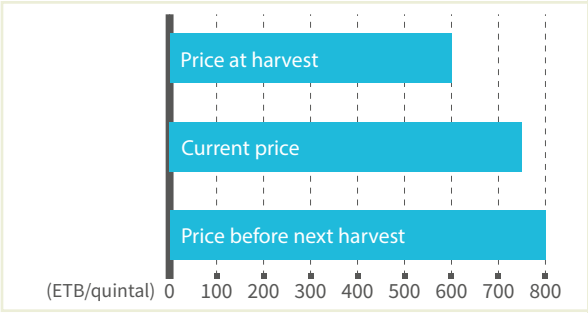


Figure 47 *Price Trend within a Year*

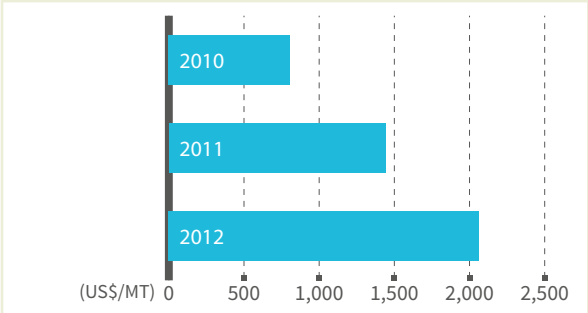


Figure 48 *Export Price Trend (US$/MT)*

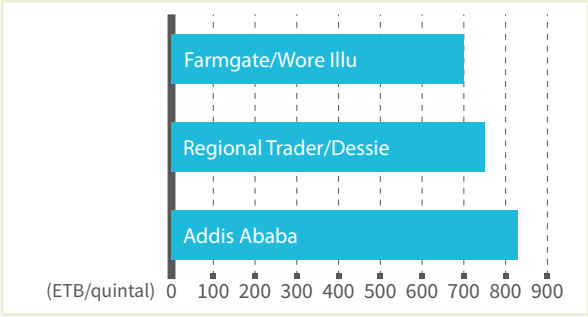


Figure 49 *Price Across Chain*

The economic analysis shows that field pea was not profitable during the 2013–2014 growing season. Exactly opposite to the faba bean analysis, field pea now scores much lower while faba bean is higher. In this specific case this had to do with a stem disease and the outbreak of worms. Hence, yields and overall profitability was low. On the contrary faba bean scored well even out-competing teff. In other years field pea probably would had scored in between the teff and faba bean. Production costs for field pea are relatively low, as farmers hardly use improved seed, fertilizers or crop protection products. Combined with the limited plot size dedicated to the crop it also shows that the crop not a priority crop for many farmers.

Export prices are high, which mainly has to do with the small quantities being exported and possible room for error there (<500 tons/year). Still, field pea is an important cash crop, with 75% of the crop being marketed. Again, price variations along the chain are low, with farmers receiving at least 80% of the retail price, while they also reflect the relative remote location of the production areas.

Conclusions and recommendations

Field pea has been a more or less 'forgotten crop' in the Ethiopian pulses sector. Still, it contributes to more than 300,000 tons of production each year and 1.8 million farmers plant 0.10 hectare or more of the crop. The relative labor intensive nature of the crop, the fact that it is often a third or fourth priority crop for the farmer and the limited exports, have caused limited attention for the crop. However, for the 1.8 million households it comprises an important food crop, more drought resistant than faba bean and suitable for the often harsh conditions of Eastern Amhara (and other more drought prone areas).

Specific recommendations are in line with the *baltena* recommendations of the chickpea chapter. Probably specific interventions in the field pea farming system will not ensure value-for-money, but at least the support activities for the chickpea, faba bean and lentils processing industry could be made available for field pea processors as well. These recommendations include: access to low-cost technologies, improving access to finance and business coaching. Additional recommendations for both field pea and lentils include:

Production
Lentils and field pea are relatively forgotten crops with limited research activities. Farmers mainly use landraces and local varieties, and variety development initiatives are limited. The absence of high yielding varieties has significantly reduced the yields and potential growth of these legumes. The fact that there is sufficient market both domestically and internationally means that investment in variety development and extension can have high a payoff. A possible seed system enhancement intervention could be initiated by TL2 or N2Africa.

Quality and post-harvest management
There is a high level of impurity and product loss in both the lentil and field pea value-chains. Most of the produce that reaches the market has a high content of soil, sand and chaffs. Evidence suggests that this mostly comes from poor harvesting and threshing practices as well as lack of proper cleaning at farm and local trader level. This process could be improved through better threshing practices (using a canvas sheet instead of threshing on the ground) or introducing small-scale threshing technologies. In addition, incentives in the market for better cleaned grain with transparent communication could be initiated.

Processing level
Small-scale processing of lentils and field peas can be improved both at household level using traditional stone mills or by using high-end standard millers in Addis Ababa, such as at Selam and Abyssinia Baltenas. One recent phenomenon, mentioned in the previous sections, is the rapid emergence of SMEs in the sector. SME processors in Debre Berhan and Beki (35 km from Addis Ababa), supply the highest share of processed lentils and field peas to the Addis Ababa market. However, looking at the *baltenas*' operations, the cleaning, soaking, drying, milling and sieving technologies and practices are rather labor intensive and unhygienic. Therefore, technologies that save labor, improve hygiene and food safety can be good entry points for interventions. This intervention can be developed in partnership with technology service providers such as Selam Technology, a number of TVET Colleges, Local Metallurgy (SMEs) and the Engineering Department of Debre Berhan University.

Access to finance
Despite the fast emergence of a large number of small and medium processors in the legume sector, and for lentils and field pea in particular, access to finance is increasingly becoming a bottleneck. Most of the enterprises have a limited asset base to access loan from the banks, which demand collateral. In addition the SMEs lack proper business plans and organizational structures that are requested for by financers. Another challenge is that most of the enterprises exceed the loan maximum that MFIs often set. As such meso-finance (too big for MFIs and too small for commercial banks) is clearly a missing link in the system. As possible entry point for interventions financial instruments like loan guarantees and challenge funds, or the support for business planning can be envisaged.

From entrepreneurship to business
One major growth bottleneck for *baltenas* (SMEs included) is the transition from self-employed with a limited number of employees to a full-fledged SME with a clear mid-term and long term business strategy and plan. Individual coaching for these very small business to transform into real business could be provided through the envisaged IVCD Legume project.

Legume-livestock linkages
Byproducts from lentil and field pea processing are important animal feed ingredients. This is particularly imminent in Debre Berhan, which is also a high potential dairy belt. Though the system is functioning well at the moment, there are good possibilities to upgrade the feed or dairy business in terms of technology, examples: feed mixer, milk processing and better market linkages. In this respect closer partnerships can be considered with other projects like SNV-EDGET, IRLI, and CNFA-LMD.

5|5 Grass pea

Grass pea (*Lathyrus sativus* L.) is an important food legume in Ethiopia. The legume is nutritious, rich in protein (28–32%) and contains good quantities of essential amino acids. It is a particularly important crop in areas that are prone to drought and famine, and is thought of as an 'insurance crop', as it produces reliable yields when all other crops fail.

It is the fifth most important pulse crop in Ethiopia after faba bean, haricot bean, chickpea and field pea. Grass pea is a highly popular food and feed legume in the farming system due to its tolerance to droughts, floods and disease and its importance in ameliorating soil fertility. It is commonly grown as a relay crop, directly sown after the cereals' harvest. Consumption of *Lathyrus sativus* has for more than 2000 years been associated with neurolathyrim caused by the nearotoxin β-ODAP which is present in the peas. The chapter on the grasspea value-chain provides more extensive information on grass pea and neurolathyrim.

Amhara is by far the largest production area for grass pea. Especially the zones of South Gonder and North Wollo are major production areas. At some distance Southwest Showa produces substantial grass pea too, though here it is most probably as a second crop (after the main season). For this study the zone of South Gonder was selected for in-depth value-chain research.

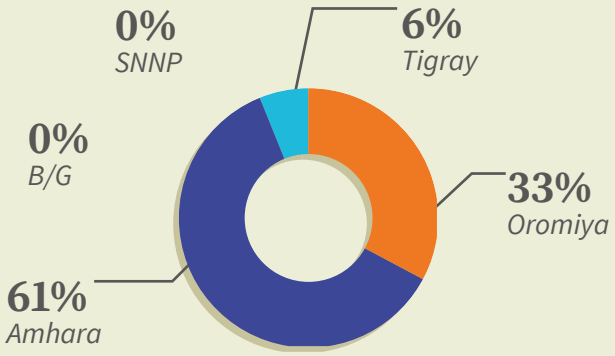


Figure 51 *Grass pea Production—Regional Share*

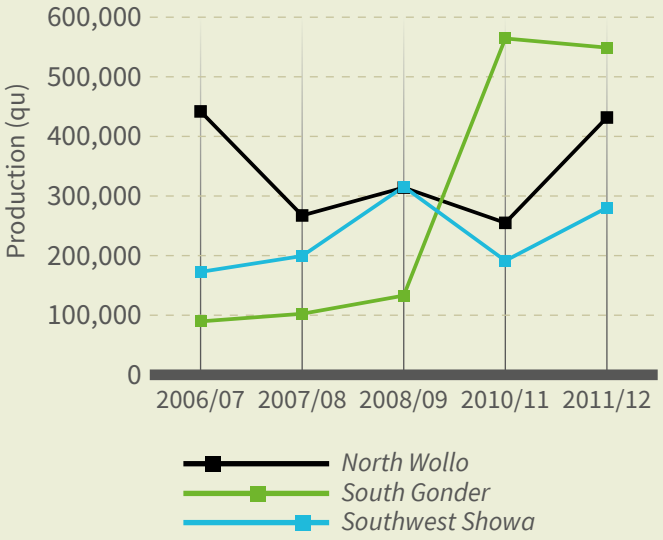


Figure 52 *Grass pea Production Trend for Top 3 Zones*

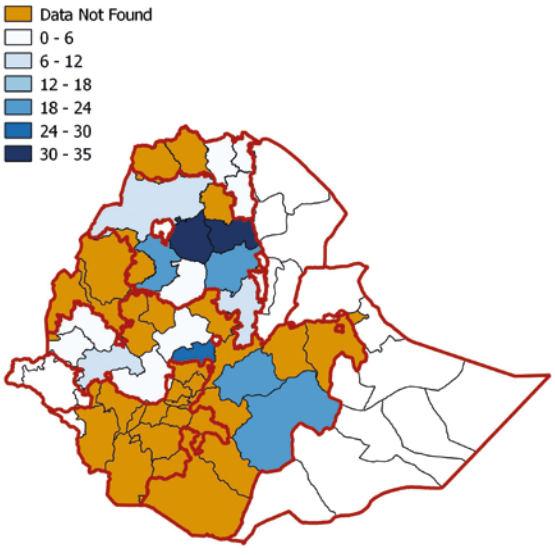


Figure 50 *Average Annual Grass pea Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

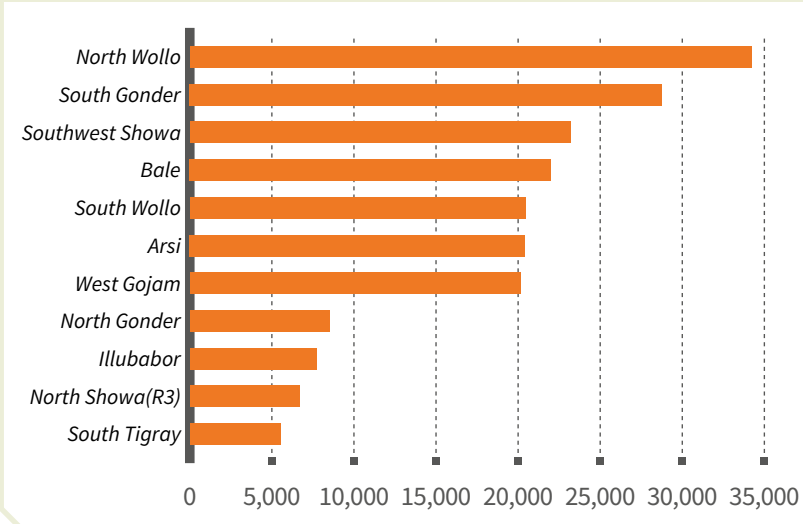


Figure 53 *Top 10 Grass pea Producers (Average Production in Tons)*

The farm perspective

Grass pea can be produced in two ways. The first and dominant one, is growing the crop as the main crop during the long rainy season. In this way, land for grass pea is prepared from the end of August till October and sowing is from October to November. Spraying of insecticide is also done during this time. Harvesting and threshing of grass pea is done from December to January and it is usually sold up to May. The second way of grass pea production is in a mixed, relay cropping system with rice which is quickly coming up as a standard practice in areas like Fogera in South Gonder, and in some flood areas of North Gonder. In this case, the grass pea is sown when the rice is left with about two months before harvesting (August/September). Farmers plant the grass pea seed over the rice crop. They cut the grass pea along with harvesting the rice at maturity stage, which leads to the emergence of sprouts from the grass pea. Through this practice the residual soil moisture of the land is used optimally.

The by-product of grass pea is called *defecha*. The average volume of *defecha* production is estimated at 3.6 t/ha on average when it is produced by mixing the rice straw. The amount is three times as high when it is produced independently. The byproduct of grass pea is used for animal feed. The average price of *defecha* is ETB100–140 per quintal. *Defecha* is usually given to cattle and particularly lactating cows for boosting production and fattening cattle.

The grass pea value-chain

The grass pea value-chain is highly similar to that of chickpea. This is not surprising given the similarities in farming systems and uses of the crop. Therefore, we will not elaborate on the specific value-chain characteristics, but more importantly focus on the overriding issue of the β-ODAP content and associated illnesses.

Though grass pea has impressive economic returns and is not labor intensive, its high content of Beta-oxalyl-diamino-propionic acid described in short as β-ODAP makes it a risky crop. β-ODAP is a neurotoxic secondary metabolite present in the legume *Lathyrus sativus*. The neurotoxic amino acid can cause irreversible nervous disorders, such as: hyper-irritability, muscular rigidity, weakness and paralysis and leaves the patients crippled for life when it is consumed as a major portion of the diet over a three-to-four month period (Spencer et al, 1986). A person will be exposed to this risk when the crop makes up at least one third of someone's dietary intake for two or three months. Although sporadic cases of neurolathyrism also appear in normal years, the disease is highly prevalent in times of food shortages following flooding or famine. A reported epidemic of neurolathyrism occurred in three districts of northeast Ethiopia following a drought in 1998 where more than 2,000 people were affected in one sub-district alone (Getahun et al, 1999). The consequence of ODAP in Fogera is evident in the abnormally high number of people with muscular disorders. A victim farmer whom we visited during the field research underlined the risk of consuming high amounts of grass pea. This was imminent in the old days, though still many people in Fogera think that the high prevalence of muscular disorders has to do with fate.

The ODAP content of *Lathyrus* has been shown to differ widely both between accessions and between environments (Ramanujam et al, 1980). Over the years, different research efforts have been undertaken to develop high-yielding grass pea varieties with low ODAP content. However, according to Girma and Korbu (2012), the 50 years of on-station and on-farm research has not been successful in producing varieties with the desired traits. A conventional breeding approach to develop low ODAP varieties rarely works because the trait is highly influenced by climatic and edaphic conditions. The development of biotechnology and its application in grass pea has resulted in somaclones with neurotoxin ODAP content of less than 0.1% (100 mg ODAP/100gm seed) in India. As a result the government of India released one of the somaclones, Bio L212 (Ratan), for cultivation. Low ODAP lines are also available at the International Center for Agricultural Research in Dry land Areas (ICARDA).

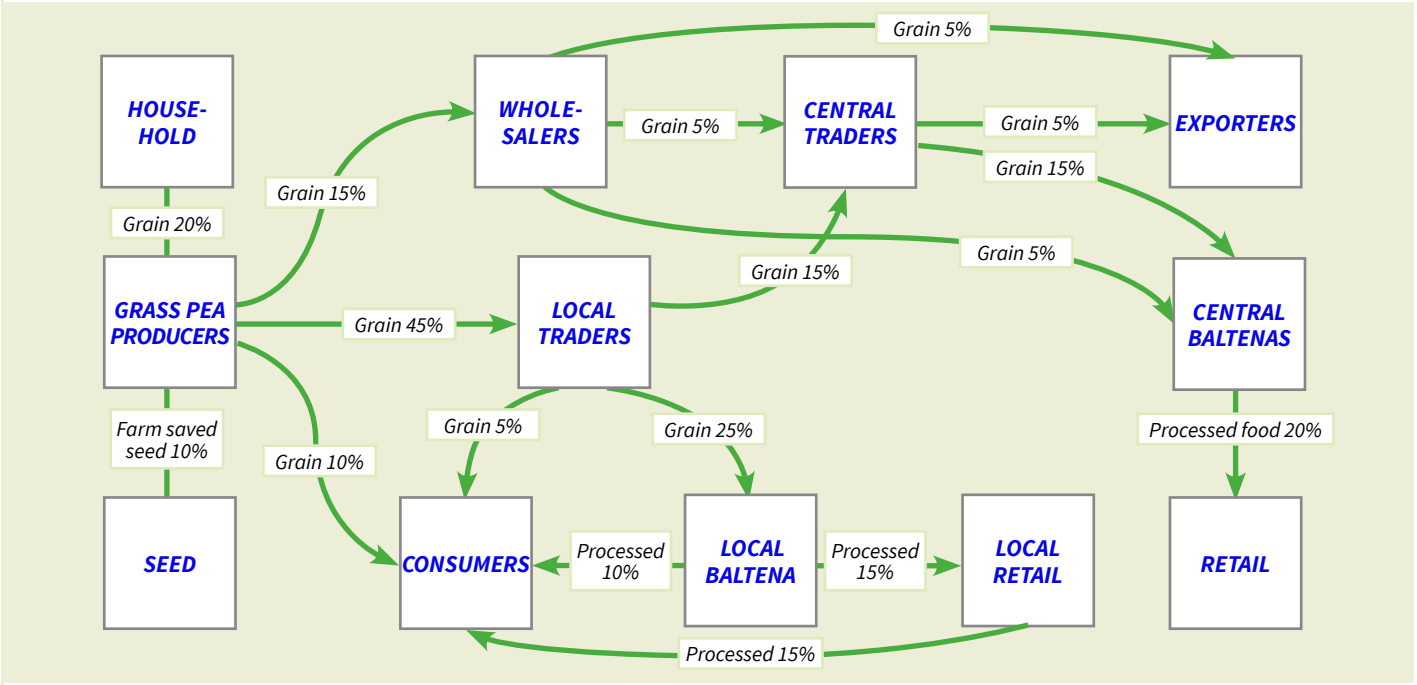


Figure 54 Grass pea value-chain

Conclusions and recommendations

Grass pea has huge advantages compared to the other legume crops: yields are relatively high, labor requirements are low, and it can be grown as a relay crop, is resistant to droughts and floods, and the straw is voluminous and has significant value. However, all these advantages pale in comparison to the detrimental health impacts of the crop. The neurological illnesses that the crop can cause by far outweighs its benefits and any recommendation should focus on developing and introducing low or zero ODAP content containing varieties. CCRP-McKnight or N2Africa could be requested to take up this role and work in collaboration with ARARI on this issue. Research Institutes in India and ICARDA seem to have developed lower ODAP content varieties and these could be tested and introduced to Ethiopia as well.

5|6 Lentils

Among the different pulses grown in Ethiopia, lentil has a growing demand in domestic and international markets. The lentil (*Lens culinaris*) is a brushy annual plant of the legume family, grown for its lens-shaped seeds. It is about 40 cm tall and the seeds grow in pods, usually with two seeds in each. Lentils originated in Central Asia and have been consumed since prehistoric times. They are one of the first foods to have ever been cultivated. Lentils are high in fiber, low in fat and cholesterol free. Lentils are second in highest protein content, after soybean, of the investigated pulse crops with 30%. Lentils are also high in vitamins and minerals, including: foliate vitamin B1, manganese, magnesium, phosphorus, copper, potassium and many others.

Particularly in Ethiopia, lentil is one of the heavily consumed pulse crops. It is usually eaten fried, roasted and boiled whole or split in the form of stews or vegetable soups. It is also ground to powder to prepare *shiro* (a pulse-tomato-onion sauce), *azifa* (a green lentil salad), and *hilbet* (lentil paste). It is also widely used in crop rotation practices to improve soil fertility. *Mesir wat* or lentil stews, are especially popular during fasting days and local consumption is very high during these days (more than 200 days per year for Ethiopian Orthodox Christians). The demand for this commodity, both in local and international markets, has increased significantly in recent years. Its local price is higher than most pulse crops and this has probably also caused the sharp increase in production between 2006 and 2012 of more than 60%.

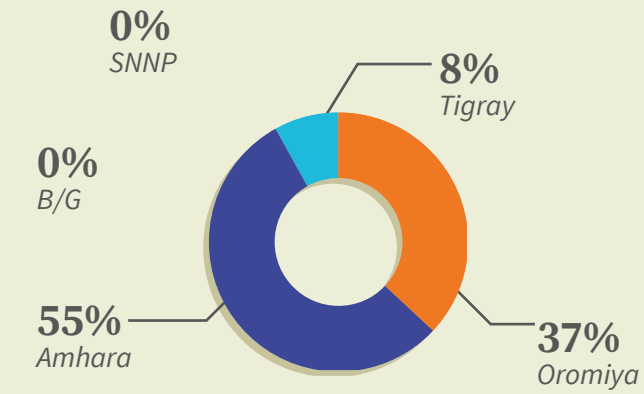


Figure 56 *Lentils Production—Regional Share*

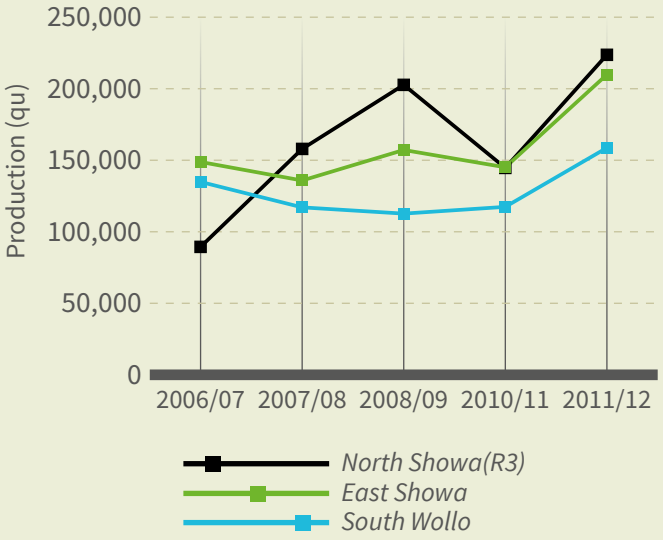


Figure 57 *Lentils Production Trend for Top 3 Zones*

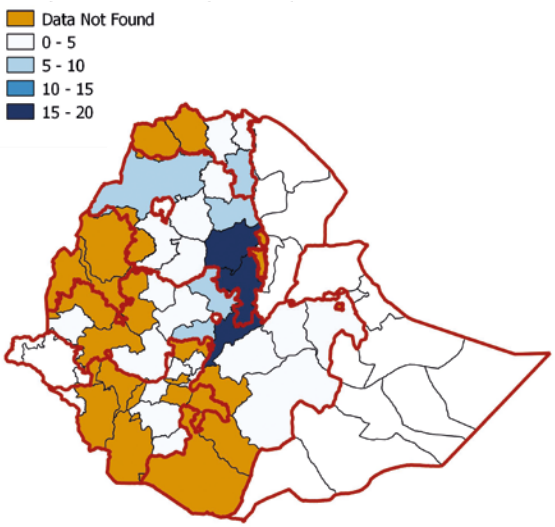


Figure 55 *Average Annual Lentils Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

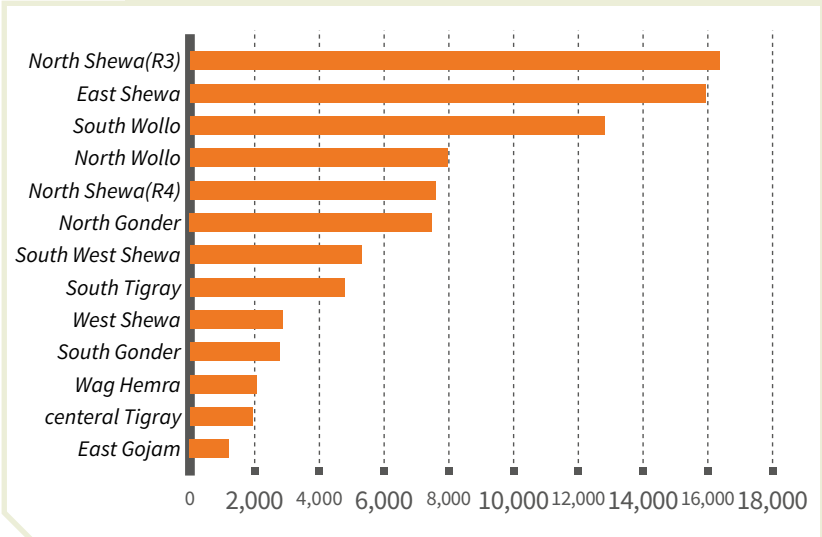


Figure 58 *Top 10 Lentils Producers (Average Production in Tons)*

The North Showa zone of the Amhara region and the East Showa Zone of Oromiya are the two leading lentil producing zones of the country. Together they account for more than 40% of the national lentil production. Productivity is lower than most other legumes, and stands at 1.2–1.3 tons per hectare. This study selected North Showa (Amhara) for in-depth study. Growing conditions in this zone are also representative for East Showa (Oromiya).

The farm perspective

The common practice is to plough the land during late April, but in some cases a second till is made in June. All interviewed farmers use oxen plowing. Crop rotation is stated as a common practice for lentil, and intercropping is not practiced. Farm inputs which are necessary for lentil production are seeds, fertilizer, labor and chemicals. Most growers use their own labor for the production activities, but few wealthy farmers use casual laborers from nearby village. Forty birr per day is the average wage during the peak working months.

Commonly, farmers keep seed reserves from the previous production year. Though most farmers don't trust marketed seeds, in rare cases they use local markets and neighboring farmers as seed source. There is only one improved seed variety introduced and adopted by local farmers, *Alemaya*. Farmers get this seed mainly from the cooperatives and offices of agriculture. Fertilizer is the second critical input used by lentil farmers. The only source for fertilizer is the cooperative. The farmers mentioned that the price of DAP in the previous production season was 1,500 birr per quintal. Most farmers take it via credit through the cooperative system with an interest rate of 12%. They usually use 2 quintal DAP for a hectare of land. Chemicals, which are used to treat pests and disease, are also used by farmers in rare cases.

The chemicals are available from cooperatives and private shops in the nearby cities. The commonly used chemicals, as mentioned by interviewed farmers are Dimethoate and Karate, both are insecticides.

Harvesting and postharvest handling activities are done manually. Harvesting is done by pulling the stand from the ground; this is mentioned as one reason for the mixing up of soil with the final product. Threshing is also done manually by rotating cattle over the harvested stand in an open field. The field is usually creamed by wet cow dung to make the ground smooth and reduce the inclusion of soil or weeds. After threshing it will be blown by the wind to separate the seed from the straw. The grain will then be packed and sent to the market or stored at home in a mud-made container. No further postharvest processing or value addition is undertaken at farmers' level.

Farmers listed pests, weeds and natural calamities (excess rain) as the main constraints for lentil production. Especially root rot, wag, *guitle* and *kishkish* are the main types of pests limiting the lentil production potential of the zone. Though lentil can stand a wide range of temperatures, it is rather sensitive to high rainfall. Lentil prefers between 300 and 500 mm of rain per year (CGIAR, 2012). In addition to those problems, lack of improved seed is also mentioned as a constraint in the process.

The lentil value-chain

It is estimated that the major part of the lentil production goes to the local wholesalers based at Debre Berhan, the zonal capital, which account for around 60% of the total. Cooperatives take the second position with 25%, followed by local collectors: 5%. The remaining product is reserved for home consumption and seed for the next growing season (only 10%). According to the data, the marketable surplus of lentils in North Showa is around 90%, this indicates that lentil is mainly produced for commercial purposes. The lentil value-chain is presented on the next page.

The lentil value-chain is rather similar to the field pea value-chain. Therefore most emphasis will be paid to the role of the emerging medium-scale processors and the important role of the cooperative union.

Farmers in North Showa have relative close links to their cooperatives. Through the cooperatives farmers are linked to: improved seed, fertilizer, chemicals and farming tools. In addition, some of the cooperatives provide market information and credit services as well as the purchase of the lentil produce. The Wodera Union, which unites a number of local cooperatives, links to the small and medium level processors based at Debre Berhane and supplies them around 50% of their total lentil stocks. Debre Berhane University, which hosts about 10,000 students, is the second biggest client for the Wodera Union and buys an estimated 30% of the total supply. Big processors and wholesalers in Addis Ababa are the remaining clients.

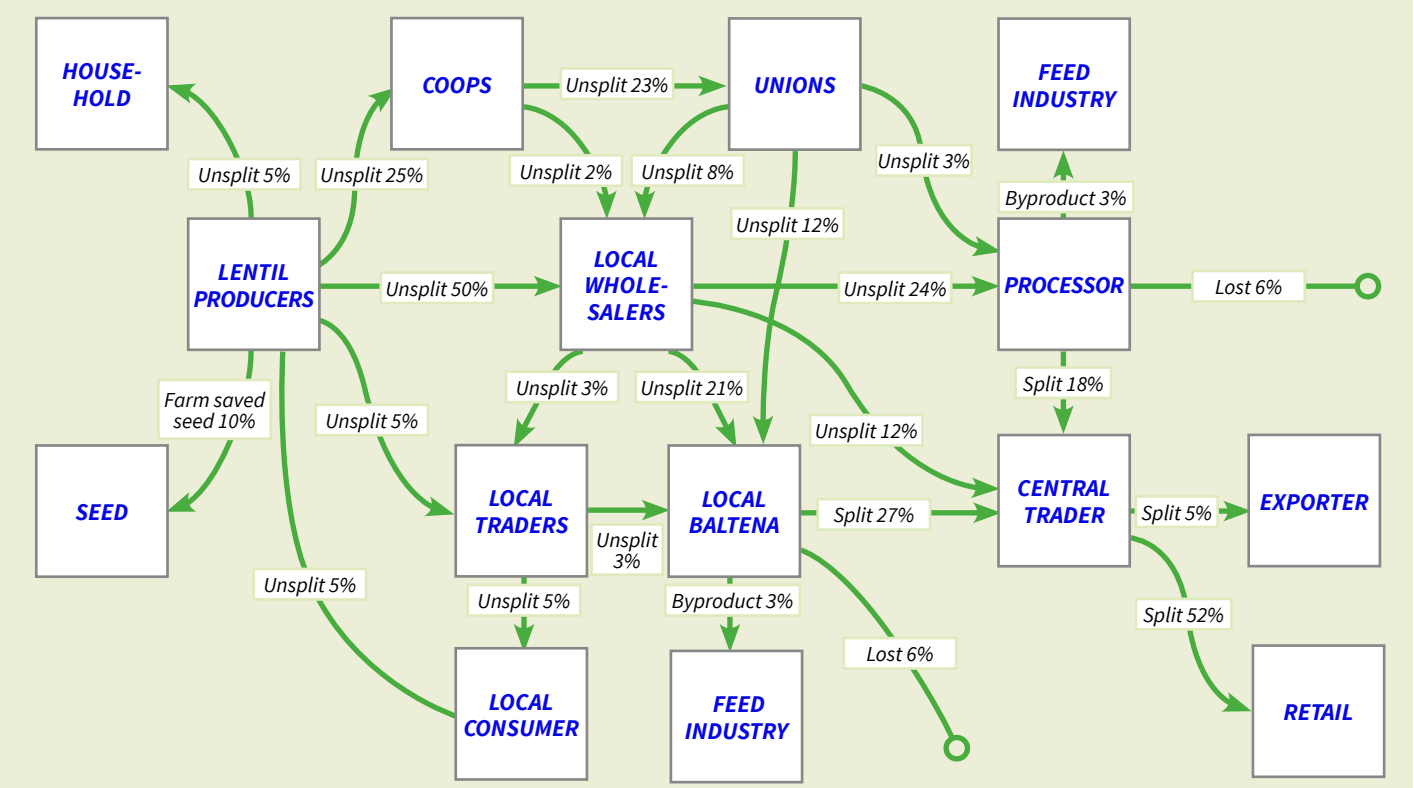


Figure 59 The value-chain of lentils in North-Showa (Amhara)

At the northern outskirt of the small but fast emerging town of Debre Berhan one finds a hectic legume processing center, where over 100 local entrepreneurs (organized into 7 processing cooperatives) are engaged in splitting of lentils and other legumes. This rather large though traditional industrial zone has created employment opportunities to over 1,000 people and annual production of processed lentils is close to 3,000 metric tons.

Ato Nigussie Shewangizaw, the chairperson of one of the processing cooperatives, joined this business together with 40 colleagues in 2006. His enterprise started with a capital of ETB97,000 raised from members and borrowed from the local government, as part of an SME promotion strategy. After repaying the loan the enterprise's capital rose to about ETB 4 million today. Unlike the conventional cooperative model, Ato Nigussie's cooperative adopted a model of shared facilities but independent business operations, i.e., the members own the compound, machines and equipment but independently run their warehouses, inventories, supplies and market.

Interestingly, Ato Nigussie was a livestock trader before he joined the enterprise and by changing business he lost a large amount of merchandise to Addis. For him his old business was highly unpredictable and risky compared to the lentil processing. When asked about his current business he answered: *"It is feasible, but the point is that we even have bigger untapped opportunities; we have the market and the manpower, but we are severely constrained by working capital and old machines."* Today each member of the cooperative processes 7 tons of lentils per week compared to 0.2 tons at the start. The majority of the split lentil is sold to traders in Mesalemia Commodity Exchange (Addis Ababa). Ato Nigussie and his counterparts are exploring opening a new processing plant in Shewa Robit. Only the lack of finance is holding them back. Only three of the 40 shareholders are women but paradoxically the women make up more than 75% of the labor force in the enterprise. The low participation of women in the ownership has partly to do with culture, but also, importantly, the perception of tedious supply chain coordination and management.

Box 6 Medium level lentil processors in Debre Berhan

A very interesting feature of the lentil value-chain is the importance of the medium-level processors. The major activities involved in the processing are:

- ***Manual cleaning:*** to remove sand and other admixture
- ***Washing by water:*** to remove dust and other soluble materials
- ***Soaking the lentils through water filled containers:*** to separate and remove the cotyledons (1)
- ***Draining the soaked lentil in ventilated sacks for 24 hours:*** to drain the water (2)
- ***Sundried for a full day:*** to make it ready for milling (3)
- ***Graded in to four classes based on size:*** to make it suitable for uniform splitting/milling
- ***Milled/Split by the electrical mill:*** this is the ultimate goal in the process (4)
- ***Waved by wind:*** to separate the straw from the seed
- ***Mixing:*** the four different grades are mixed again
- ***Weighed and packed:*** the final task.

The below pictures visualize the production process for one of the bigger processors in Debre Berhane.

Processors select the raw lentil on the basis of the following criteria: size (the bigger the better), shape (round preferred over flat or irregular shaped), and admixture (the lesser the better); color (red is preferred), water absorption capacity (time to absorb the water) and seed cover (the thinner the better). Consumers also use most of the above criteria, especially the proportion of foreign matter and the taste are important. According to interviewed consumers the red lentils taste better.

Processors can be found in different size and level of organization. They range from large-scale (more than 500 employees) to small-scale even family type businesses. They can be organized as cooperatives, partnerships and private companies. What is common to all is the end product. Big processors have a relatively large output, are more sophisticated in terms of technology and are more stable in capital. Most of these processors are found in Beki, 30 km north from Debre Berhane. They receive the lentil from the local wholesalers, the cooperatives and the Wodera union and they sell the processed lentil to the big wholesalers based in Addis Ababa and Adama. The small-to-medium level processors often supply directly to more local retailers as well as directly to consumers.


1


2


3


4

Economic analysis

According to the interviewed farmers lentil is a popular crop, mainly for five reasons:

- It is drought resistant
- There is increased demand from processors and wholesalers, which has also boosted the market price
- It is an important crop for household consumption
- It has a lower labor and input requirement, especially compared to that of teff or wheat
- The lentil stalk fetches a good price as cattle feed.

The following graphs reflect this comparative advantage of lentil. The comparative advantage is mainly due to the current high market price for lentils, at ETB1500 per quintal almost double that of field pea, and the relative low production cost and labor requirements.

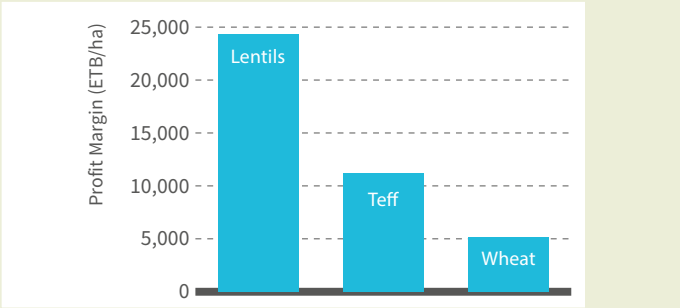


Figure 60 Profit Margin per ha

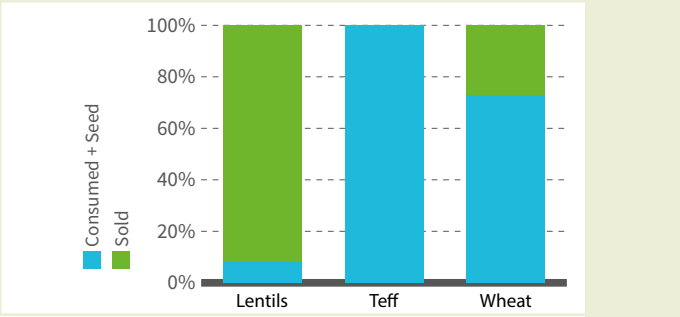


Figure 61 Consumed vs Marketed

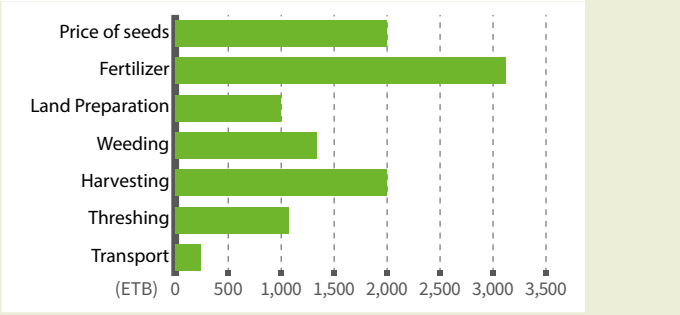


Figure 62 Production Cost Components

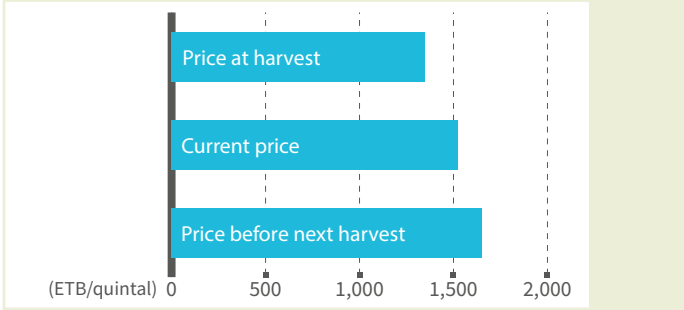


Figure 63 Price Trend within a Year

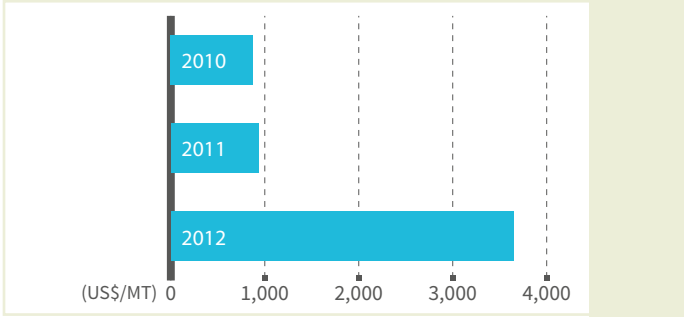


Figure 64 Export Price Trend (US$/MT)

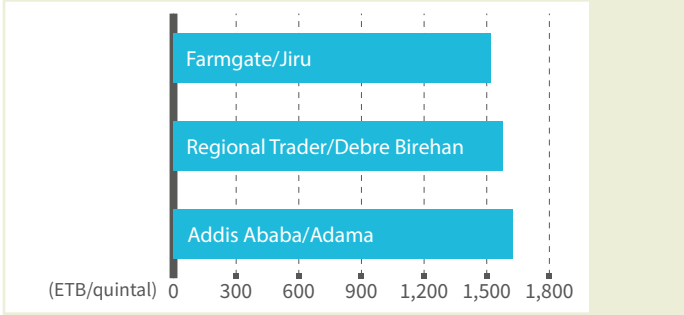


Figure 65 Price Across Chain

In addition, yields were relatively good in the study area of Jiru, with 2.6 ton per hectare. Farmers indicate that the market for lentils is rarely a problem, though there is quite substantial price fluctuation during the year, increasing from ETB1300 at harvest to ETB1600 at the end of the season. This is directly reflected in the percentage of marketed product, which is at 90% indicating that almost all is sold (while 10% is retained for next year's seed). In these areas, field peas are more used for home consumption than lentils.

The sharp increase of export prices is mainly because of the fact that the export of unprocessed lentils was prohibited in 2012. So, the 2012 price only reflects the split lentil. In addition, export quantities between 2010 and 2012 were low. Again, the margins in the chain are relatively low, leaving an ETB100 per quintal margin between farm gate and Addis wholesaler. This indicates that no excessive rent seeking behavior or market monopolization of middlemen or wholesalers takes place in the lentil value-chain.

Conclusions and recommendations

A similar conclusion can be drawn for lentils as for field peas. Also here attention for the crop has been marginal, though still around 1 million households have lentil in their cropping system (on an average of 0.15 hectare). Lentil productivity can be improved and market prospects, both domestic and international, are better than for field pea. In addition, lentil requires relatively less labor and the research and one advanced variety is available. The recommended interventions mainly follow the interventions for chickpea, focusing on improving: the seed supply, use of inoculants, and additional support for baltenas and wholesalers.

5|7 Groundnuts

Groundnut (*Arachis hypogaea*) is known by many local names including peanut, earthnut, monkey nut and poor man's nut. Groundnut evolved in South America but has now spread worldwide as an important oilseed and food crop. Groundnut seeds contain high-quality edible oil (50%), easily digestible protein (25%), and carbohydrates (20%). The world trade depends largely on the European demand. The non-drying oil is used as a substitute for olive oil, as a salad and cooking oil. It is used in manufacturing margarine and the inferior quality is used for soap, and as a lubricant. High quality oil is used in the pharmaceutical industry. The cake after the oil pressing is a high-protein (45–60%) livestock feed. The nuts are eaten raw, boiled or after roasting.

Groundnut was introduced to Ethiopia first in Hararghe area in the 1920s by the Italian explorers. Currently, the crop is widely grown in the warm lowland areas of the country under rain-fed conditions. In these areas the crop is an important smallholder cash crop. The produce is mainly consumed within Ethiopia and a small portion, around US$1.5 million, was exported in 2011. In the last five years groundnut production has increased rapidly by 165% mostly through area expansion and a modest productivity increase.

An important area for expansion has been the relatively less densely populated region of Beneshangul-Gumuz. In this region most farmers practiced shifting cultivation in the previous decades. Currently, the shifting cultivation practice has largely transformed into a mixed farming systems of crops and livestock. By far the largest production areas can be found in East-Hararghe (Oromiya-East) and Metekel (Beneshangul-Gumuz) (***Figures 66–69***). The production systems and value-chains of these two zones were studied in depth.

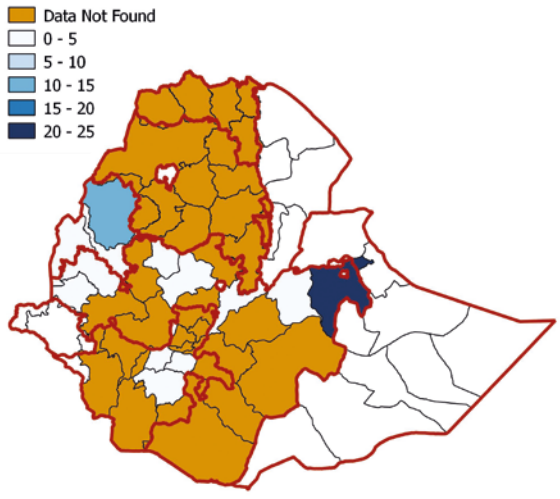


Figure 66 *Average Annual Groundnut Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

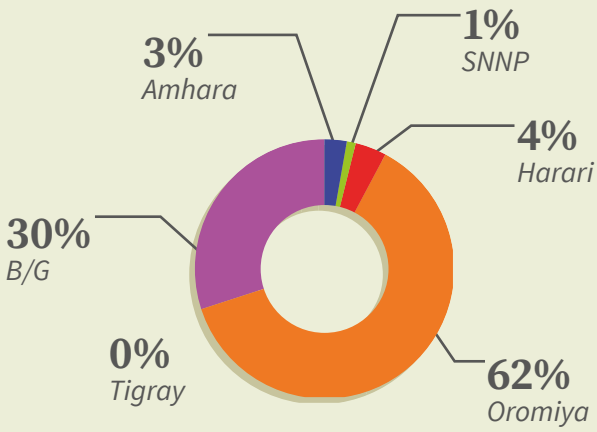


Figure 67 *Groundnut Production—Regional Share*

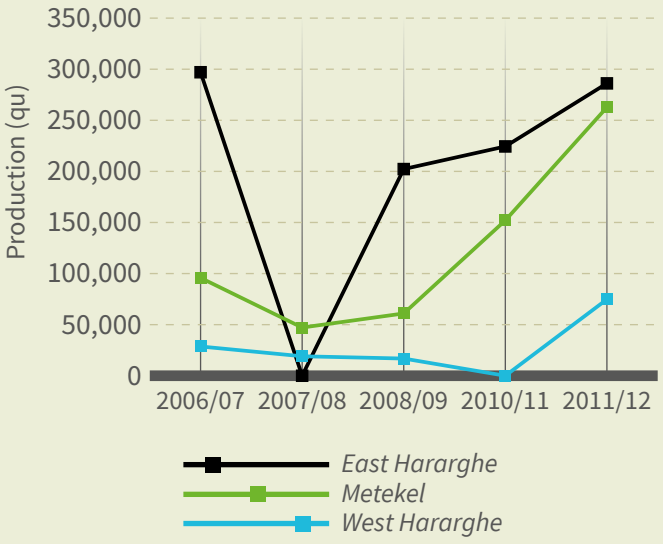


Figure 68 *Groundnut Production Trend for Top 3 Zones*

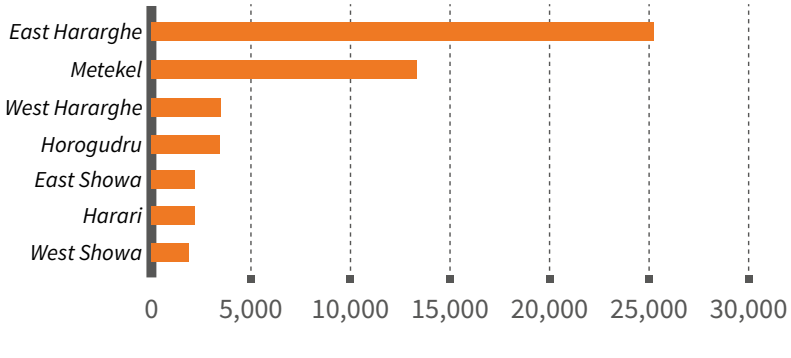


Figure 69 *Top 7 Groundnut Producers (Average Production in Tons)*

The farm perspective

Most suitable soils for groundnut are well-drained, loose, friable, sandy loams, well supplied with calcium and with moderate amounts of organic matter. It can be grown on heavier soils, but this makes harvesting more difficult as the soil sticks to the nuts and it may also stain them. The crop cannot tolerate water logging. The major production challenges in groundnut production are the sensitivity to diseases (root rot, stem rot and wilting), high weed infestation and decreasing productivity due to soil fertility decline. Crucial in groundnut production is the postharvest handling (drying and storage), which if not done properly, can lead to fungal infestations which can cause *aflatoxin* (see ***Box 7***).

According to the information gathered from the Bureau of Agriculture, Haramaya University and Fedis Agricultural Research Center improved varieties like Werer-961, Baha Jidu, Baha Gudo and Haba Sedi are newly introduced varieties that are, though on small scale popular under the farmers. Farmers generally prefer the large seeded varieties. This is derived from the traders' preference in the market.

In both Metekel and East Haraghe groundnut is a cash crop, produced by small-scale farmers. The interviewed farmers in Metekel mentioned that groundnut is a very easy and productive crop. In both areas farmers produce groundnut for household consumptions (10%), while 15% is used as seed for the next growing season. The remainder (75%) is sold to the local market. A relatively large amount of seed is used for groundnut production; the crop has a low multiplication factor of around 6. This lowers the potential return on investment for seed multiplication significantly.

The importance of the crop is evidenced by the place it takes in the farming system of an example *woreda*, Babile, in East Haraghe Zone (***Table 7***). Together with sorghum groundnut is the main crop in the farming system, followed at a large distance by maize and sesame.

The average price of groundnut in Metekel zone (Pawe district) goes up to 1300 per quintal. This is higher than for most other legumes, though yields per hectare are lower. The higher price could be the reason for the increased popularity of the crop. At the same time labor requirements for groundnut are much higher. This is mainly due to the labor intensive nature of groundnut harvesting and shedding.

Mechanical shelling could be a solution to this. A sheller or peeler can reduce the labor requirements by mechanically cleaning (through a destoner) and shelling the groundnuts. Groundnut shellers separate the peanut into seeds and hull. Also a small oil press can be connected to the sheller. The Feddis Agricultural Research Center is currently working on an improved groundnut sheller, that could be further commercialized in the region. If well-adjusted shelling machines can reduce damages to less than 2%.

Year	Crop type	Acreage (ha)	Production (qt)
2010/11	Sorghum	9,252	100,183
	Maize	2,876	45,162
	Groundnut	8,620	95,523
	Sesame	112	126
	Total	20,860	240,994
2011/12	Sorghum	9,207	158,080
	Maize	2,980	15,424
	Groundnut	8,395	112,530
	Sesame	95	244
	Total	20,677	186,278
2012/13	Sorghum	9,300	140,986
	Maize	2,990	50,722
	Groundnut	8,595	130,086
	Sesame	110	376
	Total	20,995	322,170

Table 7 *Cultivated land and production of different crops in Babile Woreda (Source: Babile Woreda Office of Agriculture)*

The groundnut value-chain

Two value-chains are presented below, one for the East-Hararghe Zone and one for Metekel Zone. The value-chains, again, indicate that most trade is going through the regular (non-cooperative) trade channels of local trader (aggregator), regional trader/wholesaler and central markets (60–65%). Some 5% of the produce runs through the cooperative-union channel.

An example is given for Metekel zone, where the product is sold first to local grain traders (collectors or aggregators). These traders collect groundnut from 20 *kebeles* of Pawe *woreda* and then send it to the main markets of Bahir Dar, Gondar, Mekele and the Addis Ababa. The transporting system of these traders is through using mule wagon or small lorry and they send the product (after grading) to the regional and central markets by Isuzu or larger trucks. In the Pawe *woreda* there are cooperatives in every village, however, they don't play a big role in connecting farmers to markets and mainly work on input supply (fertilizer). Both the smaller collectors and local traders have limited capital and rely on the wholesalers in *woreda* towns or neighboring cities. Based on the price information delivered to the collectors, they determine the buying prices for groundnuts, so that their operation costs and profit margins are covered.

It was stated that the local traders and collectors earn a margin of ETB 20–30 per quintal. The local traders complain about quality problems, especially due to high moisture content. Mostly farmers add water for two reasons: for easy shelling operations and to drive up the weight. This results in quality deterioration, potential proliferation of aflatoxin and ultimate value loss in the central markets. The occurrence of aflatoxin is a serious issue and recent research shows that Ethiopian groundnuts exceed internationally standards substantially (***Table 8***):

District	Store (µg/kg)	Market (µg/kg)
Babile	293–11,865	15–9,765
Darolabu	15–4,939	15–1,977
Gursum	15–5,563	16–10,087

(EU limit: 4µg/kg; FAO/WHO: 15 µg/kg)

Table 8 *Aflatoxin concentration in groundnut samples from East Ethiopia (Chala et al., 2013)*

The regional traders collect groundnuts from the local traders often provide cash to the local traders, and can give short-terms loans to farmers and collectors. The regional traders (wholesalers) store the groundnut in their warehouses and sell for regional processors or wholesalers in Bahir Dar, Gondar, Mekelle and Addis Ababa for Metekel and through Harar, Jijiga, Adama and Addis Ababa for East-Haraghue. Wholesalers mainly work through brokers and they receive cash through the Commercial Bank of Ethiopia. Brokers work on a commission basis which is typically in the range of ETB 5–10 per quintal. Groundnut processors are located both within the region and outside the region. There are two categories of groundnut processors: large-scale oil processors and small-scale *baltenas*. Whereas the large scale mainly focus on edible (and oil cake) production, the small scale focus on peanut butter, *halewa* (local cake) and kolo (roasted groundnut) production. The peanut butter and *halewa* processed in Harar town is sold in the supermarkets of Harar town, Dire Dawa City and Addis Ababa.

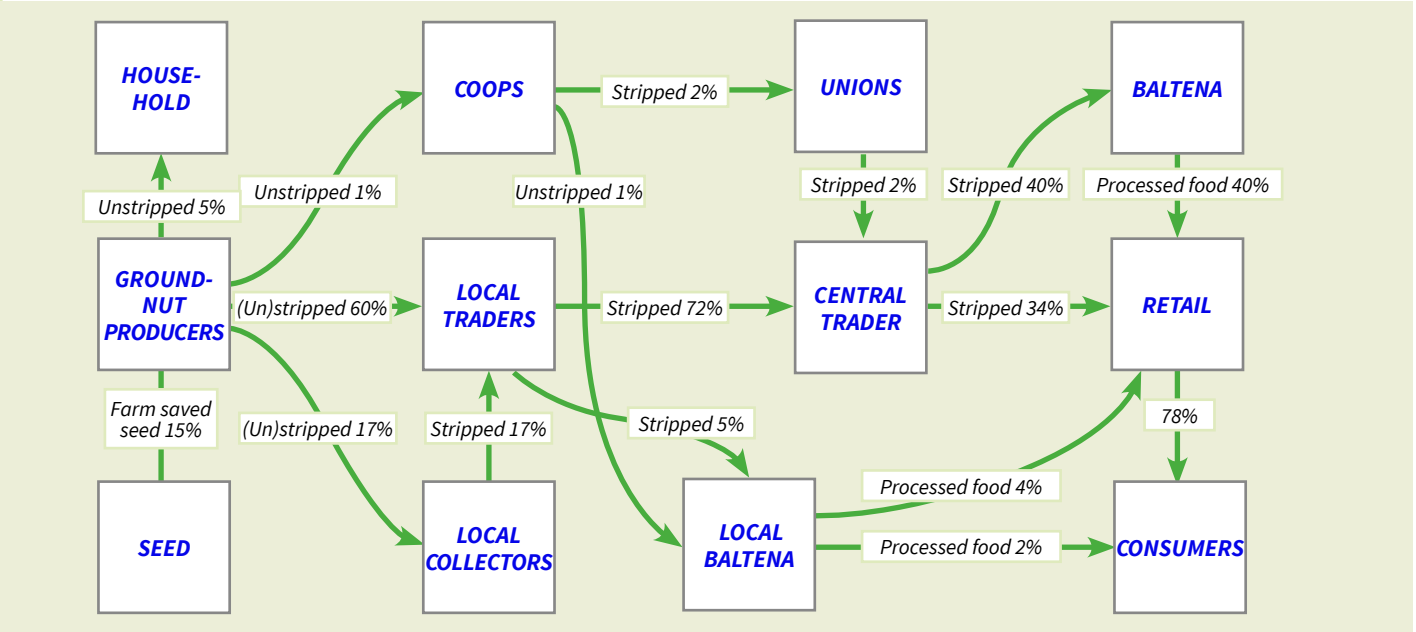


Figure 70 *The groundnut value-chain of East-Hararghe*

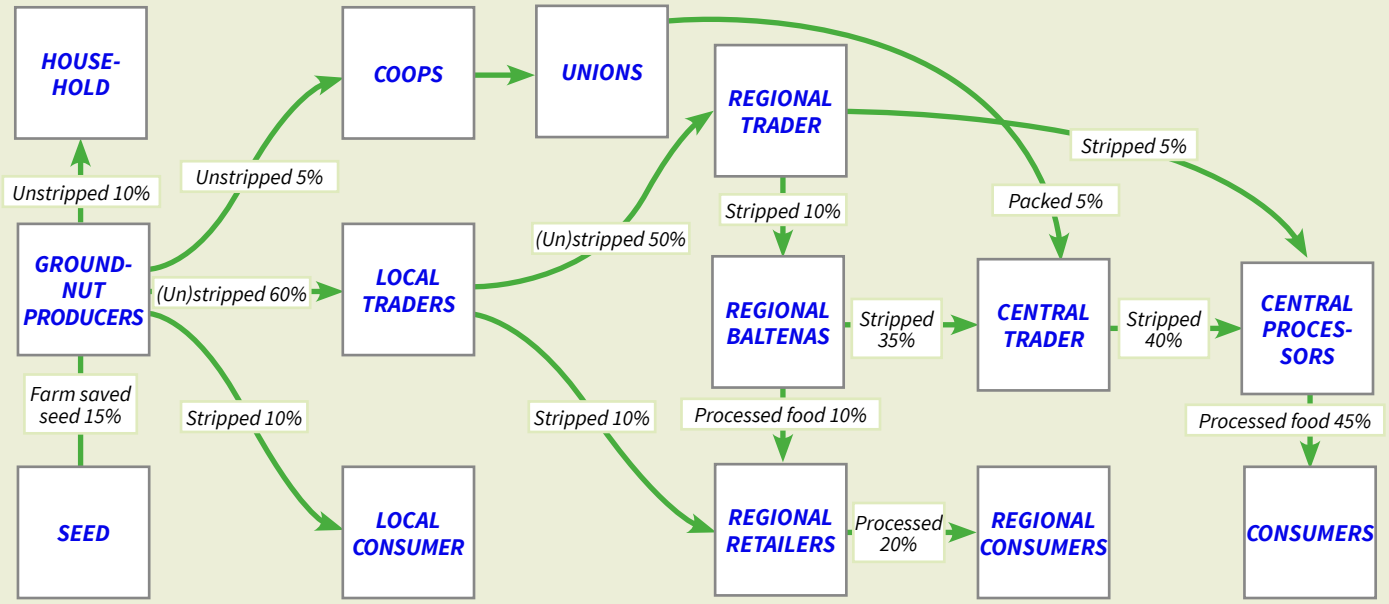


Figure 71 *The groundnut value-chain of Metekel*

In Eastern Hararghe, there is an edible oil factory, Hamaresa that presses edible oil from different oil crops including groundnut. The factory has a production capacity of 6,000–8,000 liters per day, but is currently running below 20% of its capacity. Probably imported palm oil is still much cheaper than the arachis or peanut oil. Some groundnut is also sent to Addis Ababa for processing into different food items and sold in supermarkets. An example of one of the larger groundnut processors, Hilina Health Foods, is provided in ***Box 7***.

The biggest groundnut processor in Addis Ababa is Hilina Enriched Foods Processing Centre Plc. It produces plumpy nut for the emergency food market as well as peanut splits. It recently introduced the Sheba peanut splits with three flavors—salted, paprika and pepper. The company was one of the organizations selected by the World Food Program (WFP) and UNICEF to supply 16.5 million dollars' worth of supplementary plumpy nut packages for emergency food purposes in the region (Somalia, South Sudan, Darfur), during the 2011/12 fiscal year. It also exports the Sheba peanut splits to the Middle East and Yemen.

"*We will also start producing peanut butter soon,*" said Hilina Belete, deputy managing director of the company. The Company processes 1,800 tons of peanuts a year. It imports close to 11% of its annual demand, which is 200 tons, from India and China. Using this, Hilina manages to produce 960 tons of plumpy nut packs and peanut splits every year. Her father, Mr. Belete Beyene, managing director of Hilina Foods, is at the moment most worried about the quality of the domestic peanut supply. Close to 40% of the local supply needs to be rejected, as a result of the high occurrence of aflatoxin, which damages the peanut. *"We use lab experts, educated in food science and biology, abroad and in the country, in order to produce our brands, adhering to WHO standards and the international Codex Alimentarius."* We invest most of our time and capital on rejecting peanuts affected by aflatoxin. Also exports of groundnut to especially Djibouti and Yemen have nearly stopped now because of the aflatoxin problem.

Aflatoxin is a mycotoxin produced by fungi that infects the peanut during its post-harvest period, and causes serious liver damage, liver cancer and cirrhosis. The company gets most of its supply directly from groundnut farmers in Harar, Gambela, Pawe and Gojam. It currently buys a kilo for ETB19. *"Farmers in Afran Kelo, Babile and Assosa prepare it for us, but we buy from the market at Merkato for ETB23, when we face shortages,"* said Belete. The company also buys the unshelled peanut for ETB12 a kilogram, to save it from aflatoxin, which proliferates under poor storage and high moisture conditions. *"We lose a lot of the groundnuts supplied and we even sometimes return entire batches to the sellers,"* she adds. *"We provide trainings and manuals to the farmers on post-harvest management. The manuals we developed together with Haramaya University and Addis Ababa University."*

Box 7 *Hilina Health Foods and the problem of aflatoxin*

Economic analysis

During the 2013–2014 growing season groundnuts did not particularly perform well in the comparative analysis with other crops. The main reason for this was the incidence of disease and adverse weather conditions. However, overall groundnuts take in an important position in the farming systems of Eastern Hararghe and Metekel. Overall, at a price of more than ETB1,000 per quintal and at a yield of 1.1 to 1.5 tons groundnuts remain a competitive crop. The price fluctuations over the year are relatively strong; doubling from just after harvest till nine months later. This increase is much stronger than for the other legumes analyzed. The main reason for this is the stable and continuous demand for groundnuts, as well as the relative lack of substitutes. Groundnuts are often used as a complement to chat, i.e., the roasted groundnuts are consumed while chewing chat.

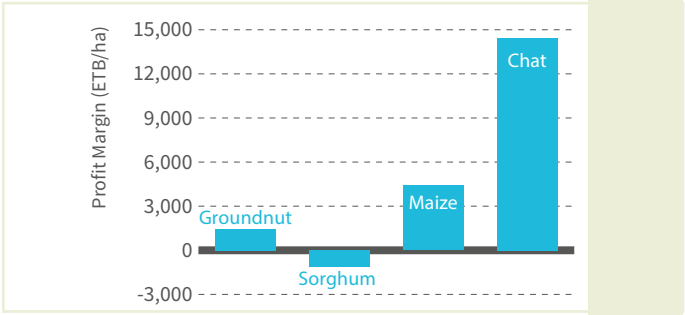


Figure 72 Profit Margin per ha

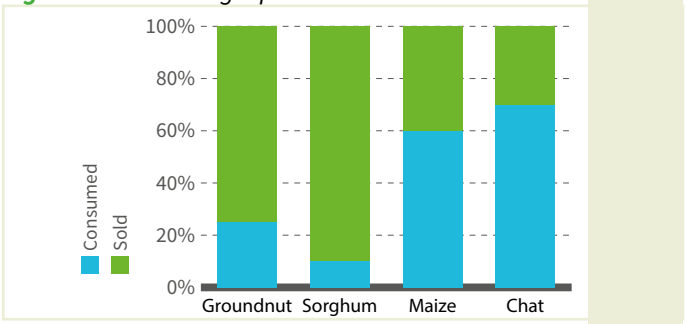


Figure 73 Consumed vs Marketed

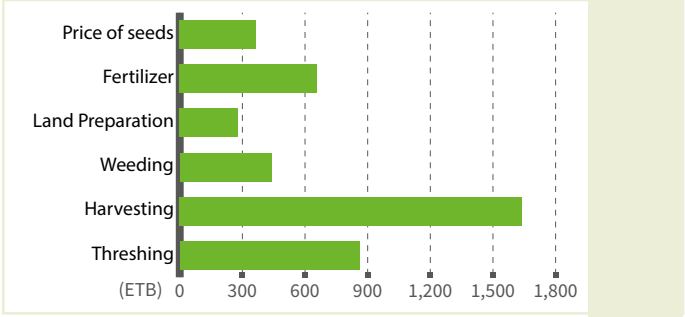


Figure 74 Production Cost Components

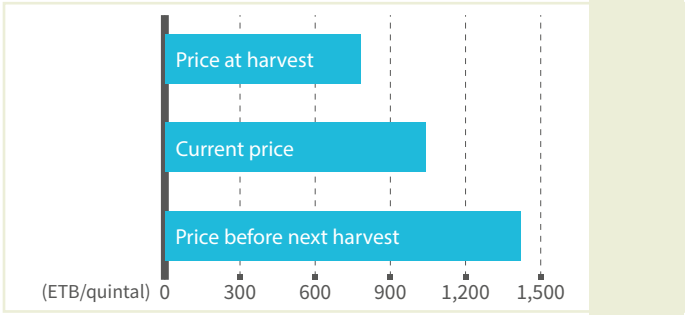


Figure 75 Price Trend within a Year

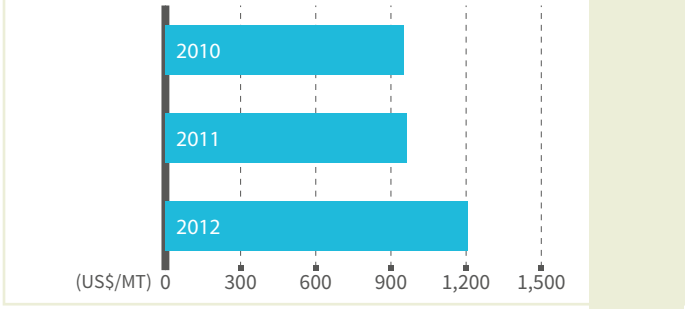


Figure 76 Export Price Trend (US$/MT)

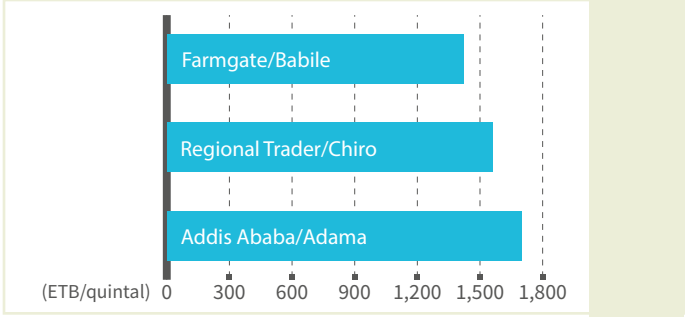


Figure 77 Price Across Chain

As with most of the legumes, groundnuts are an important cash crop and around 80% is marketed, while the remainder is used for seed and a little for home consumption. Export trends continue to increase, though this has had little effect on the domestic market prices as the export of groundnuts has been banned due to the proliferation aflatoxin.

The production cost graph shows that especially the harvesting and threshing are major cost components. This has to do with the laborious nature of the groundnut harvesting and drying, as well the subsequent shelling. Many farmers indicate that this is a key bottleneck for further expanding the groundnut acreage. Lastly, the margins between farm gate and retail price are relatively high in groundnuts with farmers receiving around 80% of the Addis wholesale price. This is a result of the relative large distance between the peripheral production areas and the central markets.

Conclusions and recommendations

Production

One of the main problems in groundnut production and postharvest management is aflatoxin. Ethiopia's aflatoxin levels are much higher than the internationally accepted levels. Aflatoxin is mainly a postharvest issue and it is recommended that improvements are made to the drying, (wet) shelling and storage practices to combat this. Clear market incentives are necessary here and quick aflatoxin testing technologies could be introduced to assist a more advanced grading process. The government (MoH and MoA) will probably need to play a role here as well.

In addition, we recommend that small-scale cleaning and shelling technologies are being developed or introduced, e.g., in partnership with Agricultural Research Centers and interested private partners. Once operational these commercial shelling stations could be established that are financially self-sustainable (like the *baltenas*).

We recommend to support warehouse management, product handling and grading, and develop options for incentive based schemes (premiums for high quality produce, including low aflatoxin levels). In the same line, regional assemblers or wholesalers could develop agro-dealership business models, where they can distribute inputs (seeds, plant protection, fertilizer, small machines) and provide extension services, possibly in an outgrower model. Furthermore, wholesalers could step up their business by investing in large-scale shelling technologies as well as quick testing technologies for aflatoxin.

Processors and exporters

The processors and exporters could be supported in product innovation, packaging and market development, e.g., for peanut butter, peanut snacks and *halawa*. Specific technology that could assist in this is peanut roasting and packaging technologies which could be introduced from abroad or developed locally. In addition, the local producers of groundnut and farmers groups could be better linked to the large-scale processors such as Hilina Food and Elsa Qolo through contract farming arrangements or using local aggregators.

Cross Cutting

Overall, given the relative distance between the major production and consumption areas, the formation of business platforms or clusters could be supported, with the aim of improving business relations and resolving the existing and emerging bottlenecks (quality, grading, processing, pricing). Moreover, there appears to be a clear necessity for a high-level task team that will address the issue of aflatoxin as this is a sector-wide issue that needs the involvement of producers, traders, processors, exporters, research and government. It probably also requires bringing in foreign expertise (e.g., from India).

5|8 Soybean

Soybean was first cultivated in eastern China around 2500 B.C. Since then it has spread around the world and has become an important component of world agriculture. Especially from the 1970s onwards its production increased rapidly. The major producers are: U.S.A, Brazil, Argentina and China which account for 90% of world production. Soybean ranks second as major oil crop (after oil palm) with an area of 99.5 million hectare in the world, whereas groundnut was third with an area of 23.95 million hectare (FAOStat, 2014). Soybean oil is dominant in the world market accounting to 30% of total vegetable oils. In Ethiopia, soybean research started in the 1950s with the aim of replacing imported soya flour. Nationally coordinated research started in 1967 by EIAR. Through the years the research institute has developed a number of soybean varieties that fall into early, medium and late maturity categories. The early maturing varieties are suitable for moisture stressed or short rainfall areas, whereas the medium and late maturing varieties are well adapted for intermediate and long rainfall areas. Soybean is a medium altitude crop well adapted to altitudes of 1300 to 1800 masl, receiving annual rainfall of 900 to 1300 mm.

Soybean (*Glycine max* L. Merr.) is an exceptionally nutritive food. Its grain is 40% protein, with protein quality that is far superior to that of cereals and even other grain legumes, featuring an amino acid balance close to that of milk and meat. Soybean can also contain about 20% oil including healthy fatty acids, lecithin and vitamins A and D. In Ethiopia most people have limited access to animal products and especially children suffer from malnutrition. Soybean could be an important source of cheap protein for poorer households. The crop is also important to enrich soil fertility through biological N fixation in symbiosis with bacteria, on average it is estimated that it can fix 76 kg N per ha (CGIAR, 2012). So far, in Ethiopia soybean is mostly used in food industries for human food and animal feed.

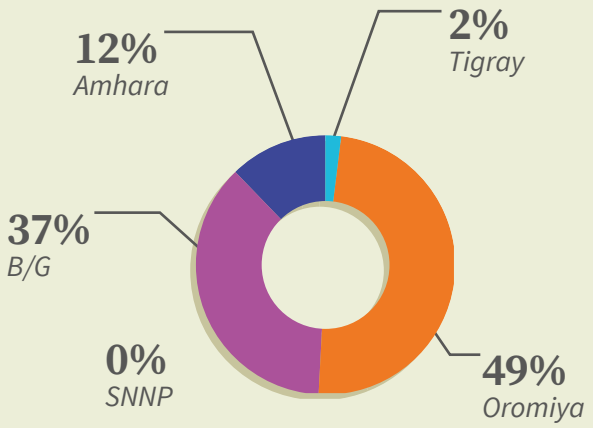


Figure 79 *Soybean Production—Regional Share*

The production of soybean has grown rapidly over the last years, doubling in production every year since 2010. Currently Ethiopia produces around 60,000 tons. Two zones stand out in terms of soybean production: Metekel in Beneshangul-Gumuz and Illubabor in Oromiya. For the purpose of this study the Metekel Zone was selected which is responsible for around 10% of all soybean production. The Metekel zone is an atypical zone for Ethiopian conditions, given its relatively large average landholding size (4 ha). In addition, the Metekel Zone, and Beneshangul-Gumuz as a whole, has welcomed large-scale investors in the soybean sector, and a more industrial type of agriculture is emerging with land sizes of 250 to 10,000 ha. Ruchi Soya, Karaturi, S&P, Saudi Star and the Sugar Corporation are all companies that plan to develop commercial farms with over 10,000 hectares in Beneshangul-Gumuz and Gambella.

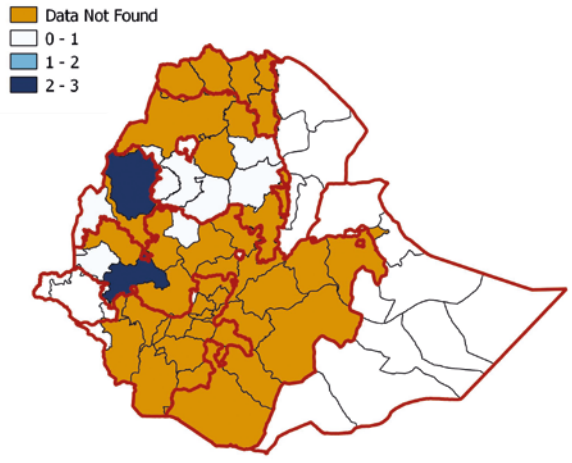


Figure 78 *Average Annual Soybean Production for 'Meher' Season (2006/07—2011/12) in 1,000 Tons*

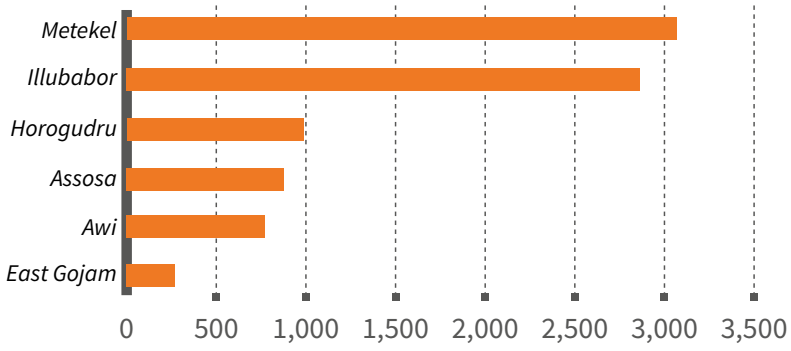


Figure 80 *Top 6 Soybean Producers (Average Production in Tons)*

The farm perspective

Soybean can be grown in rotation with e.g., cotton, maize and sorghum. Around Jimma, soybean is grown by smallholder farmers (on average 0.5 ha). As poor soil fertility is a major issue around Jimma, farmers appreciate soybean in their rotation. Soybean was introduced into Beneshangul-Gumuz during the resettlement program. Since then farmers grow soybean as a crop for economic and rotation purpose. Especially the increased demand for soybean from the regional and national markets (for animal feed, oil and so-called health foods) has played an important role in the expansion of soybean.

Soybean is a labor intensive crop, especially because of its frequent weeding requirement. Other issues farmers complain about are susceptibility to water logging (the soils in Beneshangul-Gumuz tend to be heavy) and low market prices. Compared to other legumes, soybean is less of a household consumption crop as it is not common in the local diet, hence most is sold to the market. New varieties are being introduced and the Belesa-95 variety is popular due to its adaptability to a wide range of soil types, its productivity, and market value. Furthermore, farmers prefer Belesa-95 because of its easy milling characteristics, seed color, seed size, and high market demand by especially processors. In terms of seed production, soybean tends to be more profitable due to a higher multiplication factor (of around 20) and the fact that new varieties are released more frequently.

Soybean is the legume that can benefit most from the use of improving the soybean's *rhizobia* through inoculants. This in turn can increase nitrogen fixation and hence yields. *Rhizobia* are bacteria that are capable of fixing nitrogen (N) symbiotically in association with the host plant. *Bradyrhizobium japonicum* is the bacterium that fixes nitrogen with soybean. The bacterium forms a symbiotic or beneficial relationship with roots allowing for biological nitrogen fixation to occur. Once applied the bacteria remain in the soil and often no subsequent applications are necessary.

Most small-scale farmers in Beneshangul-Gumuz use two or three times ploughing with oxen traction, and some use fertilizer especially DAP up to 100 kg per hectare. The seed rate ranges from 80 to 100 kg/ha at a price of 15 birr/kg for quality seed of improved varieties. Some inoculants are available through Pawe Agricultural Research Center. Average productivity of soybean is around 1.6 tons per ha.

The below business model canvas of a typical soybean farmer summarizes the main characteristics of soybean farming in Metekel Zone.

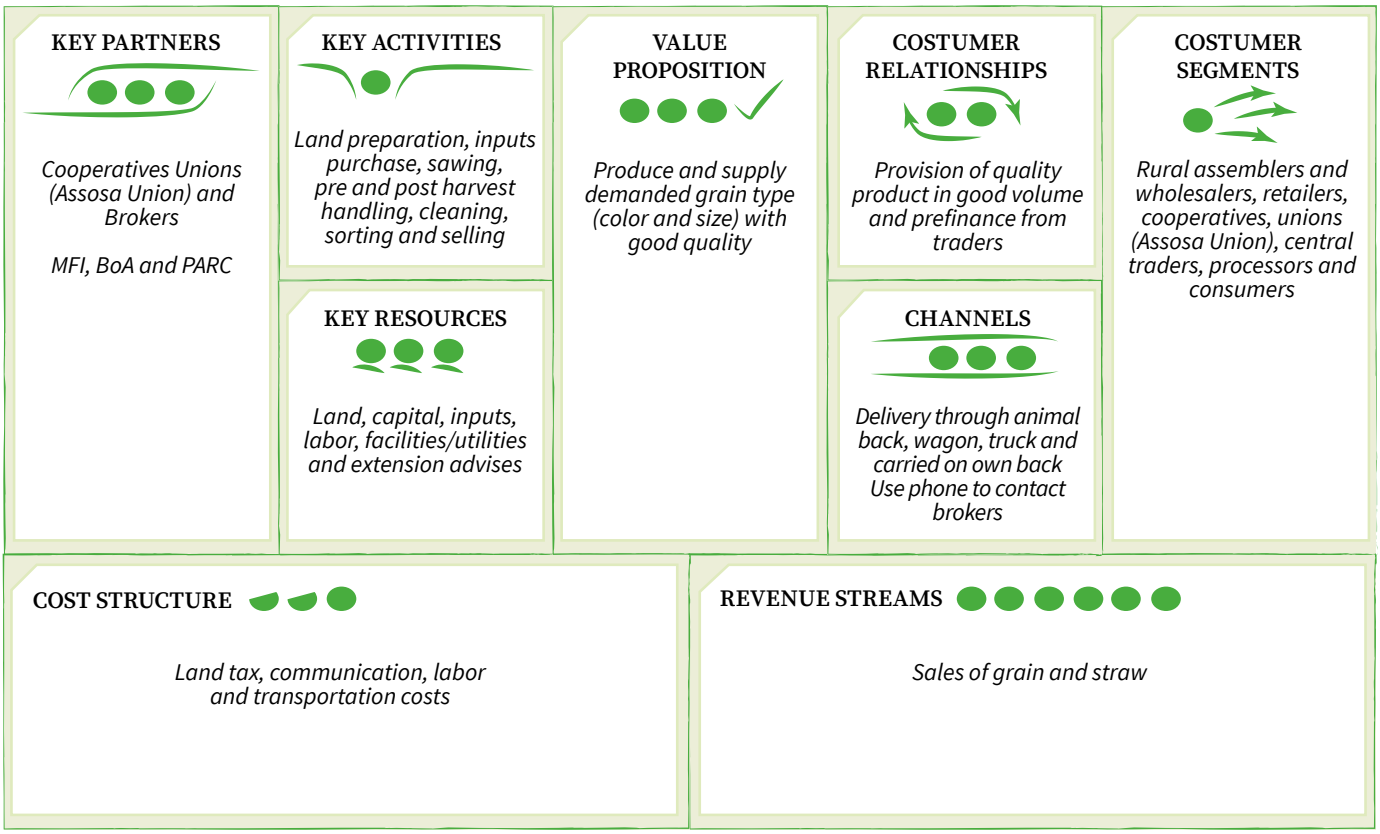


Figure 81 *Business Model Canvas for a soybean farmer*

The soybean value-chain

Metekel zone is at the center of the soybean cluster in Beneshangul-Gumuz and the town of Pawe serves as its trading center. E.g., nearly 4,000 quintals of soybean are supplied to the central markets in and around Addis Ababa every week from *Pawe woreda*. Together with Asossa Zone they make up around 16,000 tons of soybean production in 2013 or about 25% of the overall soybean production in the country. The main actors in the soybean value-chain are rural assemblers, rural wholesalers, urban whole sellers, central traders, and processors. Two soybean value-chains are presented below, the first depicts the large-scale farmers, the second the small-scale farmers.

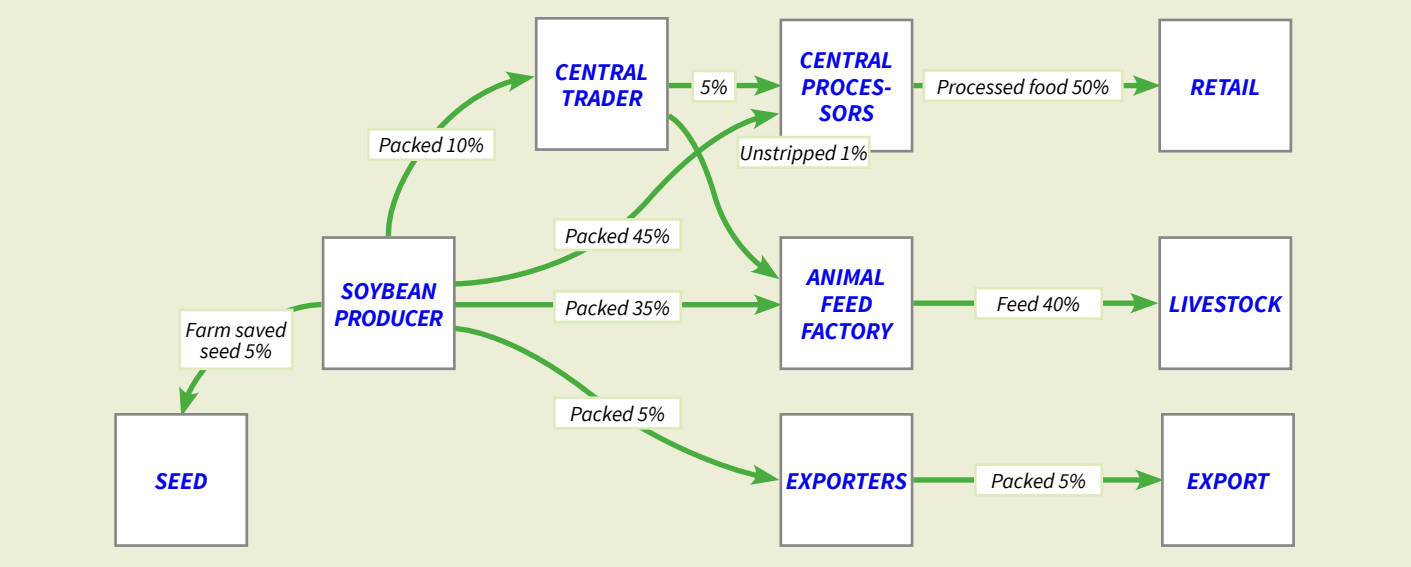


Figure 82 The soybean value-chain of Metekel (large-scale farmers)

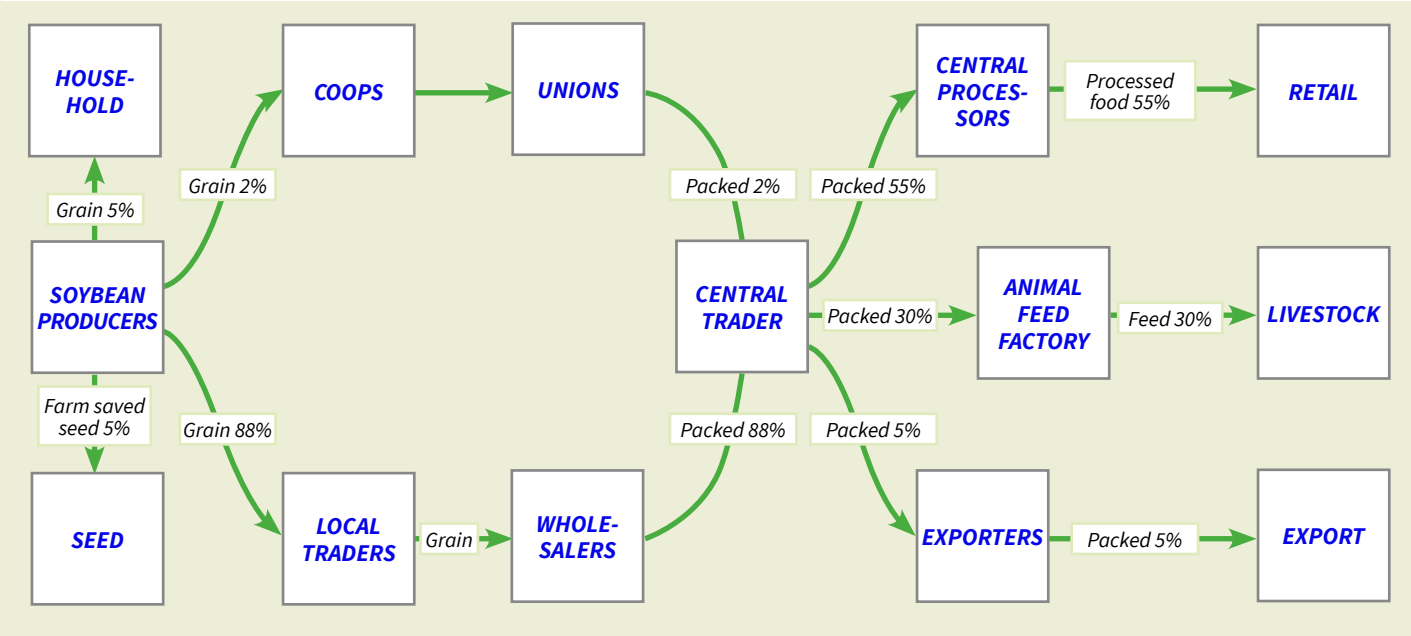


Figure 83 The soybean value-chain of Metekel (small-scale farmers)

Sales follow a similar pattern as with other legumes. It was estimated that around 30% of the product is sold directly after the harvest from November to January, whereas 60% is sold from February to May when cash is needed for the holiday season and inputs purchase. Only 8% of the product was kept for the June–July period when market prices are higher. Farmers sell their products at their village, and nearby towns and traveling time is between 10 minutes at the village and a maximum of 2 hours to the nearby town market. The minimum product quantity for sales is between 20 and 40 kg, usually transported by people carrying it themselves. For higher quantities horse or mule carts are used (transporting up to 1500 kg). Overall, the communication on market prices is relatively good through the use of mobile phones and connections with market brokers and traders.

In the case of the large-scale producers, the products are supplied directly to urban wholesalers, central market traders, and sometimes also to processors directly. Cooperatives and Unions play a minor role in these transactions and are mainly focusing on input supply. In other regions though unions play a more important role as anecdotal evidence of Pramukh Agro-Industries indicates for the Illubabor Zone in Oromiya.

Some additional cleaning, sorting and packaging is undertaken by the local traders who then sell their product to the Pawe and Asossa town wholesalers. The urban wholesalers (aggregators) collect produce from large-scale producers, rural assemblers, rural wholesalers and unions and they accumulate the product to sell to the central market traders, and sometimes directly to processors. There are brokers at any stage of the value-chain that connect producers with local market traders as well as connecting traders with processors. The wholesalers often repack and sell to urban wholesalers who deliver to the bigger agro-industries like Akaki and Alema Koudijs Animal Feed Factories, Fafa and Hilina *health foods*, Pramukh Agro Industry and a limited number of edible oil processors. These larger processors play, much more than for the other legumes, a very important role in the chain. Some examples of their business models are provided in ***Box 8*** and below.

FAFA Foods is one of the biggest buyers of soybean in the country. FAFA produces baby nutritional food, such as: *favena, dube flour, sericum, serifam,* and *famix*. Products are sold in Addis Ababa and its periphery and FAFA has five agents at major regional towns. In addition, FAFA produces animal food for pets, sheep, cattle and poultry. Other important processors of soybean are larger and smaller animal feed companies. The larger often also mix concentrates (vitamins and minerals premixes into the food), whereas the smaller mix ingredients like: oilseed cake, full fat soy and maize. ***Box 8*** provides more information on the business model of Pramukh Agro Industry. Exports of soybean are currently picking up and have reached more than US$35 million in 2013. This is probably a result of the low domestic market price in 2013 as well as the advantage of GMO-free production areas.

The soybean and lentil processing company in Ethiopia is established in 2011 with the support of the Government of the Netherlands' Private Sector Investment (PSI) Program. Pramukh Agro Industry has two types of products: Tasty Soy Pieces (TSP) or Soy Chuck and split lentils. As a trading and export company they sometimes deal with chickpea and green mung bean as well. TSP is a protein rich meat substitute made from whole soybeans flavored with salt and spices. In Ethiopia TSP has a good market potential because TSP is much cheaper than animal protein and over 40% of the population fasts from all animal protein for over 200 days a. Split lentils (red lentils) are also supplied to the local market in bulk particularly during the fasting season. Edible oil (8–10%) and husk are valuable by-products from the TSP. Pramukh Agro has an annual processing capacity of 5,000 MT of soybean and 4,000 MT of lentils.

Pramukh Agro Industry sources from wholesalers based in Addis Ababa. The relationship with its suppliers is based on trust. For the soybean, the company closely works with the Chewaqa Farmers Cooperative Union in Illubabor Zone. They trained farmers on agronomics and product quality and direct sourcing will follow in the next years. From their experience, purchasing from unions gives access to bigger volumes, better quality and may have a higher benefit to farmers. However, sourcing from agents is better in terms of speed and practicalities. In addition, traders reach the market on time and pay cash to farmers at point of purchase while cooperatives are mostly late to arrive in the purchasing window. The latter is partly due to limited credit opportunities and importantly slow internal decision-making. According to Pramukh Agro Industry, there is no significant price variation between cooperatives and traders.

Pramukh Agro sells its products through accredited agents who distribute to supermarkets, wholesalers and retail shops. According to the General Manager the demand for TSP is huge. The GM estimated that there is an average of 100 fastening days per year for 32 million consumers. Assuming that on only 10% of the fasting days people will buy TSP, the potential market demand is 10,600 tons. Currently meat is sold at €5–7 per kg; compared to a retail price of €1.8 per kg for TSP.

Box 8 *Pramukh Agro Industry*

Economic analysis

Soybean scores high in terms of relative profitability. It performed both better than maize and sorghum in 2013. This is mainly due to relative high yields for soybean (compared to sorghum) and lower costs (compared to maize). The study areas of Metekel is relatively fertile and yields were high at 3.0 tons per hectare during the 2013 growing season. With respect to production costs, only land preparation is expensive in the case of soybeans, the other activities are less labor intensive. Though weeding is mentioned as a labor intensive activity and herbicides are hardly available.

The graphs further show that soybean is a typical cash crop with 95% sold to the market. Also, export prices have increased significantly in the 2010-2012 period, contributing to the boom in soybean exports from Ethiopia in 2013. The margins in the chain, again, are relatively small; farmers receive around 90% of the wholesale price. Within the year prices fluctuate from ETB600 to ETB900, though traded volumes at the end of the season were small and most was sold between ETB650 and ETB800.

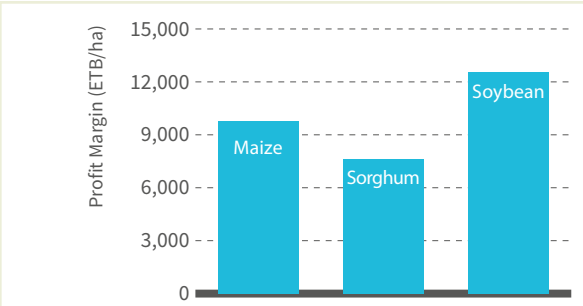


Figure 84 Profit Margin per ha

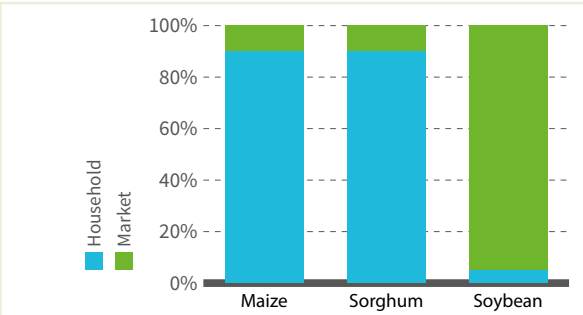


Figure 85 Consumed vs Marketed

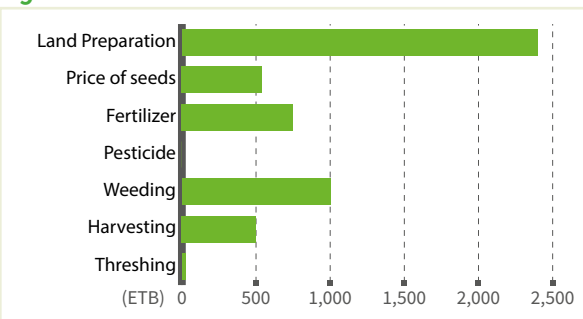


Figure 86 Production Cost Components

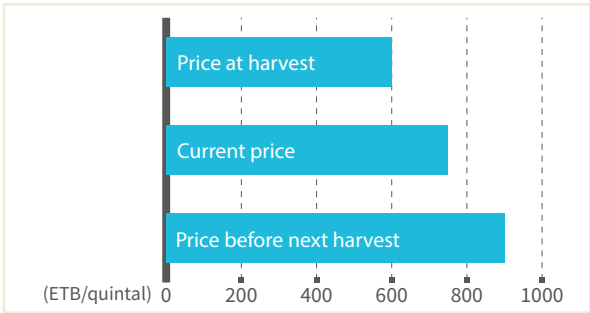


Figure 87 Price Trend within a Year

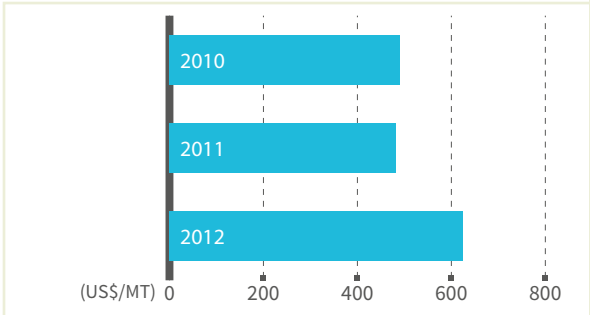


Figure 88 Export Price Trend (US$/MT)

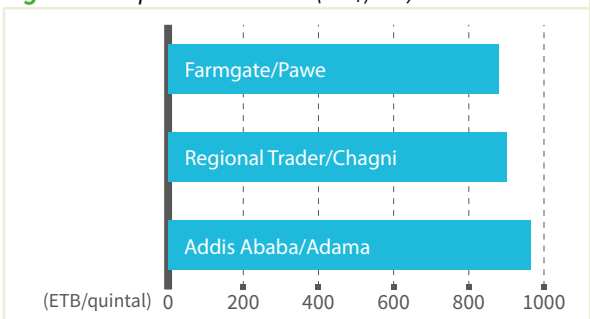


Figure 89 Price Across Chain

Conclusions and recommendations

Soybean is a relatively new product in the Ethiopian market doubling in production almost every year. This has created some serious demand-supply issues as the major Addis Ababa based processors cannot keep up with supply. Last year, this caused prices to fall to ETB900 per quintal at processor level, which is lower than the world market price for soy. The market potential for soy, however, is huge given the enormous growth in dairy, animal fattening and the health food sector. It is expected that this bumpy road of supply-demand corrections will flatten out over the next years as more market players step in and soy becomes a more important ingredient in the Ethiopian diet.

Household utilization

Soybean provides a wide range of opportunities to improve household food and nutrition security, as well as an important source of cash. The majority of the population in Ethiopia does not have access to expensive animal protein sources such as egg, milk and meat, while child and maternal malnutrition are among the highest in the world. This added to the fact that more than 40 million people are fasting from animal protein for nearly 200 days a year means that domestic consumption of soybeans has great potential. A number of soy food products can be integrated in the Ethiopian diet. Therefore, supporting local or household milling and food processing is important. Besides the technology, practical coaching and training on home economics is important to get the soy food chain off the ground. ***Figure 90*** illustrates the difficult market situation for soy, where all processing is concentrated around the Addis Ababa market (including: animal feed, edible oil and emergency feed).

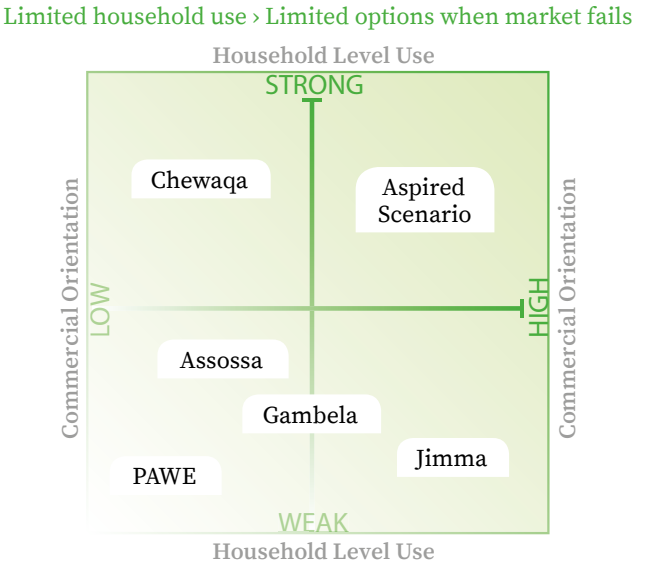


Figure 90 *Market opportunities for soybean sales in different soy producing areas of Ethiopia*

Production and Agronomics

Another important constraint in the soybean value-chain is the gap between actual and potential productivity. Productivity fluctuates strongly due to water logging (soy is grown on relatively heavy soils), strong weed infestation (also partly due to mono-cropping), the overall low soil fertility status and high infestation with weeds (laborious, reducing popularity of the crop). N2Africa experiments have shown that yields can triple through the use of inoculants, phosphate and good agricultural practices. Other solutions are the introduction of herbicides and better rotation or intercropping systems (with maize).

Processing

An important other entry point for value-chain interventions are the bigger soybean processing companies around Addis Ababa. Additional investment opportunities are in place for soybean oil processing factories. The total annual expenditure and volume of edible oil consumption is estimated at ETB11 billion or around 400,000 tons. The industry has shown a steady growth of 17% over the period from 2008 to 2012. Still, three fourths of the edible oil market is met by imported oil and the growth trend of imports is 21% compared to 10% for domestic edible oil. Activities could be initiated to work with the bigger oil processing companies on direct sourcing and improving agronomic practices e.g., through supplying inputs in a pre-financing system. Already Pramakh Agro-Industries is entering into this type of arrangements.

Supporting local bulking capacities

One of the main challenges in the soybean value-chain in Metekel zone is the absence of well organized and capable farmer organizations or even private dealers. Most factories look for a minimum volume (usually above 300 tons), however, the current local organization in Metekel can hardly provide this. The entry of one or more larger wholesalers, either linked to one of the commercial farms or independently, is crucial in coordinating the supply chain and linkages with factories in Addis Ababa.

Value-Chain coordination

Overall value-chain coordination on all of the above aspects is limited. Already, the Soybean Business Platform, under the Agribusiness Support Facility of the Addis Ababa Chamber of Commerce, is actively working on this. This could be an important entry point for further developing linkages in the chain and it can serve as an information platform at national level. A similar arrangement can be developed at zonal level, in particular in Beneshangul-Gumuz, Metekel.

6 Conclusions and recommendations

6|1 Conclusions

Legumes are the second most important group of crops after cereals in Ethiopia. Together they provide food and income to more than 10 million households. The overall acreage of production is close to 2 million hectares and overall output is almost 3 million tons. However, most legumes have not received much attention from government, development organizations and research. Most attention is paid to cereals (teff, wheat and maize) and cash crops (especially coffee). Given the unique properties of legumes (nitrogen fixing, high in protein) and the relative importance of the crop in the farming system, it is well justified to develop an integrated value-chain development project on legumes in Ethiopia.

Overall growth figures for Ethiopian legumes are impressive; overall production increased 10% every year over the last six years, with even more spectacular growth figures for groundnut (+30% per year) and soybean (+110% per year). In addition, exports increased significantly and pulses are now the third most important export commodity (after coffee and oilseeds) with a contribution of around US$200 million.

The study found that the legume processing industry, both small-scale and large-scale, is joining in the boom. A number of food products are now being processed by small and bigger factories where formerly these were produced at home or imported. Most notable are: *shiro* (the combination of milled peas, spices and salt), *kike* (split peas), baby food, soy milk (powder), soy chunks, corn-soy blends and plumpy nut (both for emergency, supplementary food), and peanut butter and peanut snacks. The major exception to this boom is the edible oil industry (especially for soy), that still carries the history of relative inert state companies, and relatively few newcomers have entered the market. The local and national processing industries have created tens of thousands of jobs (for especially women) that add significant value to the end product.

A second conclusion is that the supply chains of most legumes (especially more centrally located) are relatively well organized and products move quickly at low transaction costs between the different trade levels. This is in line with findings of the IFPRI (Minten et al, 2013) teff value-chain study that found that farmers receive about 80% of the retail value, figures being lower farther away from the main market and even higher closer to the central market. Overall, the margins made by assemblers, local traders, brokers and town wholesalers are low and farmers often receive a reasonable price for their products. In addition, farmers often only sell a small portion in the first two months after harvest (around 30%) and gradually sell the remainder over the next three to seven months (70%). These findings contradict the often heard notion that the middlemen are squeezing out farmers and that farmers enter into rapid sales of most of their produce directly after harvest.

Main issues in the trade are related to the quality of the product (moisture content, level of admixture and impurity) price transparency and trust in the chain. There is still much to be gained from more transparent grading systems, with clear quality standards and related pricing. This can increase the overall value of the chain benefiting farmers, traders, and wholesalers, processors and exporters. In our study it was found that at the main central markets admixture and impurities are often 20% whereas at large-scale processor level (for internationally accredited products) this can go up to 40% (e.g., for groundnuts).

The role of the cooperative and union system is particularly important for the input supply of fertilizers and to a lesser extent seed. There is great diversity between unions and cooperatives in how successful they are in these activities. In general, the presence of cooperatives is highest in Tigray and lowest in SNNPR (Bernard et al, 2013). In terms of output marketing the cooperatives and unions play a marginal role.

This study confirmed that for the eleven zones under investigation only Sidama had an active cooperative-union system that played substantial role in output marketing of haricot bean. In the other ten zones the role of the cooperatives was minimal and mainly confined to input supply. When farmers did sell to the cooperative it was mainly to pay back fertilizer credit through an in-kind bean transaction. These findings are confirmed by the recent IFPRI baseline study on cooperatives (Bernard et al 2013), that found that on average 0.9% of farmers' produce is bought by cooperatives. A positive exception is in place for SNNPR where cooperatives bought 3.5% of overall produce. Our study found that the more important trade channels are: local traders (60%), consumers and other farmers (20%) and household use and farm saved seed (20%).

The formal seed system for legumes is poorly developed. Most farmers rely on their own farm saved seed (harvest of the last season), neighboring farmers or the local grain markets. Only for haricot bean in SNNPR a more sophisticated system has been set up involving the contracting of large private farms and specialized seed producer cooperatives. It was estimated that this system supplies more than 20% of the farmers with quality haricot bean seed of improved varieties. For the other zones under investigation this was often less than 5%. The studied legumes are self-pollinated crops often with low multiplication factors (as low as 6 for groundnut). As farmers can reproduce new varieties easily over a longer period of time (5–10 years) themselves; this implies that a one-off input of new varieties can benefit farmers for many years. The two notions also make legumes less interesting for the private sector as they are relatively bulky (100–200 kg seed is required per hectare) and farmers only buy occasionally. In many studies (IFPRI, 2010; Monitor Group, 2012) the formal seed system is proposed to fill these gaps, while in the case of legumes probably a more diversified approach is required.

Many cost-benefit analyses have been undertaken to compare the farm profitability of different crops. Legumes often came out as one of the most profitable crops in the farming system. This was the case for haricot bean, chickpea, grass pea and soybean. Another study (IFPRI 2010) found that faba bean and chickpea are more profitable than wheat, barley and teff. It reflects the strongly changed role of legumes in the domestic and export market, as well as in the Ethiopian diet. At the same time, in all legumes farming systems, the high labor requirements and the strong yield fluctuations due to the high disease pressure are two of the greatest bottlenecks for further growth. This is especially true for labor intensive crops like faba bean and haricot bean, where the frequent weeding, harvesting, threshing and sorting requires much more work than for the competing cereal crops: especially wheat and maize. In addition, the disease pressure of these two crops is high (especially fungal diseases like chocolate spot for faba bean), making it a risky crop.

6|2 Recommended activities

Seed production

We treat seed production separately to input supply as it involves an entire chain of activities that requires special attention. For most legumes improved varieties are available that have superior characteristics in terms of yield, seed size and disease resistance. These varieties currently don't enter the market due to a number of reasons, mentioned above. We recommend that, to increase the availability of quality seed of improved varieties, two pathways are taken: (1) support for large-scale private farms to engage in seed multiplication, especially for legumes with higher multiplication factors in areas with large-scale production and/or much government attention: soybean, chickpea and haricot bean; and (2) multiplication through seed producer groups within the main production areas for: faba bean, field pea, lentils and groundnut. The activity can especially benefit from working closely together with the national and regional agricultural research centers, N2Africa (new varieties), and the ISSD project (seed multiplication and marketing).

Input supply

To further boost productivity the inputs (seeds, fertilizer, inoculants, herbicides, fungicides and insecticides) need to be available and accessible to farmers. The current input system favors the supply of fertilizers through the cooperative-union model, whereas other inputs for legumes are not widely promoted. Already N2Africa will work on increasing the supply of inoculants through their business development strategy. For the access to other inputs, preferably as a geographically tailored package, we recommend three models:

(1) the cooperative model
(2) the private agrodealer model and
(3) the chain integration model.

Though the cooperative model does not seem optimal for output marketing, the cooperatives' input supply function could be expanded. Already, farmers get their fertilizers from the cooperatives and the better organized cooperatives and unions could be assisted by enlarging their portfolio with herbicides, insecticides and fungicides, as well as inoculants and seeds. With respect to the crop protection agents it is important that the cooperatives are trained in the judicious use and storage of the chemicals. The shelf life of pesticides can be greatly enhanced by proper storage (dry and cool place) and keeping the containers well closed and sealed. Cooperatives could provide trainings to farmers as well on best spraying times and practices. The second model of private input supply is currently piloted by CNFA through the Commercial Farmer Service model. A number of private input supply shops are being set up and these shops also provide extension advise to farmers. For specific geographies, with a high density of specific legume farmers (legume clusters), commercial farm shops could be supported that specialize in the specific cropping system of that locality. Lastly, as evidenced by the ACOS model, larger processors and exporters can play a role in providing training and inputs to farmers. This can be done through contract farming or more loosely through involving value-chain finance from MFIs and Banks (the Heineken Malt Barley model). This model is especially interesting for specific niche products like specific white pea bean or chickpea varieties, or aflatoxin free groundnuts. Regardless of the model, in each of the input supply arrangements pre-finance or credit should take up an important role, as to ensure farmers accessibility of the products.

Agronomic practices

Probably the hardest nut to crack is how to support farmers in improving their agronomic practices. A number of recommendations have been provided in terms of row planting, intercropping, pest and disease management, and soil fertility management. However, currently, the government extension system is not strong enough to, interactively, take up these recommendations with farmers. We provide two options to address this issue:

(1) leverage the extension system through dedicated legume subject matter specialists and the establishment of informal legume commodity groups and
(2) agronomic advise through chain integration with larger processors and exporters. The first option builds on the work undertaken by TechnoServe in the coffee producing areas and ISSD for seed producer cooperatives.

Basically, additional well-trained extension staff is added for the legume clusters and relative informal groups of farmers (of typically 30–50) farmers are practically trained on good agronomic practices, leaving room for farmer-to-farmer experience exchange and experimentation. Within the Coffee Initiative the training and facilitation role is taken up by young graduates (often diploma level) that come from the area and have good communication skills. The trainers work closely together with the zonal, *woreda* and *kebele* extension service and development agents participate in the activities. The second option is through having private extension agents embedded in the outgrower schemes of the larger processors and exporters, in line with the above mentioned input supply model. This model has been successfully rolled out for the 3,000+ sesame farmers of Selet Hulling PLC. The company has three dedicated agronomists to support these farmers.

Low cost small-scale technology for production and postharvest activities

The main threat for further expansion of a number of legumes lies in the labor requirements of the crop, both at production and postharvest level. Especially for faba bean, haricot bean and groundnut labor needs are high; especially where it concerns: the weeding, harvesting and threshing. Herbicides were already mentioned as one solution, mobile threshers can be another solution. More importantly, in the processing of legumes important improvements can be made to the: cleaning, sorting, flaking, dehulling and roasting technologies. The report has presented a number of options of available machines that currently are hardly available within Ethiopia. It is recommended that both local production and marketing of these machines is encouraged (e.g., through Selam Technology or a number of A-TVETs). In addition, the private sector can be stimulated to import and actively market these technologies in key legume producing areas. After sales support will need to be an important component of the marketing strategy as the successful adoption depends on the performance and durability of the machines. Specific innovation funds (e.g., a co-financing grant facility) could be set up to stimulate investments for the production, marketing and after sales support of low-cost, small-scale technologies.

Transparent marketing system

As mentioned earlier the overall chain efficiency is relatively high with low transaction and transportation costs. However, significant improvements could be made in terms of the quality of the different legume products. At all levels in the chain traders and wholesalers complain about product quality. At the same time no clear incentives or information systems seem to be in place to stimulate better quality products. The quality issues relate to moisture content (especially for groundnut and haricot bean), impurity and admixture (all pulses), weevils or aflatoxin infestation (groundnut and haricot bean), seed size and color. The level of admixture can be as high as 20%, indicating that also an additional 20% transport cost needs to be incurred to move the goods. All these issues are clear chain issues where the chain leader (most powerful chain actor) needs to take responsibility. It is proposed that, where they are not yet developed through e.g., the ECX, clear and specific legume grades are developed that provide transparency to farmers on specific price incentives, in terms of moisture content, admixture, impurity, seed color and seed size. The larger wholesalers, processors and exporters should take the lead in this, working in close cooperation with the local wholesalers. Probably this system can first be piloted for specific legumes where the quality problems are largest, e.g., groundnut (moisture/aflatoxin) and haricot bean (moisture/well-cleaned).

Local traders, town wholesalers and small processors: Access to finance and warehouse management

The purchasing power of local traders, smaller wholesalers and small processors (*baltenas*) is seriously constrained by the lack of credit. All these actors indicate that often the formal banks are not an option due to their stringent (collateral) requirements and extensive bureaucracy. In some regions MFIs fill this gap, though their geographical presence is limited. As a result most local traders, wholesalers and processors turn to private money lenders instead, which charge high interest rates. Support activities could be developed that entice MFIs to set up shop in the key legume clusters. In addition, a dialogue could be started with the banks to improve their services to the indicated group of traders and processors. In time, when the financial services provision improves, the medium-scale wholesalers and processors could start providing inputs as well.

In addition, for a number of legumes postharvest losses can be high when not stored properly. This, again, especially relates to groundnut and haricot bean, though other crops suffer as well. It is recommended to provide trainings on good warehouse management to local traders, town wholesalers and small processors in terms of: drying, sorting, warehouse design, use of pallets and judicious use of pesticides. All these activities combined, can increase quality, shelf life and in the end prices for final sales. The activity is probably best positioned at the level of local traders, wholesalers and processors, as substantial bulking takes place at this level (i.e., on average more than 60% of all produce at one point ends up at the warehouses of these actors).

Chain integration with large-scale companies

A number of opportunities have already been mentioned for working closely together with a number of large-scale companies in terms of input supply, extension services and grading. Still, a number of standalone activities can be envisaged that support a number of (emerging) processors and exporters in their business operations. This especially concerns the activities of: business planning, warehouse management, access to finance, international certification and quality control systems. It is advised for this activity to go beyond the 'usual suspects' and include a number (5–10) of potential, emerging medium sized, Ethiopian processors and exporters. There seems enough domestic and international market potential for a great number of these actors.

β-ODAP in grass pea

If any activity for grass pea is recommended it would have to be the reduction in β-ODAP content. The study observed that many people in food insecure areas suffer from problems affecting the nervous system, directly caused by the (over) consumption of grass pea. Internationally, varieties with much lower β-ODAP content are available (especially through ICARDA and the Indian public research system) which could be popularized in Ethiopia. As grass pea has superior traits to its main competitor, chickpea, especially in terms of drought and flood resistance as well as yield, it is not expected that grass pea, in the short run, will disappear from the Ethiopian legume landscape. The relative importance of the crop, both in overall production and as an essential part in the diet of food insecure households, justifies action. Possibly, CCRP-McKnight or N2Africa could start some (limited) activities to this end.

Groundnuts and aflatoxin

A similar issue is in place for groundnuts, where poor post-harvest management and storage practices can induce the proliferation of aflatoxin. The toxin is spread by a soil fungus that can be contained through proper drying (on the field, e.g., on raised beds) and storage (ventilation, at low humidity and temperatures). The problem is very serious as shown by the work of Chala (2013); aflatoxin levels at the market can exceed FAO/WHO-limits by a factor as high as 800. High aflatoxin levels can cause serious liver damage, liver cancer and cirrhosis. Recent studies by IFPRI show that a number of solutions are developed to combat aflatoxin content in groundnuts, mainly through market based approaches (Unnevehr and Grace, 2013). In particular they mention: private supply-chain coordination (Mars Inc.), the introduction of basic groundnut quality evaluation tools, the introduction of groundnut shellers (which reduce mold growth and contamination) and/or the introduction of aflatoxin bio-control agents. In the Ethiopian context, probably, the introduction of 'good groundnut handling practices' can best be incorporated in the above mentioned activities of: extension support for groundnut commodity groups, warehouse management at local trader and chain integration through the larger processors of plumpy nut, peanut butter and peanut snacks. These activities can also be linked to the business platforms as discussed below.

Value-chain coordination: Legume Business Platforms

Most of the above activities require closer cooperation between the different actors and service providers of the respective value-chains. E.g., the addressed aflotoxin, grading and access to finance issues all demand great coordination of the chain. Coordination Groups or Business Platforms have been successful in bringing together the different value-chain players, jointly develop agendas and action plans as well as actively implement chain interventions through e.g., innovation funds. Examples are the national Soy Business Platform (AACCSA-ABSF), the Coordination Groups under the former SNV-BOAM project or the Heineken Malt Barley Taskforce. Depending on the market structure, Business Platforms can be envisaged at (zonal) cluster level or at national level. At national level also a (public-private) Legume Platform could be considered addressing the more strategic issues in the enabling environment.

6|3 Crop choice

In total eight legumes have been studied. Given the limited resources for an IVCD Legumes project a selection needs to be made on three to five legumes that can bring the biggest impact. Criteria used for this exercise are: product volume, production growth rate, priority crop in the farming system; market demand; opportunities for local processing; food security situation; women involvement; and potential linkages to other projects and programs. The following table depicts a qualitative assessment of these criteria.

	Faba bean	Haricot bean	Chick-pea	Field pea	Grass pea	Lentils	Ground-nut	Soy-bean
Volume of production (t)	943,964	463,008	409,733	327,378	325,581	151,500	124,419	63,653
Production growth/y 2007–2013	6%	15%	7%	7%		10%	30%	110%
Priority crop (ha/hh)	0.13	0.12	0.22	0.14	0.22	0.13	0.24	0.27
Market demand	High	High	High	High	Medium	High	Medium	Medium
Local processing	High	Low	High	High	High	High	High	Low
Food security situation	Relative food secure	Often food insecure	Both food secure and insecure	Food insecure	Food insecure	Food insecure	Food insecure	Both food secure and insecure
Women involve-ment	High	Medium	Medium	High	Medium	High	High	Low
Potential linkages	N2Africa	N2Africa	ATA/ N2Africa ACDI-VOCA				(N2Africa)	N2Africa/ ABSF

Table 9 Legume crop selection based on eight criteria

Overall, we recommend the inclusion of:

- ***Faba bean***, because of its sheer size, good market outlook (both domestic and international), opportunities for local processing and potential linkage to N2Africa's activities.
- ***Haricot bean***, as second biggest pulse crop in Ethiopia, has a good market outlook (both domestic and internationally), can significantly impact the food security situation and strong linkages can be developed with N2Africa. In addition, hotspots of haricot bean production are there which can enable cluster formation and further specialization.
- ***Groundnut***, though a relatively small crop, it has the advantage of being relatively confined to specific areas (Hararghe and Beneshangul), with rapid production growth (30% per year). There are good opportunities for local processing and the crop can make substantial impact on the livelihoods of the involved farmers. In addition, it is one of the priority crops for N2Africa, though not in Ethiopia.
- ***Soybean***; again the geographic concentration can facilitate cluster formation, the nutritional impact can be large and it can easily link to existing initiatives like N2Africa and the Soy Business Platform of the Agribusiness Support Facility. In addition, its growth rate is enormous, doubling every year since 2009.

We deliberately do not recommend chickpea. This is because we feel already many programs and projects are focussing on this crop (AGP-AMDe, ATA, N2Africa, SNV), including substantial value-chain activities. Especially the AGP-AMDe project, with a total budget of US$50 million, focussing on six priority crops (coffee, wheat, maize, sesame, honey and chickpea), has substantial resources to support chickpea value-chain activities. There is a risk of duplication of activities here. Possibly with respect to local processing chickpea could still be included.

Two relative outsiders are field pea and lentils. Though little attention is given to these crop it makes up an important part of the livelihoods of many, especially food insecure, farmers. The production and processing potential of the crops is good and market outlook is positive. Probably if further focus needs to be applied the field pea cluster in South Wollo or the lentil cluster in North Showa (both in Amhara) provides the best opportunities in terms of improving the food security situation both through increasing productivity as well as through supporting the local processing industry.

Following the above analysis we recommend the following clusters to be included for the envisaged BMGF IVCD Legume project:

Faba bean	Haricot bean	Groundnut	Soybean	Field pea/Lentil
North Showa (A/O)	East Showa (O)	East Hararghe (O)	Metekel (BG)	South Wollo (A)
Arsi (O)	Sidama/Wolaita (S)	Metekel (BG)		North Showa (A)

Table 10 *Proposed legume clusters for interventions*

In addition, on a special request from the participants of the validation workshop, we explored opportunities to include activities in the regional state of Tigray. Though overall production of legumes in Tigray is low, two specific zones score relatively high in lentil and chickpea production: respectively South Tigray and Northwest Tigray. The first could be combined with the field pea/lentil activities of South Wollo and North Showa. The second could be combined with the ongoing chickpea activities of ATA and AMDe in North Gonder.

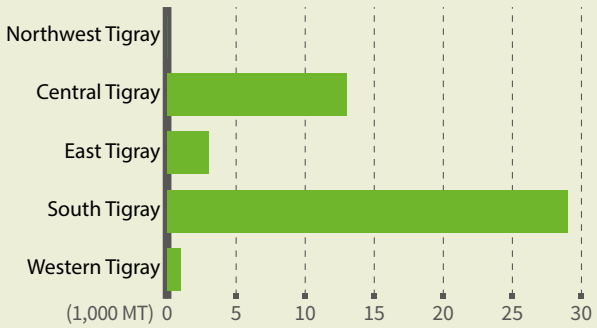


Figure 91 *Lentil production in Tigray (CSA, 2013) 2006/07–2012/13 in 1,000 MT*

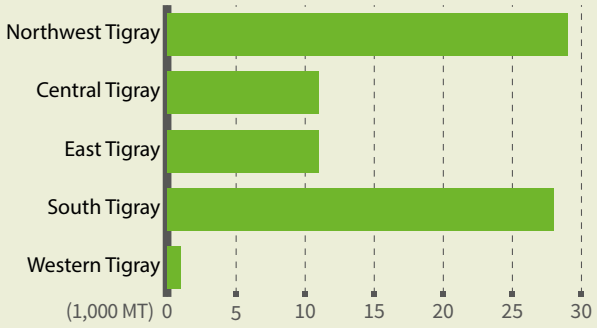


Figure 92 *Chickpea production in Tigray (CSA, 2013) 2006/07–2012/13 in 1,000 MT*

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