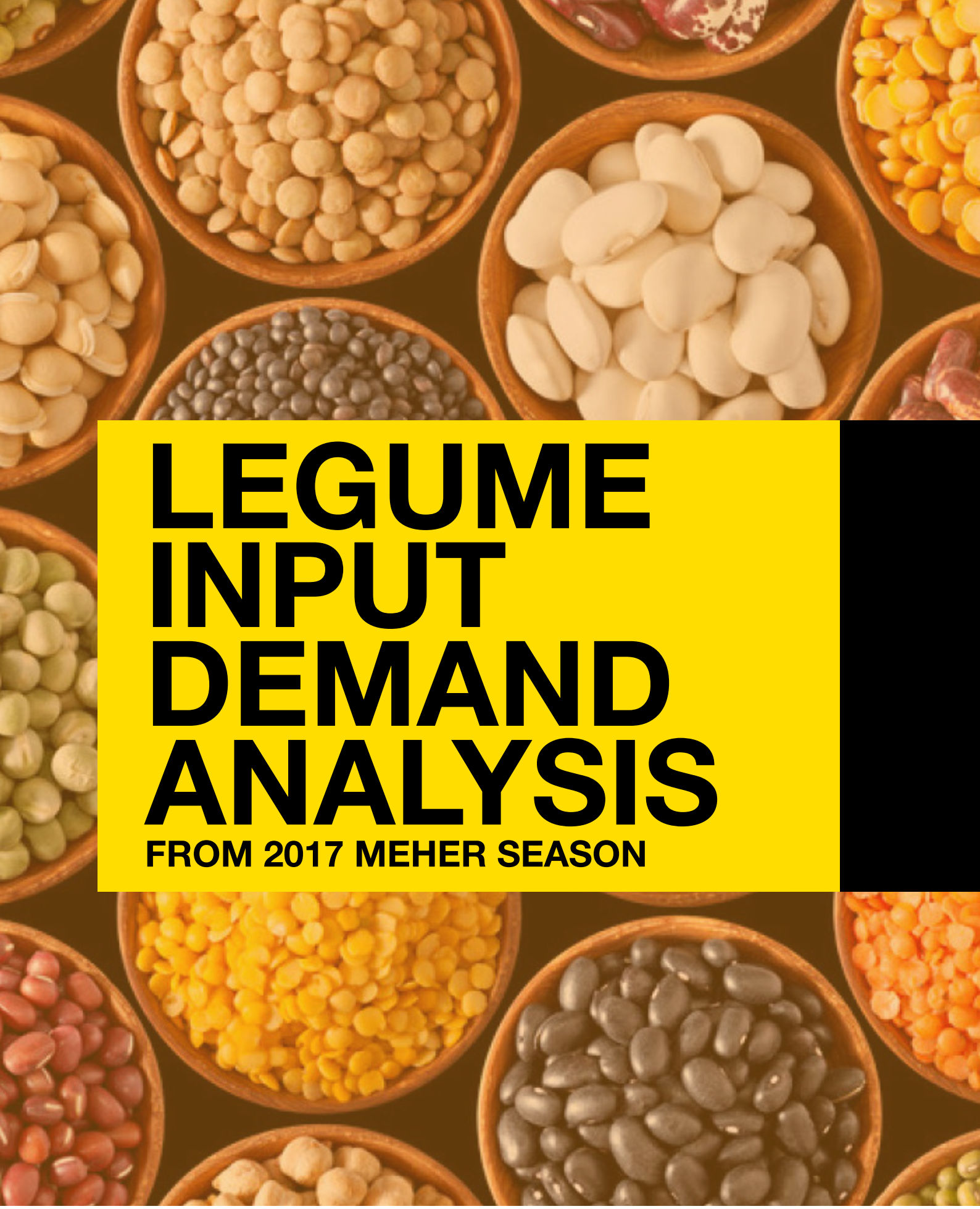

LEGUME INPUT DEMAND ANALYSIS

FROM 2017 MEHER SEASON

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ILRI
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WAGENINGEN
UNIVERSITY & RESEARCH

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SHAYASHONE

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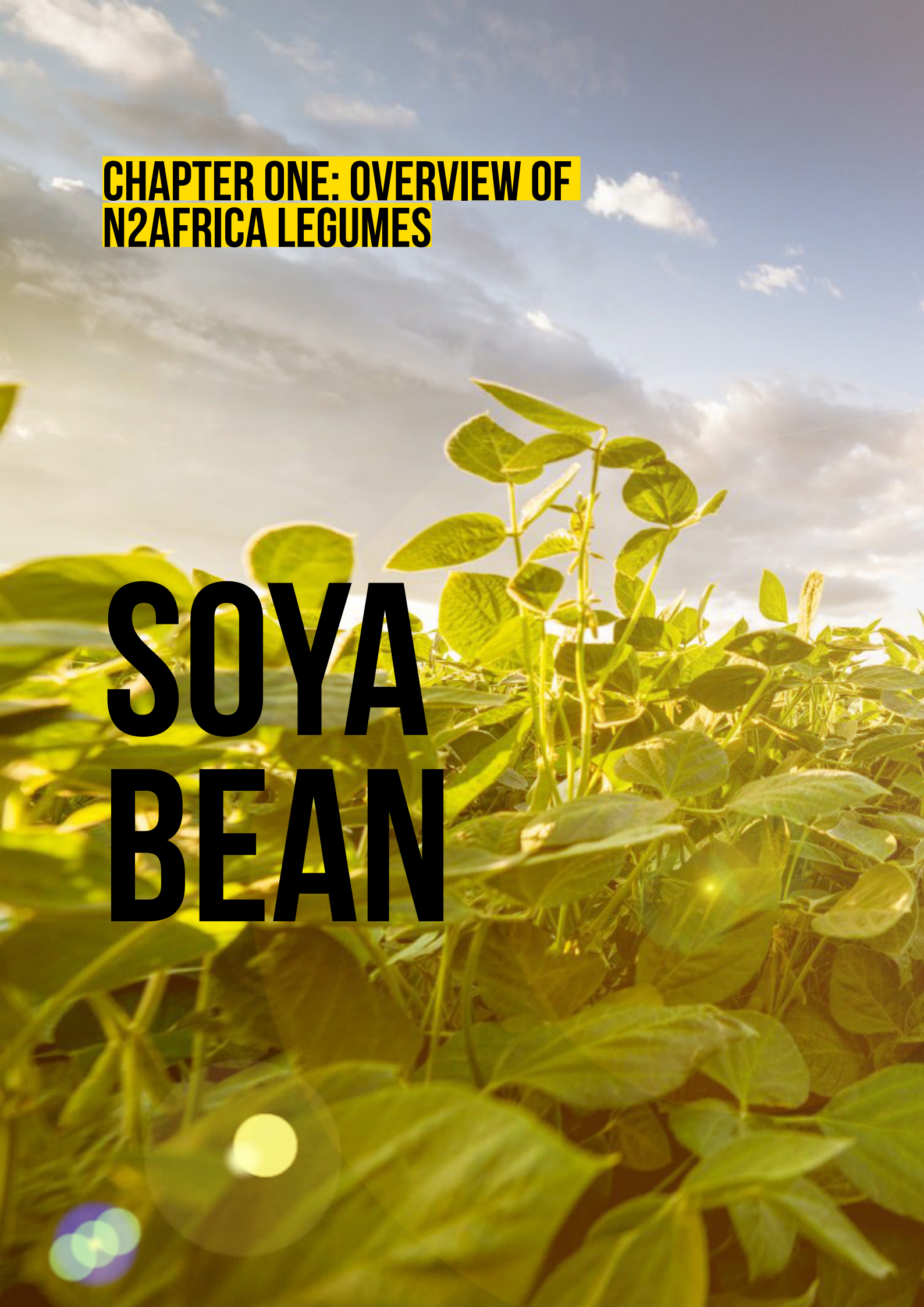
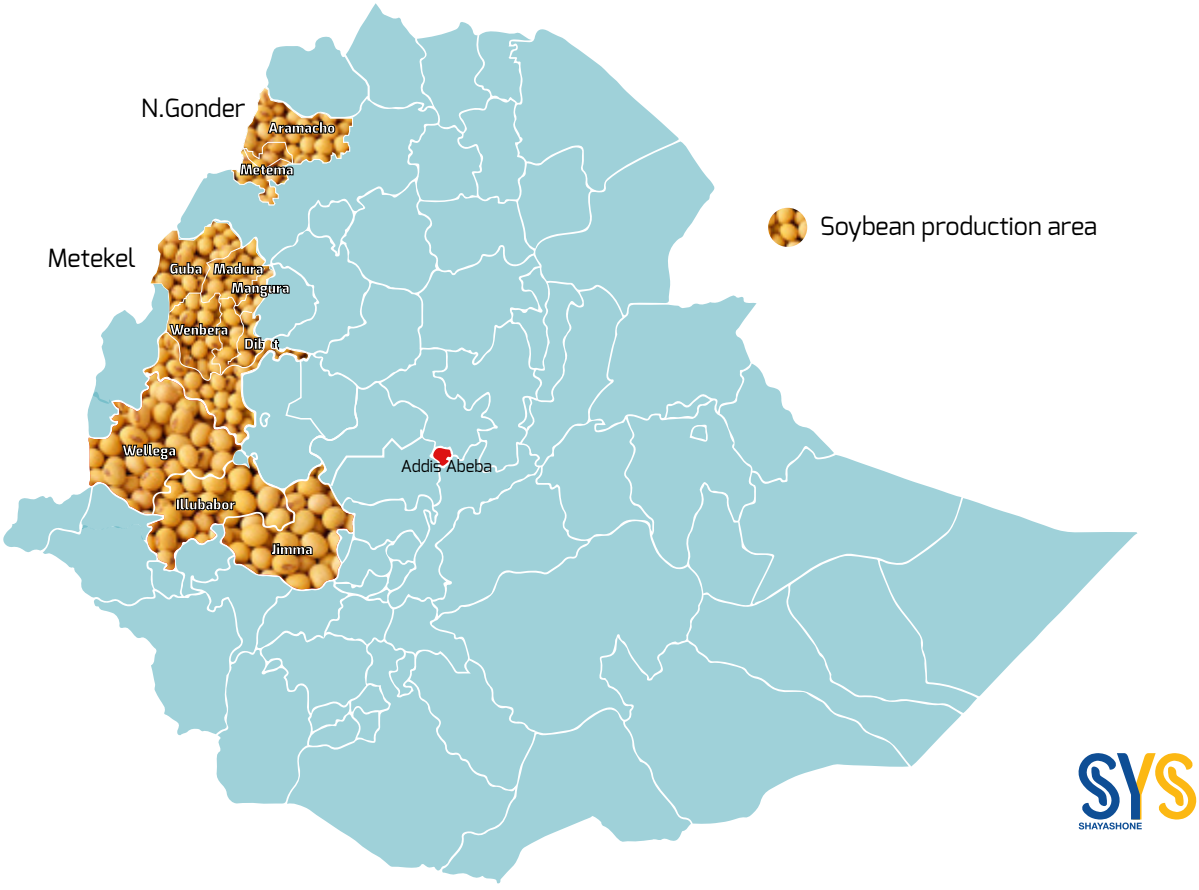
CHAPTER ONE: OVERVIEW OF N2AFRICA LEGUMES



SOYA BEAN

Soya bean production in Ethiopia has grown rapidly over the last years, doubling every year since 2010. Ethiopia produced estimated volume of 812.35 Thousand MT in 2016/17, combined production by smallholders and commercial farmers. The growth in production is attributed mainly to the increase in area covered and productivity. The total hectare of land under soya bean production during the last 10 years has increased by 10 folds; while the total volume of production during the same period increased by 21 folds. Productivity level of soy bean is 2.22 MT/ha and this level is very low compared to its potential which could go up to 4 MT/ha if improved varieties are used.

Though soya bean can be grown in different parts of Ethiopia, the major areas currently growing the crop are situated in West and South West part of the country, notably Benishangul-Gumuz, Gambela and Parts of Oromia and Amhara Regions. These areas have vast fertile land and favorable agro-climate to grow soya bean. Entry of large scale commercial farmers including government sugarcane-soy intercropping programs and research strategy towards soil fertility rehabilitation has made soya bean as favorite crop. In this regard, the recent production increase of soya bean as a rotation crop in the traditional sesame belts of Western Amhara is worth mentioning. Over the last five years total acreage of soya bean has increased by 15%.



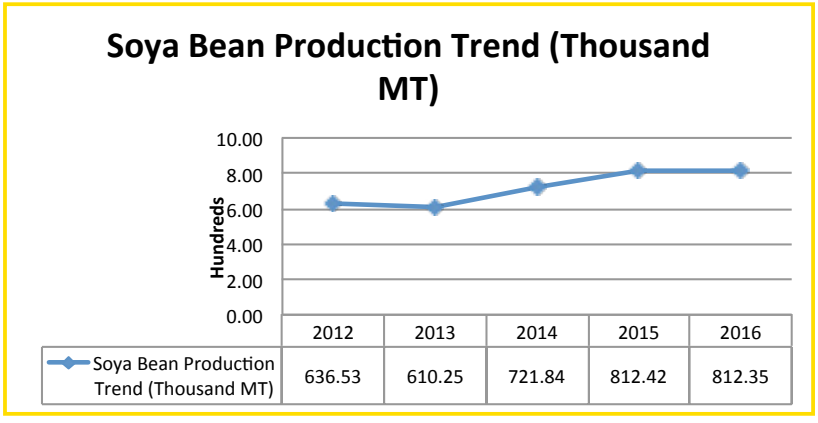
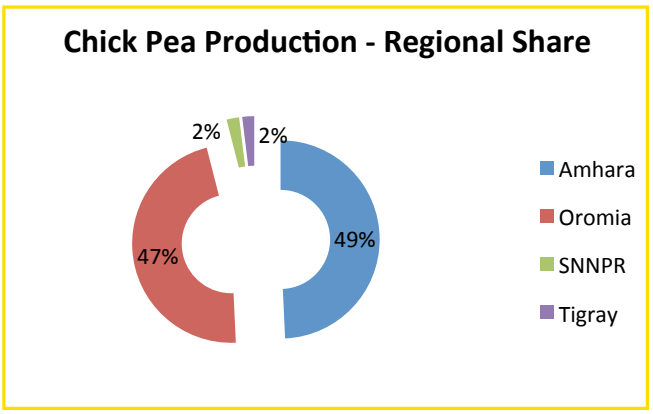


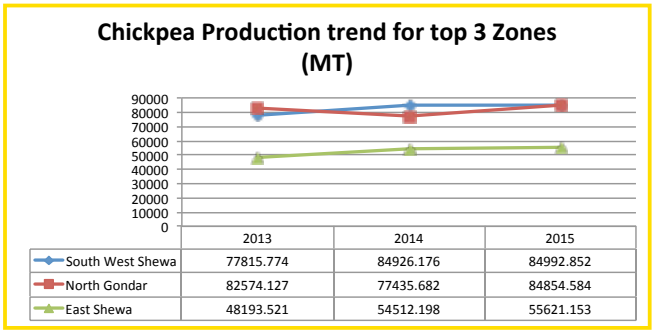
Figure 1: National Soya Bean production corridors and production trend


CHICKPEA

Chickpea is the third widely produced legume in Ethiopia after faba bean and haricot bean. Ethiopia produces over 470,000 MT of chickpea that makes it the fifth leading producer in the word. The country is also the leading producer in Africa, accounting for close to 40% of total production of the continent. Chickpea is an important consumption as well as cash crop for smallholder farmers. The grain is consumed in green, dry roasted and powder (shiro). It is a key source of high-quality protein, with a wide range of essential amino acids. Over the last 5 years Ethiopia has exported over US $ 197 million worth of chickpea.



Chickpea is often grown as a second crop after main maize and teff harvests, utilizing residual soil moisture. It is produced in the mixed crop-livestock farming systems of the central, north and northwestern highlands of the country. Amhara (49%) and Oromia (47%) are by far the largest producers of chickpea in Ethiopia; accounting for over 96% of the national stock. Production in SNNPR region accounts for only 2%.



	2013	2014	2015
South West Shewa	77815.774	84926.176	84992.852
North Gondar	82574.127	77435.682	84854.584
East Shewa	48193.521	54512.198	55621.153

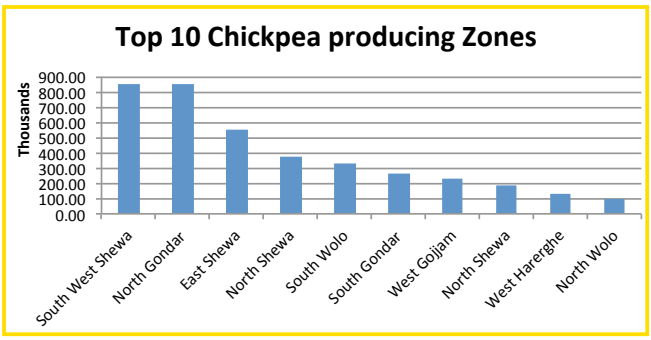
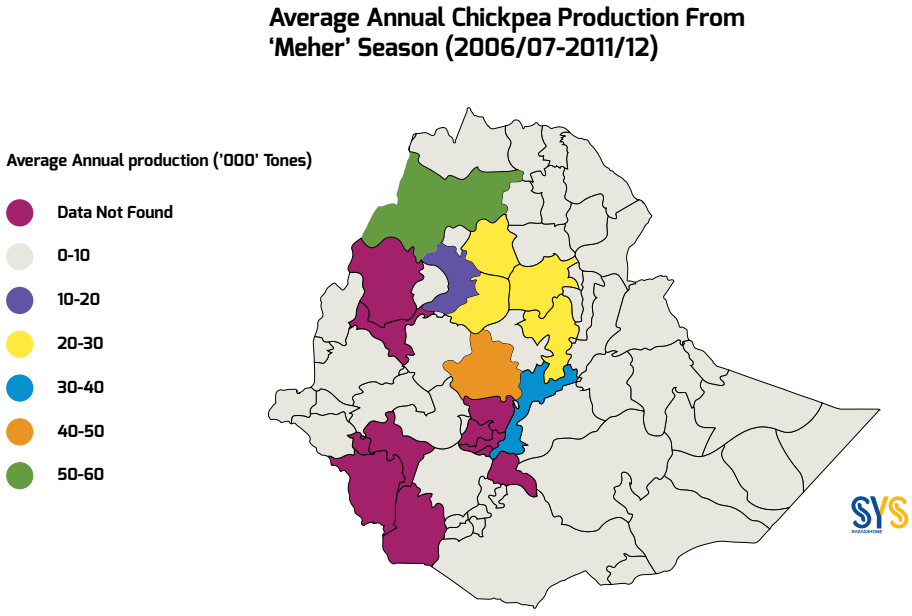


Figure 2: Current chickpea production areas in Ethiopia



HARICOT BEAN

Common Bean is one of the most important grain legumes grown in of Ethiopia. The principal production belts are, Centeral Oromia, SNNPR and Western Amhara. While white pea beans are common in central oromia and western Amhara, red kidney beans are commonly produced in SNNPR. According to CSA (2015/16) the country produced over 500,000 MT of common bean from 355,000 ha of land. In addition to the main Meher season, significant volume is produced in Belg season. Average productivity per ha is around 1.5MT despite the potential of over 2.5 MT/ha. Based on the CSA data of 2015/26, the biggest producer of haricot bean, both white and red, is the Oromia (51%), SNNPR (27%) and Amhara (20%) accounting for 98% of the national production. The SNNPR account for over 27% of the national share but still there is a significant production in belg season, which is not accounted in this share.

Haricot bean is the leading export pulse for Ethiopia, generating over 144 million USD per annum. It accounts for over 70% of the national pulse export income. The crop is also one of the most important foodstuffs particularly in SNNPR. In this region haricot bean is used for different types of household food and is an important source of proteins, carbohydrates, vitamins and minerals. Dishes such as Possesse and Bulenta (mix of boiled beans, maize, cabbage and other vegetables) are common in the rural areas. In urban areas, boiled beans, soup and some specialized food for mothers and children are practiced.

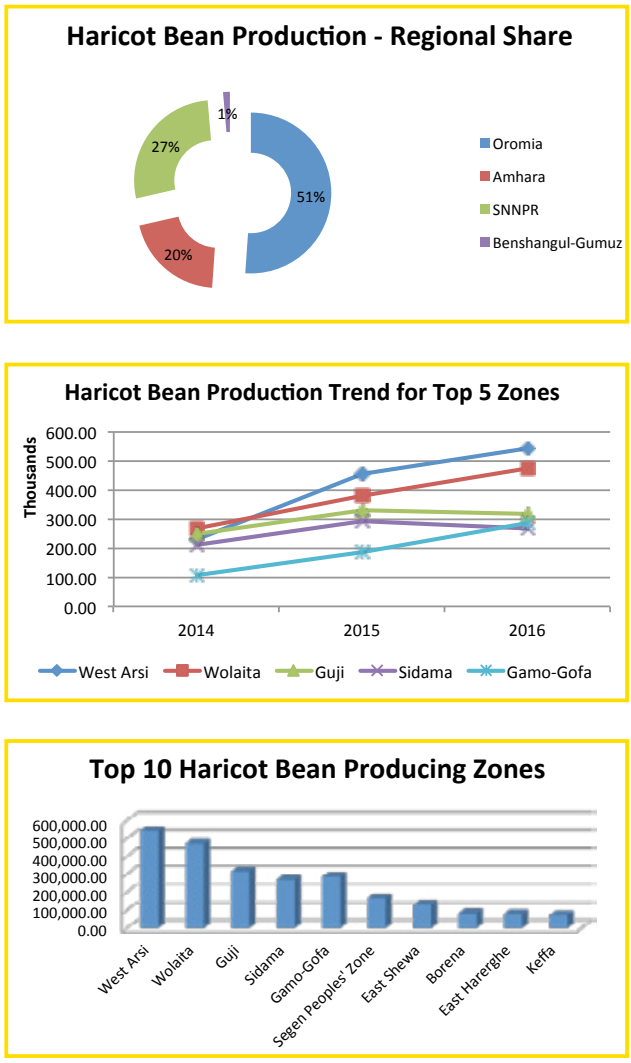
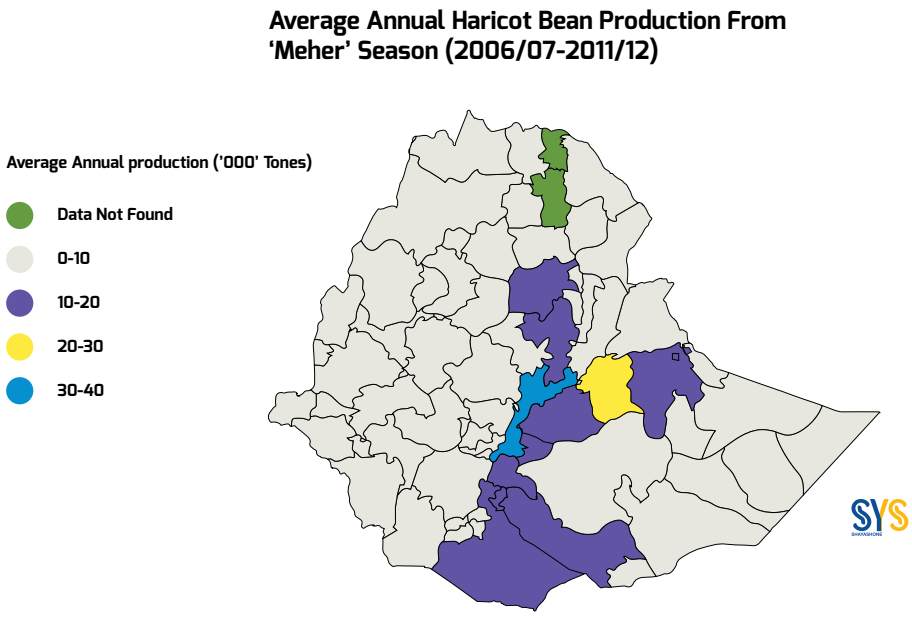
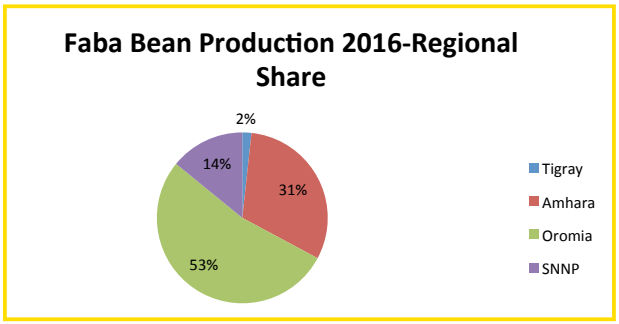


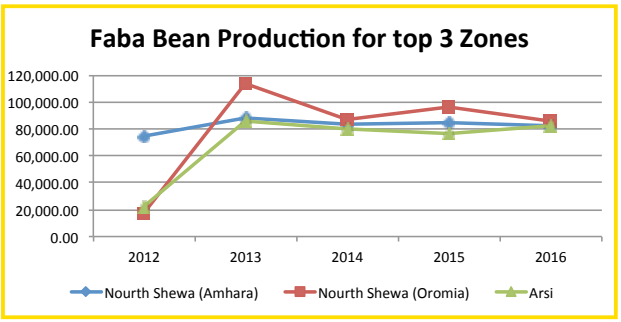
Figure 3: National Haricot Bean Production overview




FABA
BEAN

Faba bean is Ethiopia's primary leading legume. It is cultivated in the highlands often in rotation with wheat, barley or teff. Total production in the 2015-16 growing season was more than 865,000 tons which accounts for one-third of the total legume production in Ethiopia (CSA, 2016). By far the most important production areas can be found in Amhara (34%) and Oromia (54%). These two regions account for more than 89% of the production. Faba bean is one of the most crucial food legumes in Ethiopia. It is consumed in different form: shiro, boiled, and split. In addition, there is strong demand in neighboring country namely Sudan. For the last four years Ethiopia exported 142,355 MT of faba beans. It is to be noted that this export volume is possibly underestimated mainly because the export to Sudan is unregistered cross border trade. The below figures show the production statistics of the crop.





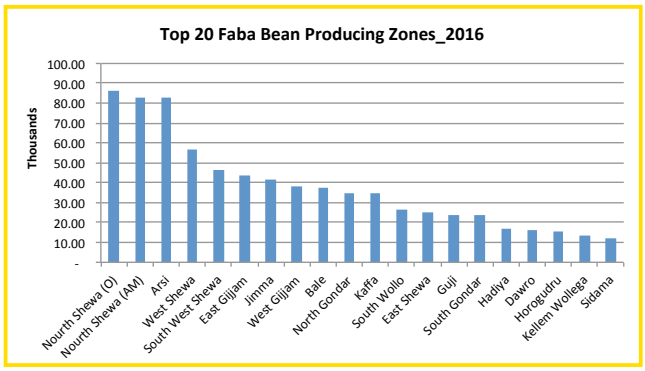
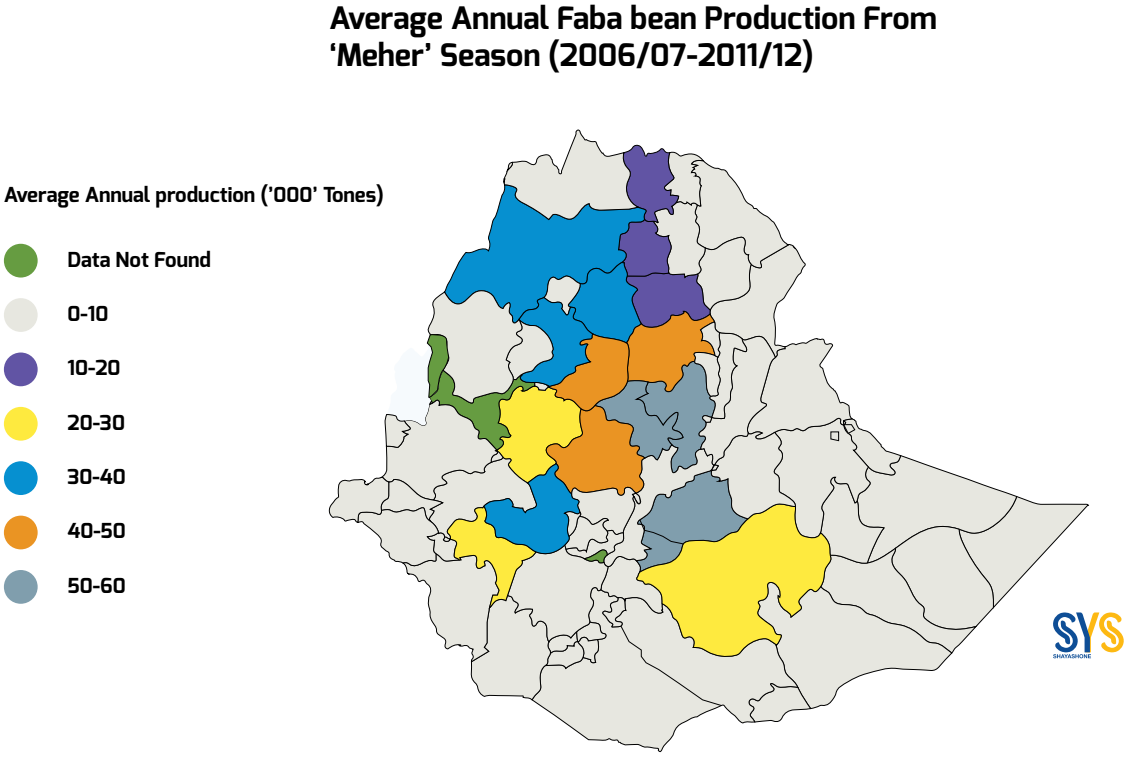


Figure 4: Faba bean production and geographic coverage



CHAPTER TWO: AGRICULTURAL INPUT DISTRIBUTION SYSTEM IN ETHIOPIA

SHORT NOTE

According to World Bank (2016) data Agriculture accounts for 37.23% of the total Ethiopian GDP and 80% livelihood. The agricultural sector is predominantly based smallholder farmers (95%). Average holding per household is 0.9 ha. The second growth and transformation plan has given strong emphasis on intensification and commercialization of smallholders' agriculture. Low level of input utilization is mentioned among the key bottlenecks towards increase in production and productivity. In response to address this gap the GTP 2 highlighted strategic targets by 2020 among which scaling up of improved seed and fertilizer supply by 90% from 2015 status, availing 308 tested technologies in crop, agro mechanization, bio-technology, and agricultural quality and nutrition were the notable one; and scaling-up of input voucher system tested in 81 woredas to resolve problems of input finance to all woredas. The plan aims to achieve an overall yield increment of increased productivity of cereals, pulses and oilseeds by 45%, 35% and 30%, respectively, in 2020.

The Ethiopian agricultural input supply system has strongly been dominated by the public sector. Fertilizer is fully supplied by government enterprises. Likewise, over 90% the improved seed is also delivered through public seed enterprises. Recently, the Ethiopian Government is creating space for the private sector. Liberalization of input markets and increased involvement of private sector to accelerate economic growth and improve competitiveness are key pillars of the current GTP. That envisions well developed efficient agricultural input and output markets to accelerate the pace of economic growth.

SEED SUPPLY SYSTEM IN ETHIOPIA

Seed is one of the most crucial elements in the livelihoods of agricultural communities. Sustained increase in agricultural production and productivity largely depend on the development of new and improved varieties of crops. Increasing quality and usage of improved seed has the potential to dramatically increase Ethiopia's annual crop production. For example, by adopting commercial seeds in combination with best practice techniques on a quarter of the current crop area, research indicates that farmers could increase production and productivity by two folds (Dercon, 2009).

There is no consistent data on demand and supply of seed in Ethiopia. The current average national improved seed penetration for most food crops covers only 10%. While the figure for pulses are 0.9% (CSA, 2017). Domestic seed sales in Ethiopia in 2012 were only $ 0.2 per capita in contrast, Tanzania (0.3), Bangladesh (0.8), Kenya (1.4), India (1.6), South Africa (9.0) and Turkey (9.9) (ATA, 2015). The table below shows the average acreage of cereals, pulses and oilseeds for the last five years. Based on an average seed rate of 0.1 MT/Ha one can estimate that the Ethiopian annual demand for improved seed can reach up to 1.25 million MT. However, the amount supplied is less than 13%. According to MoA, the annul supply as of 2014 have been 49,000 MT (excluding the informal sectors). On the other hand the GTP 1 result indicated that the annual supply of improved seed was 160,000MT in 2015. Studies indicate that demand for improved seed is growing by 10% per annum (ATA, 2015). The principal input demand and supply come from Oromia, Amhara and SNNPR regions (about 97%).

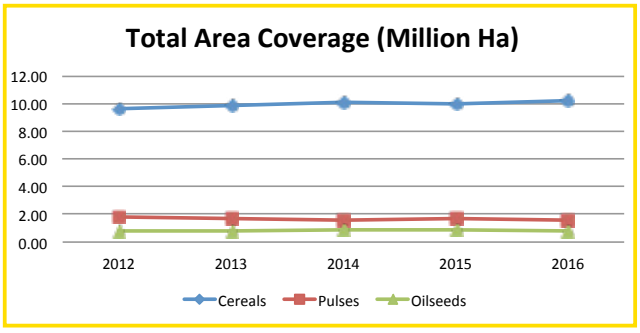


Figure 5: Estimated Seed demand and supply

According to a study by Sopov et' al (2014) the Ethiopian seed system has been confronted with several challenges; among the main problems some are:

- Lack of proper linkage between different actors involved in seed systems;
- Inadequate supply of good quality seed at affordable prices;
- Focus on few crops (maize & wheat) in the formal system and other
- beneficial crops (such as pulses & oilseeds) remain orphans;
- Low level of private sector involvement in the formal system;
- Inefficient seed promotion, distribution and marketing mechanisms;
- Weak variety release and seed quality assurance system.

The seed supply system in Ethiopia can be divided in to two broad categories-formal and informal systems. The formal system is divided into public and private seed (companies and producer). These are enterprises that are legally licensed to produce and sell seed of food and cash crops. The private seed producers, public seed enterprises, and the (inter)nationally operating seed companies are involved in the production of certified seed using known sources of basic seed of improved and released varieties.

The informal seed sector has two main sub-components farmer-saved and local seed business. This sector accounts for over 90% of the market share. Unlike the formal sector, there is no licensing and certification here. The farmer-saved seed comprise both local varieties as well as improved varieties that have been accessed through the formal distribution system. Local seed business constitutes a seed system in an intermediary position, between formal and informal systems. Since seed in this system is not necessarily certified, varieties being both local and improved, dissemination varies from bartering to a commercial basis.

INFORMAL

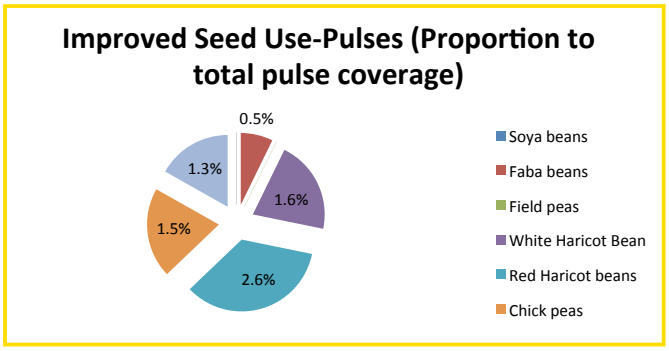
- Cheap and readily available
- Built on indegenous knowledge.
- Adapted to local agro-ecology.
- Simple and allows use of seed after primary adaption test.
- No rubust quality assurance mechnaism and seed is not licensed.

FORMAL

- Based on series of trails and certification that takes upto 3-5 years at development.
- Supplied and distributed by licensesd enterprises.
- There is regualar quality assurance and monitoring mechanism.
- Price is relativaley high and seed is not readily avaialble.

The overall structure of the Ethiopian Seed sector is illustrated in the graph below. Ministry of Agriculture and Natural Resources (MoANR) is responsible for assessing national seed demand and supply, as well as development of strategies to address any shortages in partnership with the regional bureau of Agriculture. The strategic focus of Ethiopia's seed sector is to develop seed for food crops (maize, teff and wheat) and cash crops (coffee, sesame and horticulture) (EARO, 2002; MoARD, 2004). As it stands now the Ethiopian Institute of Agricultural Research and Regional Agricultural Research Institutes is the main variety developing institutes. Variety development takes place both at research centre and farmers land.

Unlike the cereal, which has both (formal and informal) seed distribution system, the informal seed distribution system is the dominant one in the legume sub-sector. Legumes by their nature of seed genetic potential and protein content, the private seed dealer could not get it profitable as that of hybrid seeds for cereals to involve in the multiplication business. Apparently, mainly because of the limited yield potential of legume seeds. Hence, the community based seed system is promoted and currently functioning as a dominant distribution system for legume seeds. However, very recently, the private seed enterprises started to multiply legume seed not only for seed business but for rotation purpose to cereals so as to break disease cycle and improve soil health.



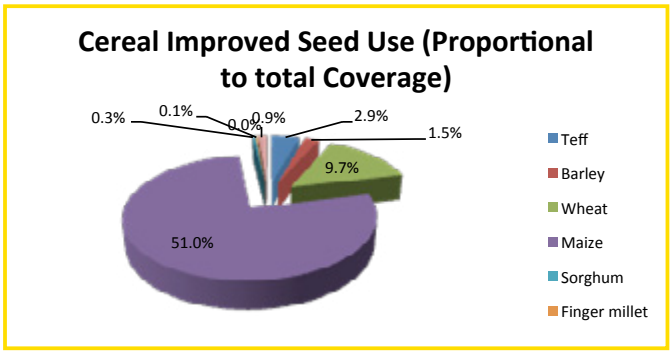


Figure 7: Improved seed Penetration Rate

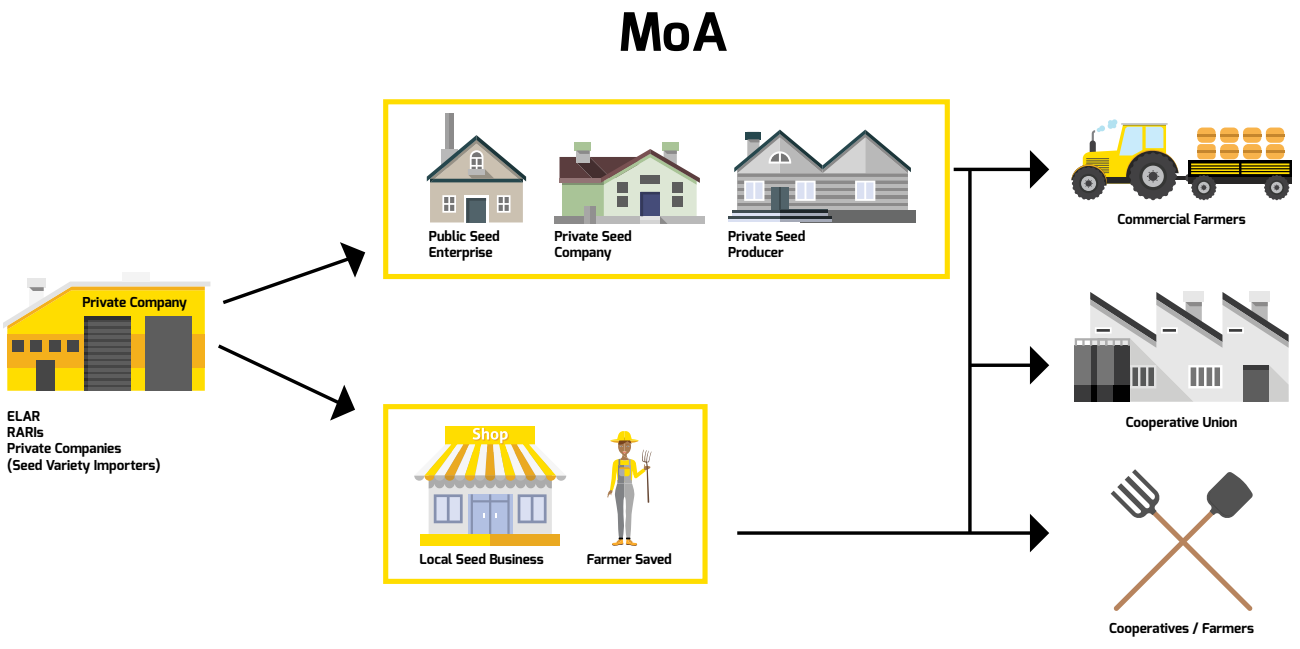


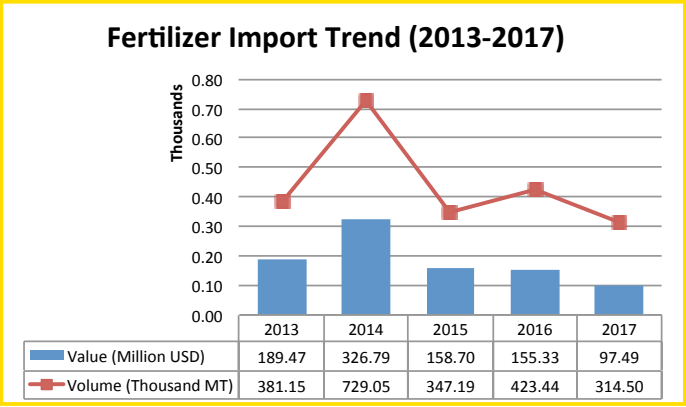
Figure 6: Ethiopian Seed System

AGROCHEMICALS SUPPLY SYSTEM IN ETHIOPIA

FERTILIZER SUPPLY SYSTEM IN ETHIOPIA

According to CSA 2017, the total amount of inorganic fertilizer applied amounts 11.4 million quintals. The report indicated that less than 47% of the total cultivated land in the country is using fertilizer. The level of fertilizer penetration for pulses is only 5%. The GTP 2 has targeted to increase this to 20.6 million quintals by 2020. In addition, the plan underlines the intention to scale-up the voucher credit system which has been pilot tested in 81 Woredas to increase agricultural input utilization to all regions and Woredas. Consumption is still far behind other African and fast developing countries of the world. The national average fertilizer consumption remains at 23.8 kg/ha, in contrast to a 62.0 kg/ha world average, 39.4kg/ha in Ghana, 141.3 in South Africa and 181.7 in Brazil (ATA 2014). For years Ethiopia was dependent on imported fertilizer. While fertilizer uptake has increased of late by over 10% per annual, yields have not increased in a proportionate manner (average of 5%). Until recently Ethiopia has been using a blanket fertilizer assortment: Nitrogen and Phosphorus regardless of differences in crop need, soil types and agro-ecology.

In order to develop a tailored fertilizer recommendation, Ethiopian Soil Information System project led by ATA and commissioned by several partners conducted a national soil mapping in 2012. The new study indicated that there are 12 key deficient nutrients in most parts of the country. Sulfur, potassium, boron and zinc are some of the key missing nutrients in addition to Nitrogen and Phosphorus. In response to this finding, five fertilizer blending factories owned by farmer organizations have been established (Becho-Weliso; Merkeb, Melhik Silte, Gibe-Dedesa and Enderta). Each blending factory has an annual blending capacity of 50,000 metric tons of fertilizers. These blending factories import blend inputs and mix into the formulation required by Ethiopian soils. Tailored fertilizer application can restore the fertility of a variety of soils that are found to be deficient in several essential nutrients. In addition, there is also a room for cost reduction as part of the processing is done in Ethiopia with cheap labor. However; despite the new belding factories it is understood that Ethiopia still continue to import fertilizer. For example, in 2017, the country imported over 1.3 million tons of Urea, NPS, NPSB, NPSZnB (2017). The share of blended fertilizer in Ethiopia is less than 5%.

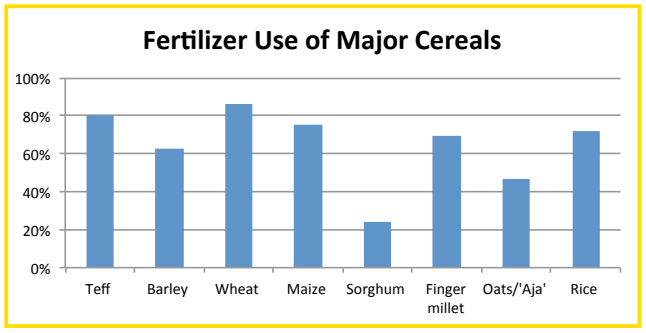


	2013	2014	2015	2016	2017
Value (Million USD)	189.47	326.79	158.70	155.33	97.49
Volume (Thousand MT)	381.15	729.05	347.19	423.44	314.50

Figure 8: Import Trend of N and P fertizer 2013-2017)

Agricultural Input supply Enterprise (AISE) is the sole importer of fertilizer in Ethiopia. Farmer organizations - unions and primary cooperatives serve the supply network for the farmers. In case of bio-fertilizers national soil laboratories and Menagesha Bio-Technology are the sole supplier. The penetration of bio-fertilizer in Ethiopia is very small (less than 1%) of the total coverage.

Legume requires phosphorous inorganic fertilizer and rhizobia as a starter for nitrogen fixation. Whereas Phosphorus is supplied through the AISE channel and the blending factories now; there are two important players for the Rizobia (Bio Fertilizer): National Lab and Menagesha Bio Technology. The latter is a private enterprise active in business for the last seven years. MBI produced over 100,000 sachets of rhizobia in 2015 of which about 71% was distributed. The most prominent strains were those of haricot bean (in SNNPR), chickpea (Oromia and Amhara) and soya bean (Oromia and BG). The company indicated that capacity utilization has been increasing by 30% over the last five years. The major challenge for the bio fertilizer producers to date has been market penetration; partly because of the limited awareness of farmers about bio fertilizers to fix nitrogen and increase yield but importantly the market chain is not well established as in the case of inorganic fertilizers. In addition, there is a tacit risk that if bio fertilizer competes with the market for the inorganic fertilizer particularly urea. One can also note that bio fertilizer needs sound application and handling.



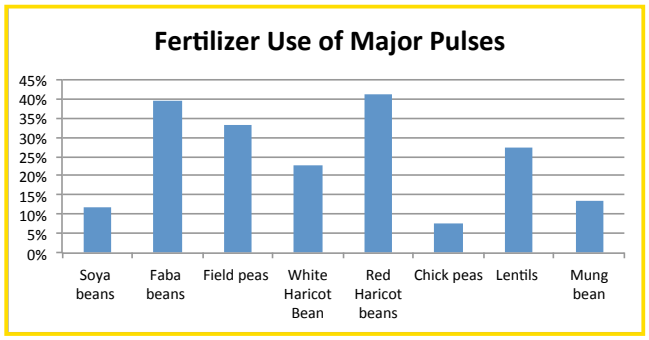


Figure 9: Fertilizer use for Major Cereals and pulses

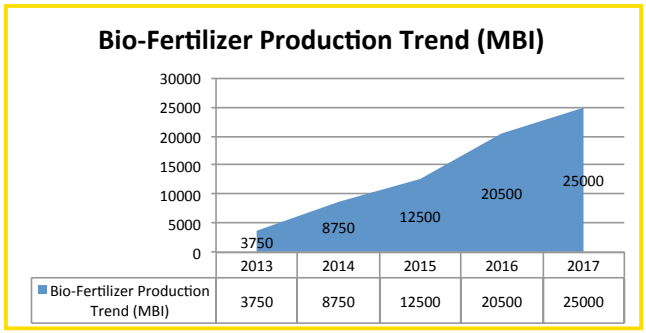


Figure 10: Trends of Bio-fertilizer Distribution last five years MBI only

PESTICIDE SUPPLY SYSTEM

Unlike fertilizer and seed, the agro-chemical sector is dominated by private players. According to information from Ministry of Agriculture and Natural resources; there are 61 approved importers of agro-chemicals as of December 2017. Data from ministry of agriculture indicated that 55 companies have registered brands in Ethiopia. Chemtex, Tiret, Adami Tulu and GAWT are some of the major players. Three challenges of importing agro-chemicals as noted by importers are: access to foreign currency, restrictive supply and distribution system and lack of reliable market about the effective demand. Though agricultural inputs are priority there is a serious shortage of forex and companies have to wait for months after blocking in local currency. This makes opportunity cost of import high and possibly leads to high price as the importers need to compensate for the long non performing finance blocked for forex access. The input supply and distribution system as of now is highly dominated by cooperatives and unions. These organizations have complex purchasing and procurement procedures that are restrictive to purchase from private organizations without tendering. In Ethiopia, traders have long perceived low effective demand due to the isolation of farmers in rural areas and lack of a clear communication pathway between farmers, traders, and extension workers.

A study by TAK-IRDI (2016), indicated cost of transport and other transaction costs as additional critical barriers. It is estimated that the cost of transport from Djibouti is around $0.06mt/km while it is around $0.10mt/km from AISE warehouses to cooperative unions. The costs of transportation are high because long distances must be covered and ground transport infrastructure is generally poor. This high transportation cost is further exacerbated by the spatial distribution of smallholder farmers across the country.

Ethiopia imported about 7.5 million kg (Net weight in kg) of pesticides at a total cost of about 1.3 billion birr in 2017. Pesticides are principally imported by private enterprises. There are over 50 importers of pesticides in Ethiopia. As of March 2016, there were 155 registered pesticides approved for agricultural application. According to FAOSTAT (2015), Ethiopia used 3,777 tons of pesticide used. The amount of pesticide, herbicide and fungicide uses is presented below. As can be seen from the graphs, the use pesticides use grows at about 18% per annual.

INSECTICIDES

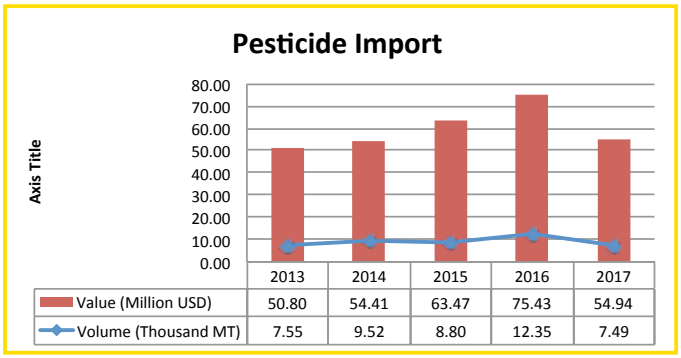
The country imported a total of 3.5 thousand tons of insecticide in 2017. The most important pesticides imported are Karate, Radiant and Actelic (mostly for storage pest). However, there are still common practices of using non approved pesticides such as DDT, Malathion and Anti Malaria for crop use.

HERBICIDES

A total of 3 thousand tons of herbicides have been imported to Ethiopia in 2017. Most of the herbicides imported are targeted at broadleaf; the most popular ones are 2,4-D, palace, Roundup and glycan. The sole domestic manufacturer, Adami Tulu, recently started manufacturing 2,4-D under license from the Chinese Company Tianjin Bohai Chemical Industry Group Corporation.

FUNGICIDE AND BACTERICIDE

Fungicide and bactericide are crucial components of agro chemicals. There are a total of 99 registered fungicides as of March 2016. The country imported 912.26 MT in 2017. Looking at the trend for the last five years, import seems to have a consistent marginal increment. The most popular fungicides are curzate, synthane and nativo.



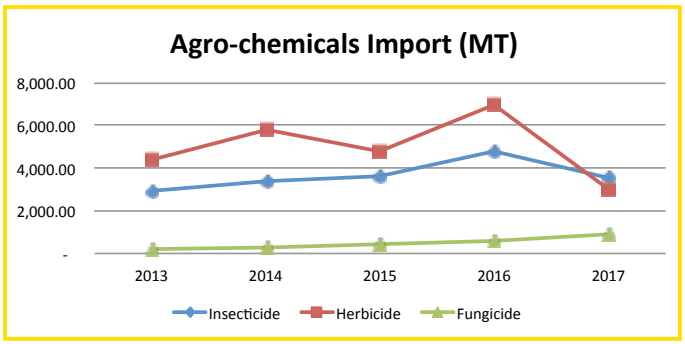
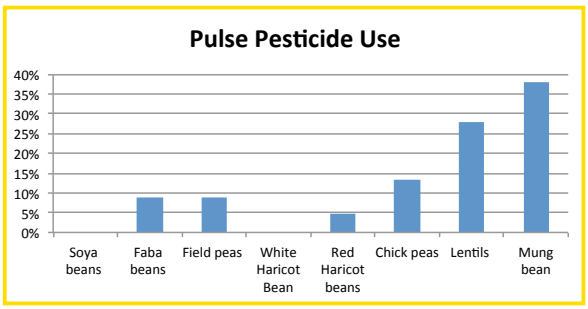


Figure11: Five year Trend of Pesticide, and Insecticide, Herbicide and Fungicide Import



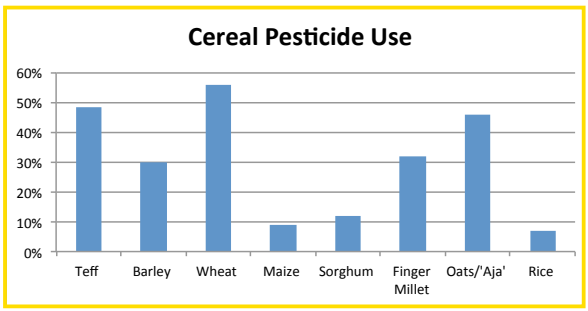


Figure 12: Utilization Rate of Pesticides in Pulses and Cereals

POST-HARVEST TECHNOLOGIES

Post-harvest loss in Ethiopia is estimated at about 22-30% (close to 7 million MT of grain production in 2014/15). This was equivalent to USD $ 230 million worth in value that can account for annual food consumption for over 23 million people based on WHO recommendation of 300KG food per person per year. The loss constitutes quantitative (weight loss) and qualitative (taste and smell) loss. Qualitative losses can lead to lower income and nutritional value; under certain conditions, for example aflatoxin consumption, may pose a serious health threat.

There are several causes of post-harvest losses. The most notable ones are attacks from weevils, rodents, and moisture or growth of molds. Weevils' attack is reported as the biggest and most common cause, particularly in lower altitudes. Insect infestation often leads to other storage problems. Insects give off moisture that result in increased grain moisture that can create a mold. Molding will in turn raise temperatures and leads to an increased rate of insect reproduction.

Farmers use different traditional and modern technologies to control insects. The most popular traditional method is the use of underground pits often meant to protect weevils. However; this method results in a high risk of mold growth. The use of chemicals is the other most commonly applied modern practice. A produce should be fumigated 3 times in order to safely store the harvest for one production cycle. The cost of buying chemicals added to staffing and un-staffing labor requirements as well as associated health risks make this option less attractive. Evidences from farmers in West Arsi, West Gojam and Metekel zones show that there is serious knowledge gap in applying chemicals for fumigation. Warehouses are left without ventilation and people still dwell in and out of the stores without taking any cautions, exposing themselves to serious health hazards. In some cases, farmers keep and the freshly fumigated grain within their residential house where the smells of chemicals are serious health threats particularly for infants and children.

Hermetic bags have been introduced lately as alternative solutions. PICS bags and Grain pro bags are the two technologies which are active in the market for the last three-four years. In this study the PICS bags have been incorporated as post-harvest solution. PICS bag is a triple-layer plastic bag that serves as an air-tight (hermetic) grain storage. Two high-density polyethylene inner bags fit inside an outer sack composed of woven polypropylene (PP). These inner liners greatly hinder the movement of oxygen across the wall of the bag. The tough outer woven bag enables the bag to be easily handled. Over the last three years over 300K bags have been sold to smallholder farmers. Maize, common bean, sorghum and chickpea have been the major priority crops though the bags can be used for all crops.

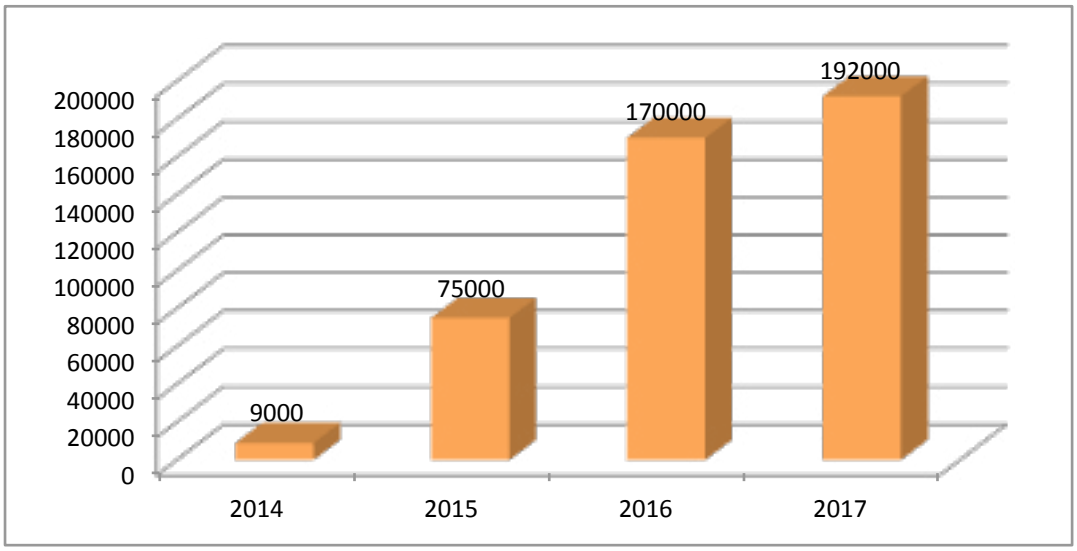


Figure 13: PICS Bags Sales Trend last three years

CHAPTER THREE: THE SURVEY CONTEXT AND PURPOSE

OBJECTIVE OF THE SURVEY

The primary objectives of this study was to analyze the demand and supply of inputs for N2Africa intervention crops; namely faba bean, soya bean, common bean and chickpea. The study aimed at quantifying the input demand of these legumes for 2017 meher season and sees the input demand prospect. For those legumes, the key input considered were seed, inoculant, agro-chemicals (fertilizer, herbicides, pesticides, insecticides and fungicides) and post-harvest storage technology, PICS. As stated above the variables analyzed were willingness to buy, quantity demanded, willingness to pay, price offer, payment modality, timing and source/place of availability. The supply audit and survey was intended to analyze the status of key input suppliers, quantifying current market and understanding key constraints facing. The overall intention for the report is to shed light into the notion that there are business opportunities for potential input suppliers but see what potential systemic problems are there for them to understand before stepping in.

APPROACH

DATA COLLECTION

This study is based on both primary and secondary data. The secondary data is compiled from previous publications, CSA, ERCA and statistics websites relevant to Ethiopian input sector. The primary data is collected in three phases: Phone Calls, Filed Surveys and Suppliers Survey. The phone interview was conducted using SYS and N2Africa farmer databases. The two databases had a total of 7000 farmers. While N2Africa farmers were solicited by partners on the ground and most of them participated in demonstration, SYS ICT database farmers were part of the PICS Commercialization and they are not necessarily involved in N2Africa interventions. However; when available over lap woredas are taken into the selection.

A total of 27 weredas were selected for the interview and within each wereda on average 15 farmers were contacted. Random sampling was employed to draw study farmers both from N2Africa and Shayashone database until the sought sample size is met. Replacements were made for the contacts not responding, inappropriately recorded number and out of service contacts. It can be noted that the phone interview success rate was less than 60%. In some of the cases the phone network doesn't work while in others the farmers don't respond or they are not interested as the survey is not relevant. Overall a total of 431 farmers were interviewed via phone.

In addition to phone calls there were field missions to 10 of the target woredas. The field missions aimed partly to validate the data gathered through phone interview and partly to collect information on supply side. During this missions a total of 30 farmers, 12 experts and 22 agro dealers were interviewed. The farmers were asked the same question during phone interview but with a more discussion and dialogue approach. Whereas the agro dealers were asked about existing input supply practices, opportunities and challenges. The table below provides a summary of farmers, agro-dealers and experts interviewed for the study.

TOTAL SURVEY WOREDAS	SAMPLE FARMER NUMBER	PERCENT
Ada'a	29	7.1%
Agarfa	33	8.0%
Bako Tibe	14	3.4%
Boricha	22	5.4%
Tiro Afeta	23	5.6%
Damot Gale	53	12.9%
Dangila	1	0.2%
Debark	3	0.7%
Debate	1	0.2%
Dembia	10	2.4%
Enemay	3	0.7%
Farta	16	3.9%
Saqa	1	0.2%
Ginir	11	2.7%
Gonder Zuria	25	6.1%
Jimma	3	0.7%
Karsa	10	2.4%
Mandura	3	0.7%
Nekemt	4	1.0%
Pawe	35	8.5%
Robe	1	0.2%
Shalla	43	10.5%
Sinana	24	5.9%
Sodo Zuria	8	2.0%
Wamahagalo	2	0.5%
Wogedi	1	0.2%
Yilmana Densa	31	7.6%
Total	**410**	**100%**

Table 1: summary of wereda, farmers interviewed

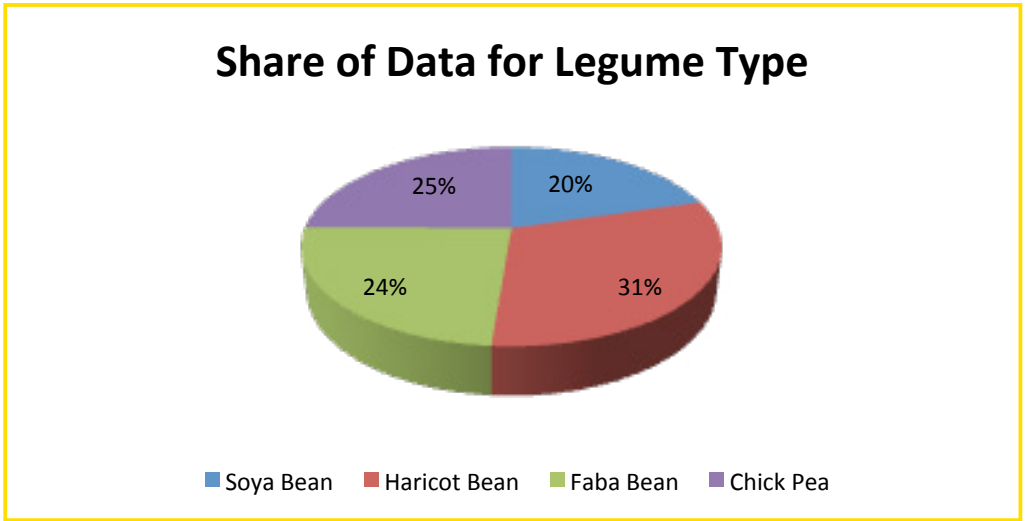


Figure 14: Survey farmers Crop of interest

KEY PARAMETERS

As stated above improved seeds, fertilizers (bio and chemical), Pesticides (herbicides, Insecticides, fungicides) and PICS bags were the key inputs under consideration. For each of these inputs farmers were asked important demand parameters: willingness to buy, quantity of demand, payment modality, timing and place of availability for the 2017 production season.

KEY CHALLENGES

The interviews about agro chemicals have been difficult for three reasons. First the farmers respond in fragmented unit of measurements. Some respond in liter, some in gram and others respond in packet. This has made it difficult to synchronize the unit. Secondly there are also range of brands and naming and the local naming is different from the brand names. Thirdly farmers often mix the inseticide, herbicide and fungicide-basically all chemicals are medicines. The boundary line between insecticide and fungicide particularly has rarely been noted even during the field interviews.

CHAPTER FOUR: KEY FINDINGS-DEMAND SIDE

CHICKPEA

SHORT NOTE

A total of 107 farmers were surveyed on phone and additional 10 in face to face. Farmers were selected from Ada'a, Damot Gale, Gondar, Yilman na Densa, Ginir, Enemay, Sodo Zuria and Agarfa (Figure below). These farmers were planning to allocate a total of 277 hectares for crop production (total average holding of 2 ha). Out of these about 92 hectares (33%) will be allotted for chickpea-average land allocated for chickpea is 0.86 hectare. About 84% of survey farmers have got the exposure to technology demonstration organized by partners of bureau of woreda agriculture and natural resources. The farmers noted that during their time working with partners including bureau of agriculture and natural resources they have gained different knowledge and trainings on land preparation, row planning, bio-fertilizer and agro-chemicals and plant protection. Of the weredas covered by this survey the top three highest number of respondents were from Ada'a, Damot Gale and Gondar. The phone survey from each of these weredas except Agarfa has been validated by on field missions.

IMPROVED SEED

The project promoted Habru, Arerti, Natoli and Acos Dube varieties to the intervention areas. The most preferred varieties are Arerti (55%) and Habru (31%). For the 2017 production season, 90% farmers were willing to buy improved seeds of chick pea. A breakdown of demand by wereda indicates that the highest demand came from Adea. Arerti is the most preferred variety on average. The demand for this variety is highest in Adea wereda whereas as majority of farmers in Damot Gale Wereda are inclined to Habru variety. During the field interview farmers were asked why they preferred Arerti over other varieties and the three most important factors were: high yielding, disease resistant and better market performance. On average farmers noted that they get 2.5 MT per ha. In absolute term the total 107 farmers requested 53 quintals of seed for 92 hectare land. Two important remarks should be noted on this on the one hand the data clearly shows the farmer strongly demand for improved seed but on the other hand the amount of demand seems smaller considering the total acreage they planned to grow chickpea. Farmers were also asked the delivery time and modality for seed. The table below provides a summary of time when chickpea seed is demanded: areas like Ada'a has high demand end of August up to October whereas others like Gondar have late planting season. 81% of the farmers indicated that they are willing to pay ETB 3,405 per quintal of improved chickpea seed and of these about 48% of farmers are willing to make full advance payment for seed purchase while the remaining wants a 50% down payment. The current practice of access to seed in all wereda is through informal seed sources: farmer saves community seed and cooperatives.

INOCULANT

Both chemical and bio-fertilizers fertilizer are applied on chickpea production. Application of 500gm per hectare of bio-fertilizer is recommended for optimal production of chickpeas. Almost all (96%) of respondent farmers were willing to buy inoculants for 2017 chickpea production at a price of ETB 40 per sachets. These farmers indicated 28.75 Kg (230 sachet) of inoculants as their quantity of demand. A break-down of the demand by weredas show that the highest demand for inoculant is reported in Adea wereda and the lowest is in Agarfa. The farmers indicated that the major constraints in inoculant are availability on time and consistency.

CHEMICAL FERTILIZER

Farmers also apply DAP/NPS as a source of P for chickpea-96% of farmers are willing and want to buy 90.5 quintals of chemical fertilizer (P) for 2017 production season. Unions and bureau of agriculture and natural resources were the preferred locations for access to both inoculants and inorganic fertilizer. But this shouldn't be overemphasized mainly because farmers indicated such options since they are the only available alternatives at this time.

PESTICIDES

About 94% of the chickpea farmers interviewed indicated they need pesticide. The two most important disease problems as later confirmed during field mission were African ball warm and root rust. Farmers particularly mentioned that chickpea planted after end of September is susceptible for root rust. Looking at a breakdown of pesticide demand by woredas the highest demand came from Adea woreda while the lowest is in Yilmana Densa. In woredas where chickpea is not a predominant crop like Agrafa farmers have less interest.

In regard to herbicide 85% of the farmers responded positively-willing to buy herbicides in 2017. The highest demand is in wereda Adea, Enemay and Ginir, and lowest is in Sodo Zuria Woreda. It can be noted that in high rainfall areas and areas where chickpea is planted on main rain (not residual moisture) weed is a serious problem and hence more demand for herbicide. About 83% of the farmers are willing to buy fungicides.

POST-HARVEST TECHNOLOGY-PICS BAGS

Almost all farmers are aware of effective post-harvest Technology-PICS. PICS (Purdue Improved Crop Storage) are hermetic technology that 100% eliminates post-harvest loss of stored crops. Over 95% of the respondent farmers are interested in PICS bags. During the field mission, farmers noted post-harvest loss particularly in relation to storage is approximately 15%. But it was also noted that harvesting and threshing losses are significant. 95% of the farmers are willing to buy PICS bags at a price of 43 Birr. The demand for PICS is higher in weredas like Damot Gale, Dembia, Yilma Ena Densa and Sodo Zuria while in areas where the technology was not promoted like Ginir the demand is less.

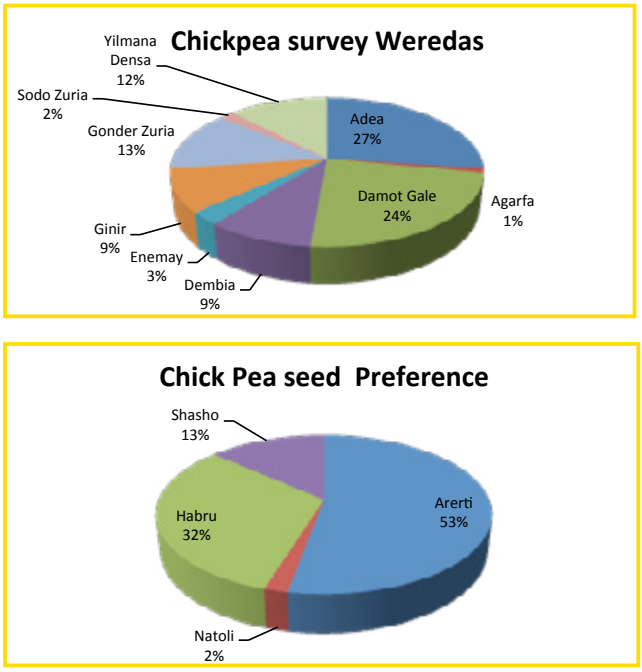


Figure 15: Chick Pea survey Woreda and Preferred Varieties by Woreda

WOREDAS	WILLING TO BUY MAJOR INPUTS						
	Seeds	Bio-fertilizer	Chemical Fertilizer	Insecticides	Herbicides	Fungicides	PICS Bags
Ada'a	97%	100%	100%	100%	100%	100%	100%
Agarfa	0%	100%	100%	100%	100%	100%	100%
Damot Gale	80%	96%	96%	100%	92%	92%	100%
Dembia	80%	100%	100%	100%	80%	100%	100%
Enemay	100%	100%	100%	100%	100%	100%	100%
Ginir	100%	90%	100%	100%	100%	90%	80%
Gonder Zuria	93%	100%	100%	100%	71%	64%	86%
Sodo Zuria	100%	100%	100%	50%	50%	50%	100%
Yilmana Densa	77%	100%	100%	62%	69%	54%	100%

Table 2: Demand analyses by woreda

WOREDA * TIMING-CHICK PEA IMPROVED SEED AVAILABILITY					
WEREDA	April	May	July	August	September
Ada'a					
Agarfa					
Damot Gale					
Dembia					
Enemay					
Ginir					
Gonder Zuria					
Sodo Zuria					
Yilmana Densa					

Table 3: Preferred Timing of chick pea improved seed among Survey Woredas

FABA BEAN

SHORT NOTE

Faba bean input demand data was collected from Agarfa, Sinana, Farta, Gondar Zuria, yilmana Densa, Kersa, Tiro Afeta, Bako Tibe, Nekemite, Robe and Ginir. The vast majority of the data is collected from Agarfa, Sinana and Farta. Sample farmers were planning to plant an area of 262 hectares in 2017 main season with different crops. From these, farmers planned to grow faba bean on 47 hectares that is 18% of the total planned crop coverage. Out of the 103 sample faba bean farmers 73% have the chance to participate on demonstration organized by bureau of Agriculture and its partners. They learnt key agronomic practices that enhance the production of Faba bean. These include land preparation, row planting, inoculant and fertilizer application, and weed management.

IMPROVED SEED

Wolki, Shalo, Moti and Degaga varieties of faba bean were promoted under the project. The recommended seed rate of these improved seeds is 200kg/Ha. All the farmers preferred improved seed varieties. About 73% of the respondent farmers were willing to buy improved faba bean seed at a price of 1700 per quintal. The willingness to buy is highest in Sinana, Farta, Robe, Bako Tibe and Tiro Afeta wereda and lowest in Agarfa. Unlike chickpea farmers found it difficult to specify varieties-they generally call them improved varieties. The information gathered during field mission indicated that while Moti and Degaga are more demanded in Sinana and those in Agarfa prefer Shalo and Wolki. The average yield gap between improved and local varieties as per the formation gather from the field mission ranges from 70% to 200%. Farmers indicated that that seed should be available starting from end of May up to mid-July. Three key constraint noted by farmers and agro dealers were: faba bean seed is hardly accessible except from research institutes and local seed system; there are diseases lately-rust that are affecting yield; lack of mechanization to widely grow faba bean (Sinana and Agarfa). In relation to supply farmers prefer BoA and unions as a supplier of improved seeds; which 52 % are willing to make full advance payment while the remaining wants to make 50% down payment. The private agro dealers interviewed noted that access to faba bean seed is hardly possible. Often the farmers either get it from the research centers or projects. From the total interviewed agro dealers there is no one who had stocked faba bean seed.

INOCULANT

From the farmers interviewed around 79% of farmers interviewed were willing to buy 23.25Kg of inoculants at a price of ETB 40 per 125gm. A discussion with farmers on the ground revealed that impact of inoculant on yield is not consistent. Farmers indicated the efficacy of inoculant ranges from 10-30% additional yield. The highest demand is reported in Agarfa wereda. The farmers mentioned in the years particularly when there is rain shortage there is little difference with inoculated and non-inoculated faba bean. In regard to payment modality 55% of farmers can make full advance payment while the remaining 45% prefer down payment for their inoculant purchase. The ideal time for availability of inoculant ranges from end of May to Mid-July. It could be noted that on average farmers indicated 494 gram per ha for inoculant and this seems fairly to the recommended rate.

CHEMICAL FERTILIZER

Over 85% of farmers are willing to buy NPS/DAP fertilizer at a current price of ETB 942 per quintal. Demand is highest in Sinana wereda and lowest in Gondar Zuria wereda. A discussion with farmers on the ground reveals that fertilizer application for faba bean is a recent phenomenon. Whereas the recommended application is 100kg per Ha of DAP; farmers in weredas Agarfa, Sinana and Robe indicated they often put 50kg. The farmers noted that the planting season varies between end of June and July. Framers noted they buy fertilizer during two weeks from planting season. On average the interviewed farmers indicated a demand of total 94 quintals. Farmers indicated the current supply system i.e. through cooperatives as their preferred source of supply. They noted that the input has consistently been supplied and in fact sometimes the challenge is too much push from the extension agents to collect fertilizer. While Farta, Gondar Zuria and Yilmana Densa are getting fertilizer on credit or cash loan via regional micro finance institute farmers in Sinana and Agarfa weredas indicated they purchase by cash. However, during discussions on the ground farmers indicated that fertilizer credit has a serious risk as the government has strict repayment scheme which often force them to sell their crop at lower price or even livestock to repay the debt.

PESTICIDES

Currently, all of the farmers noted they get their agro-chemicals from private agro dealers but their preferred delivery is through cooperatives of bureau of agriculture. The study on the ground indicated that faba bean disease (rust) is a serious problem and farmers complained there was no medicine available on time.

POST-HARVEST TECHNOLOGY-PICS BAGS

73% of the faba bean farmers are interested for PICS bags at a price of Birr 43. The willingness to purchase is high in Bako Tibe, Nekemit, Yilmana densa and Robe weredas and lowest in Tiro Afeta. The best time for availability of the bas is November-December. Overall, 502 bags are demanded for Faba Bean farmers interviewed.

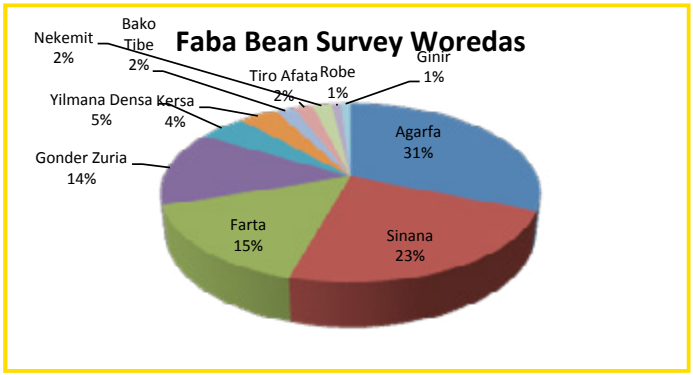


Figure16: Faba Bean Survey Woredas

WOREDA	SEED	BIO-FERTILIZER	CHEMICAL FERTILIZER	PICS BAG
Agarfa	34%	59%	91%	56%
Bako Tibe	100%	100%	100%	100%
Farta	100%	0%	100%	94%
Ginir	0%	0%	0%	0%
Gonder Zuria	93%	0%	93%	64%
Kersa	50%	75%	50%	75%
Nekemit	50%	50%	100%	100%
Robe	100%	0%	100%	100%
Sinana	100%	0%	100%	96%
Tiro Afata	100%	50%	100%	50%
Yilmana Densa	80%	0%	100%	100%

Table 4: Summary of Demand for Seed, fertilizer, Inoculant, Chemicals fertilizer and PICS

SOYA BEAN

SHORT NOTE

Soya bean Input demand data was collected from Pawe, Tiro Afata, Kersa, Yilmana Densa, Mandura, Bako Tibe, Boricha, Nekemite and Wamahagelo woredas. About 69 farmers have planned to cultivate soya bean in 2017 main season. The total area coverage planned for soya bean in 2017 meher season amounts 106 hectares ranging from 0 to 8 hectares. Out of the total respondents 65% have participated on the demonstration events organized by bureau of Agriculture and natural resources. From the demonstration, farmers learnt the merit of row planting, bio-fertilizer application, food making and the nutritional benefit of soya bean.

IMPROVED SEED

The project promoted Clark 63, Belesa 95, Keta, Dhidhesa and Ethio-yugozlavia varieties of soya bean depending on the agro-ecological suitability of the varieties. Though the majority (72%) of them couldn't identify the specific name of the variety, about 77% of the respondents were willing to buy the improved seed variety at a price of ETB 1,750 per quintal. Demand is highest in wereda Pawe and lowest at Mandura. From the total farmers who indicated willingness to buy at above mentioned price 52% are willing to make upfront payment while 48 like to take by cash or on credit. All the farmers prefer the improved seed variety supply by seed multiplying cooperative union, bureau of Agriculture, research centers and agro-dealers. Seed should be available in the months of April to July. Whereas farmers in Pawe prefer belesa farmers in Tiro Afeta are inclined to clark. The farmers indicated that the improved varieties give 50-100% extra yield compared to the local ones. The discussion during the field mission indicated three major constraints on soya bean seed. Firstly, farmers particularly in Pawe complained about lack of market to motivate them to invest in seed. Secondly, there is a problem of seed left over despite the demand. In chewaqa and bako discussion with agro-dealers and experts indicated that there is over 30% left over soya bean seed. Thirdly, the farmers often look for locally saved or borrowed seed than improved seed. This makes the soya bean seed business case weak. Considering these factors in to account it might be a good idea to strengthen the local seed business than the certified seed concept for soya bean and other legumes.

INOCULANT

Majority of the respondent farmers (70%) want to buy inoculant at a price of ETB 40 per sachet for the 2017 production season. Farmers indicated 231 sachets (29Kg) of inoculant as their quantity of demand for the indicated production season. Those farmers (23%) who do not want to buy inoculants mainly because of its labor requirement and lack of knowledge of use. These farmers prefer to buy inoculant from public supplier; namely bureau of agriculture. Over 80% of the farmers indicated use of inoculant has a positive impact on their yield. A discussion on site with smallholders indicated there are two major benefits of inoculant: increase current and forthcoming yield and cost. Farmers indicated that the inoculant not only increase soya bean yield but also yield of next generation crops on that field. Farmers indicated there is a possibility to get over 15-20% extra yield on average. Compared to the benefit gained the cost of the inoculant is perceived as minimal. However; the major constraining factors are partly because it requires knowledge and labor for proper application and importantly the inoculant is not readily available unless the bureau of agriculture brings. On the other hand the bureau of agriculture experts noted that brining inoculant in bulk has a risk because if left over the product shelf life will be over resulting big loss. The farmers indicated they would prefer the inoculant to be available in the months of April to July. In terms of payment modality 49% of farmers are willing to make full payment while 26% of farmers prefer down payment modality of 50%.

CHEMICAL FERTILIZER

About 90% of farmers are willing to buy phosphorous fertilizer-DAP/NPS. The Soya bean farmers indicated that fertilizer leads to high weeding which is a major challenge particularly in Pawe area. They put about 50kg DAP though the recommended level per ha is 100Kg. This rate reduction is attributed to N2Africa recommendation. Those who are willing to buy indicated 87 quintals as their demand for inorganic fertilizer. These farmers prefer public institutions and cooperative-unions to supply fertilizer. Currently, fertilizer is supplied through cooperative-unions and that seems the most preferred option as per the phone survey. Three important remarks were noted about current fertilizer supply during the face to face discussions: the fertilizer delivery time is sometimes delayed, price of fertilizer is expensive and the there is a push from government though the soil may not need fertilizer. Mostly farmers want fertilizer during April and July.

PESTICIDES

Fusilade, Lasso and Dual Gold herbicides are the potential herbicides recommended for weed control in Soya bean production. The recommended amount is 0.25Kg/Ha of Fusilade; 4 Lt/Ha of Lasso and 1Lt/Ha of Dual Gold. In relation to pesticide Promocarb, cypermethrin and Agro-Thoate were practiced by N2Africa farmers but as far as fungicide is concerned there was no clear identification (N2Africa Soya bean Booklet).

About 67 farmers (97% of the total sample size) indicated their will to buy agro-chemicals (herbicides, Pesticides and fungicides). Farmers particularly noted their strong demand for pesticides. During a discussion at the field mission farmers noted three key decision factors to adopt the envisaged agro-chemicals particularly herbicide: efficacy, price and side effect. Experience from existing herbicides show farmers often need to apply two or more types of herbicides to control broad leaf and grass type weeds. Having a product that can assist to control both at a time is seen as important advancement. The extent to which the herbicide can kill the weed and hence how much it reduces the cost of weeding is the most important decision factor to buy. Farmers noted that since most of the herbicides are pre-mergence the likelihood of the crop not being affected until the stage where the canopy covers the ground and stifle the weed is rare though it can reduce the weeding frequency from 3 to one or two. The average price per kg of an effective herbicide offered by farmers is approximately 220 ETB per liter. It is to be noted that this price offering is mostly based on their experience with existing herbicides, which are mostly selective and pre-emergence. During the discussion what came out strong is value for money. As such price could increase or decrease depends on the outcome. There is minimal difference between smallholders and commercial farmers. However, it is worth noting that smallholder farmers often use family labor for weeding which is seen as free resource or the least cost option. The side effect is seen as the third important factor in their decision-making. Farmers mentioned the safety feature, minimal side effect on the crop and soil as important factor. Experience from few farmers who applied 2,4-D and Glysen showed a severe damage on the crop due to miss application. As such, there is a concern that similar threat might happen in case of strong arm. The safety of the soil is also seen another important factor. In the study area farmers rotate soya bean-maize-groundnuts while at commercial farm level the cropping pattern often follows soya bean-cotton-sesame-sorghum/maize. The level of risk from residual pesticide on any of these crops in the years ahead is seen a critical decision factor.

POST-HARVEST TECHNOLOGY-PICS BAG

About 66 farmers (95%) are willing to buy this technology at an average price of ETB 43 per bag. Demand is highest in Pawe wereda. All farmers will have estimated harvest of about 3.34 thousand quintals of crop harvest for 2017 meher season. From these about 44% of the harvest will be stored under PICS bag which shows a PICS bag demand of 1,464 pieces. The total expected soya bean harvest is 1,263 quintals and from these farmers indicated they will use PICS bags for 51% of the harvest during the 2017 meher season. Consequently, 643 PICS bags will be used to store soya beans harvest of the same season.

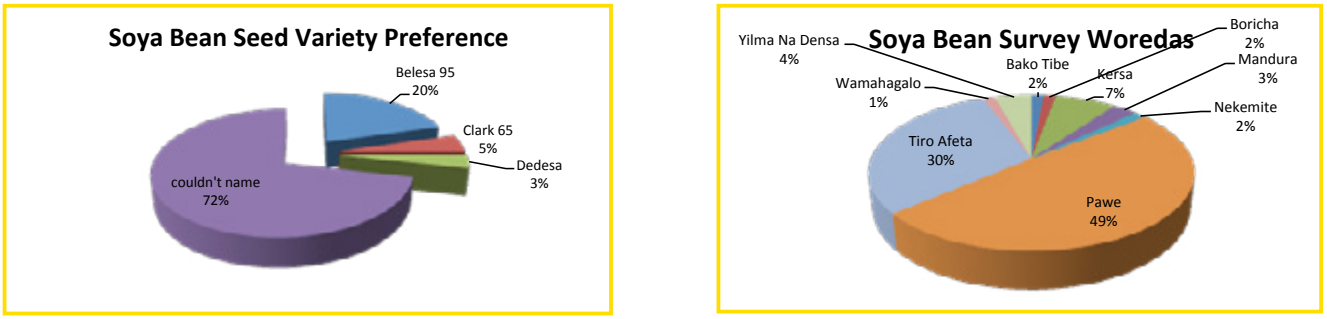


Figure 17: Soya Bean Survey Woredas and its Variety Preference

WOREDA	SEED	BIO-FERTILIZER	CHEMICAL FERTILIZER	PICS BAG
Bako Tibe	100%	100%	100%	100%
Boricha	100%	100%	100%	100%
Kersa	100%	100%	100%	100%
Mandura	50%	0%	100%	100%
Nekemt	100%	100%	100%	100%
Pawe	91%	68%	88%	97%
Tiro Afeta	86%	90%	86%	90%
Wamahagalo	100%	100%	100%	100%
Yilmana Densa	100%	67%	100%	100%

Table 5: Summary of Demand for Seed, fertilizer, Inoculant, Chemical Fertilizer and PICS

HARICOT BEAN

SHORT NOTE

Data on Haricot bean input demand was collected from Shalla, Damot Gale, Boricha, Bako Tibe, Yilmana Densa. Total samples of 133 farmers were interviewed on their input demand for 2017 mehere season for Haricot bean. Most of the farmers are from Shalla, Damot Gale and Boricha. These sample farmers planned to cultivate 288 hectares of land out of which 35% (102 hectare) is planned for haricot bean production. About 70% of these farmers were participated in a demonstration of technologies organized by public institutions like agricultural extension, research and NGOs. Majority of the farmers learnt mix of technologies that include row planting, fertilizer and inoculant application, improved seed utilization and consumption and food making.

IMPROVED SEED

Of the total farmers interviewed 88% indicated that they have demand for improved haricot bean seed. Under this particular project Nasir, Hawassa dume, Ibado, Anger and Acos-red bean varieties were promoted. Though farmers prefer to use improved haricot bean variety, they couldn't identify the specific type of improved variety. At a price of ETB 2100 per quintal, 88% of farmers want to buy improved haricot bean seed. The overall proportion of willingness to buy improved haricot bean improved seeds per wereda is given in the table below. On average the farmers indicated they use 71kg per ha for haricot bean seed. The recommended amount of improved seed for haricot bean per hectare is 1 quintal. The farmers interviewed during the field mission proved that there is strong demand for haricot bean seed. Whereas, in some areas like Yilmna Denas and Shalla; white pea bean is preferred farmers in Damog Gale and Boricha prefer red kidney bean-Hawassa Dume. The farmers indicated that availability of seed is often a major challenge. Currently they get seed mostly from the local market. In some cases NGOs, South Seed Enterprise, Universities and Research Centers are supplying but that is not more than 5% of the demand. The farmers mentioned two key challenges in relation to haricot bean seed. First t availability of improved seed is a major constraint. Second the price of the seed is high compared to the price they get for their grain. Thus said, about 70% of farmers want seeds availability at down payment basis of 50%.

INOCULANT

82% of the farmers interviewed are interested in the inoculant. Demand is highest in Damot Gale wereda and lowest in Shalla. Majority of the farmers indicated farmers' cooperatives as a source for inoculants during May to July. However, there are complains that the cooperatives don't bring inoculant on time or even at all as they do fertilizer. Regarding the payment modality, only about 27% of the interviewed farmers are willing to make full advance payment upon receipt of inoculants while more than 60% want to make a down payment 50%. Farmers indicated that haricot bean inoculants have a positive impact on yield but compared to other legumes (namely soya bean) the impact is less.

CHEMICAL FERTILIZER

Farmers apply NPS/DAP fertilizer as a source of phosphorus for Haricot beans. The recommended amount is 1quintal per hectare. Around 88% of the respondents are willing to buy NPS/DAP fertilizer. Demand for phosphorus fertilizer is highest in wereda Damot Gale and Boricha and lowest in Shalla. 81% of the farmers are willing to buy DAP at a price of 942. However, the average application per hectare they noted is 65 kg. The farmers stated that cooperative unions and agricultural offices are the preferred places to buy fertilizers. Moreover, farmers prefer fertilizer to be available in the months of May to July.

PESTICIDES

About 96% of the farmers are willing to buy herbicides. Majority (91%) of farmers are willing to buy pesticide with mixed measurements of the chemical types which makes it complicated to analyze the quantity of demand. In addition, 84% of the farmers are willing to buy fungicides. Around 22% of the farmers in case of herbicides; 17% in pesticides prefer market and traders as a source of those agro-chemicals while the rest prefer public sources. In addition, 84% of the farmers are willing to buy fungicides. Around 22% of the farmers in case of herbicides; 17% in insecticides prefer market and traders as a source of those agro-chemicals while the rest prefer public sources.

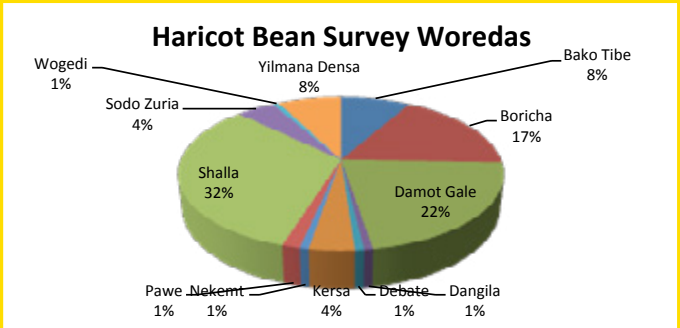


Figure 18: Haricot Bean Survey Woredas

POST-HARVEST TECHNOLOGY-PICS BAGS

About 94% of the respondent farmers are willing to buy PICS bags at a price of ETB 43 per piece. Farmers planned 32% of their total harvest and 57% of haricot bean harvest to store by PICS bags. The total quantity of demand of PICS for haricot bean is 974 bags.

WILLINGNESS TO BUY INPUTS-HARICOT BEAN

WOREDA	IMPROVED SEED	BIO-FERTILIZER	CHEMICAL FERTILIZER	PICS BAG
Bako Tibe	64%	82%	73%	82%
Boricha	100%	91%	100%	96%
Damot Gale	93%	100%	100%	97%
Dangila	0%	0%	0%	100%
Debate	100%	100%	100%	100%
Kersa	100%	80%	60%	60%
Nekemt	100%	100%	100%	100%
Pawe	100%	50%	50%	100%
Shalla	88%	77%	86%	86%
Sodo Zuria	100%	100%	100%	83%
Wogedi	100%	100%	100%	100%
Yilmana Densa	90%	100%	100%	100%

Table 6: Summary of Demand for Seed, fertilizer, Inoculant, Chemicals and PICS

DEMAND SIDE CONCLUSION

On average there is over 85% demand for all the five technology packages audited. Besides, 47% of all the farmers interviewed are willing to buy inputs on cash and 53% on down payment basis. This is contrary to the conventional hypothesis that farmers were not willing to pay for inputs. The farmers indicated that price remains valuable but efficacy and simplicity of application of the desired input are also important. The general preference for input delivery seems via the government or semi-government channel. But this shouldn't be over emphasized as farmers also noted delivery through cooperatives and unions often are late and don't bring all the required inputs. A closer dissection of each input shows that there is a deviation between recommended rate and actual rate applied by farmers for most inputs but it also seems that farmers have sound justifications for their preferred rate of input application. The graphs below summarize overall results of the demand side for all crops of the 431 farmers interviewed.

Currently, farmers are getting pesticides from private shops. The farmers indicated there are constraints in relation to chemicals. First they can't get the right chemicals at the right time. For instance, in Adea though farmers requested treatment for root rust several times but they couldn't get the solution on time. The second issue in relation to pesticides is price and quality. Farmers indicated price of pesticides is increasing from time to time. Over the last three years farmers in Agarfa wereda indicated prices went up by 70%. Analyses of import of pesticides for the last five years indeed confirm that price has increased by 16%. The efficacy of pesticides is the other complains farmers noted. Often they spray three to four times and still the chemicals are not effective. A discussion with experts and agro-dealers indicated that the issue of pesticide is indeed a serious problem. The chemicals are unsolicited and sometimes the farmers also make mistake by applying prohibited chemicals such as DDT. Since most of the supply of pesticides is through private agro-dealers the control system is relaxed. Farmer cooperative unions are the most preferred suppliers of this agro-chemical.

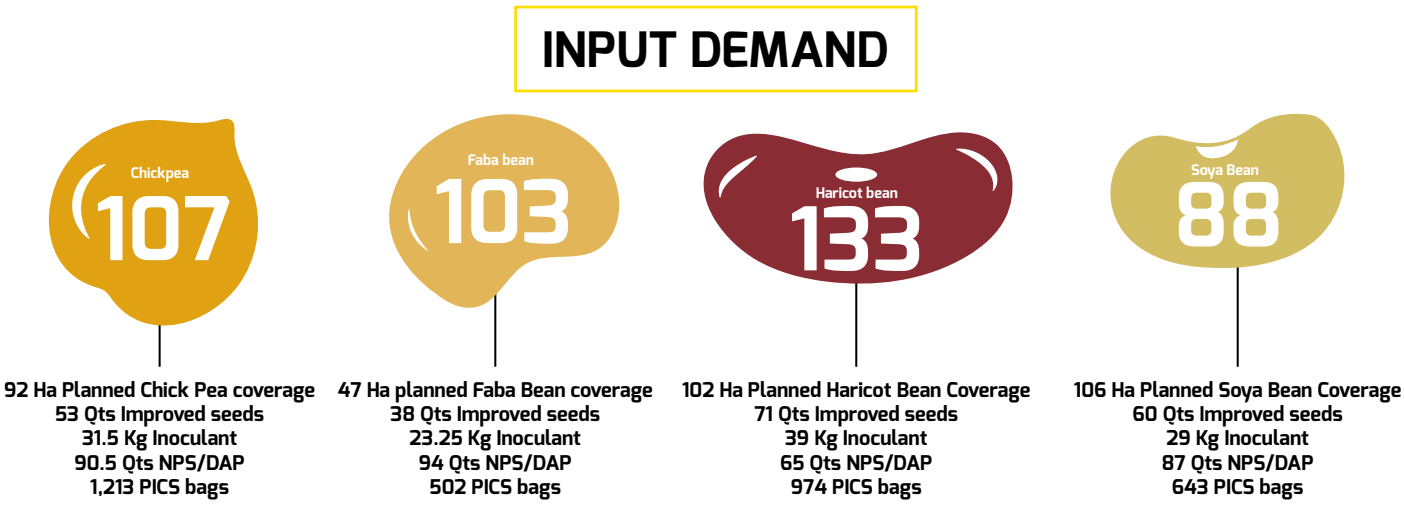
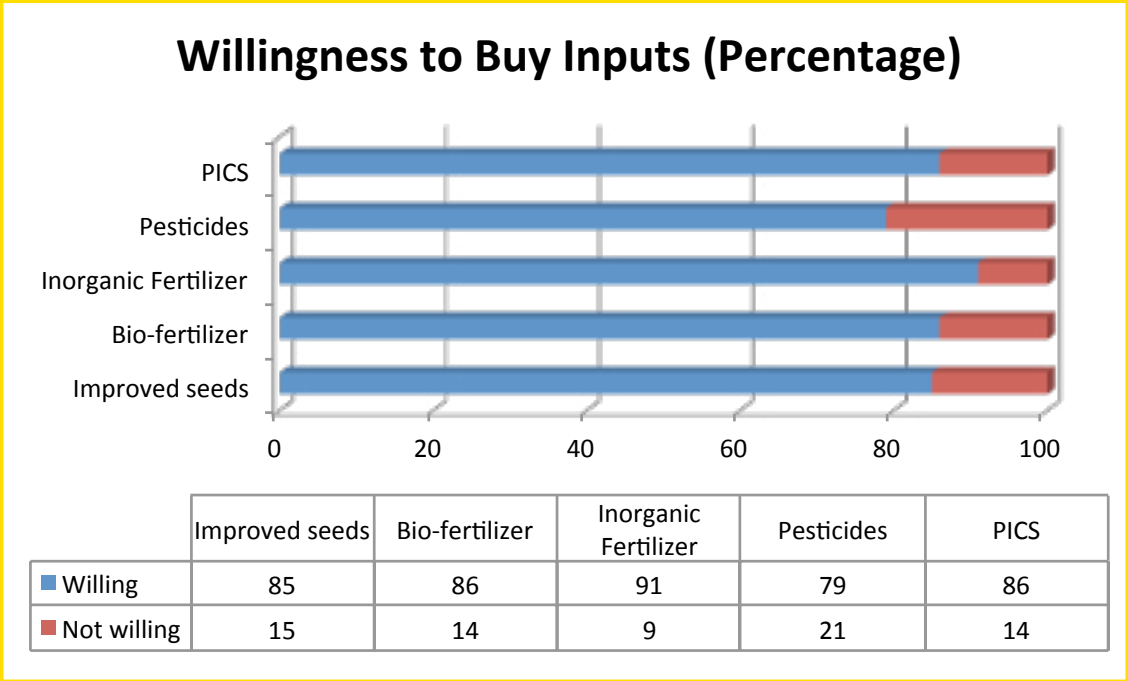


Figure 19: Total Demand (Volume of Each Inputs) by Legume type



	Improved seeds	Bio-fertilizer	Inorganic Fertilizer	Pesticides	PICS
Willing	85	86	91	79	86
Not willing	15	14	9	21	14

Figure 20: Proportion of Willingness to Buy

	PAYMENT MODALITY	
	Full advance Payment	Down Payment
Willingness	47	93
Not Willing	53	7

Table 7: Distribution of Farmers by Payment modality

CHAPTER FIVE: KEY FINDINGS-SUPPLY ANALYSIS

IMPROVED SEED

A total of 10 seed suppliers have been interviewed for this study. This includes two public seed enterprises, eight private seed companies. Of the total 10 interviewed seed companies only 3 are supplying legume seed; namely chickpea, haricot bean and soya bean. The other doesn't supply legume seed in general. From the three who supply legume seed the pulse seed accounts for less than 5% of their portfolio. The companies noted that legume seed business is difficult as the demand is unpredictable and often farmer saved seed has almost similar yield for some years. One of the seed suppliers noted that while legume seed business is good as a rotational practice for land rehabilitation seed left over has been a problem for the last 3 years. Often they sell over 30% of their certified seed at grain price.

A question was asked to the seed companies if they are interested to scale-up their legume seed business. The majority (8 out of 10) stated they wouldn't make a serious investment on legume seed now for the reasons mentioned above. The public seed enterprises however indicated that they have a dual ambition of serving the community and making economic profit. They particularly noted that there is an interested and occasional investment in common bean and chickpea seed multiplications as the demand for such pulses is high as well as they are strong rotational crops for wheat, teff and sometime maize. The South Seed Enterprises noted that they see both common bean and chickpea seed as key focus areas in the coming years.

The informal (local seed business included) seed sector account for over 98% of the legume seed supplied to smallholder farmers. A total of 12 cooperatives and unions engaged in seed production have been interviewed. They indicated they grow seed to serve the needs of their members (95%). Sometimes they sell to projects and research institutes. The seed cooperatives and unions engaged in seed business noted that legume seed is not certified. But there are research institutes and seed enterprises that occasionally monitor and qualify the seed though there is no formal certification. Unlike the formal seed businesses all the informal seed cooperatives would like to continue to supply legume seed.

Both informal and formal actors were asked about the trend of legume seed business over the last five years. Overall the response is an increase of about 20%. The seed growers indicated that though the country has a potential demand for legume seed of 0.2 million MT the growth of seed demand is around 5%.

INOCULANT

There are two important suppliers of inoculant in Ethiopia: Menagesha Bio Technology and National soil. Bio-Fertilizer is recently promoted by the government as an alternative and natural option to reduce reliance on urea. The annual production capacity of the two is estimated to be over three hundred thousand sachets. It is to be noted that scaling up production for bio-technology companies is easy and hence if the market grows they can simply increase the incubation. The bio-fertilizer companies and the agro dealers indicated that the market for bio-fertilizer is not well organized. Most of the demand is coming through bureau of agriculture and cooperatives who often prefer purchasing from the national lab than the private suppliers. In addition, there is also awareness gap among farmers about the application as well as advantages of inoculation. This is confirmed in the demand survey with farmers particularly those growing faba bean and chickpea. The suppliers also indicated that the fact that bio-fertilizers have short shelf life means that despite low price there is a risk that the product loses its efficacy. The other hindsight note made by the agro-dealers reselling bio-fertilizer is the fact that there is some tacit reluctance on the government side to actively promote bio-fertilizer as it can significantly affect the market for chemical nitrogen fertilizer.

The agro-dealers were asked whether they would be interested in stocking and distributing of bio-fertilizer. Eight of ten noted that they are interested to be distributors of bio-fertilizer but only 3 are interested to pay upfront or in cash. The dealers noted that the fact that the shelf life of the product is low means that they run a big risk if they lose current season. The other distributors indicated that they would distribute the bio-fertilizer on consignment basis. On average each of the agro-dealers estimate they can distribute 55kg per year. However; they indicated that bio-fertilizer should be promoted through the extension system and farmers should be convinced to purchase from private agro dealers.

AGRO-CHEMICALS

There are two important sources: local and imported. Locally Adami Tulu factory has been producing agro chemicals some under license for the last four decades. The annual capacity of Admi tulu is 1.5 million kg. It is to be noted that Adami Tulu produces both agricultural and non-agricultural chemicals. The vast majority of agro-chemical demand (70%) is met through imported products. Ethiopia imports over 7.5 million kg of agro chemicals per year. All the major brands of Dow, Syngenta, Bayern and Dosatntos are available in the market. The major importers of agro chemicals are Chemtex (representative of Dow Chemicals), Ambasel (Tiret Corporation) and GAWT. These companies indicated that over 95% of their agro chemical portfolios are focused on cereals. Palace, 2-4-D and round-up are the major herbicides. The most prominent insecticides are those intended for Aphids disease namely Endosulfine and Karate. The agro-chemical importers indicated that currently they are supplying over 50% of the chemicals through cooperatives and unions. Some of the smaller importers noted that the fruit and vegetable farmers are more important clients than cereals or legumes. Over the last three years the volume of agro-chemicals imported has decrease by 39%; this is mainly because of the increasing shortage of forex. The importing companies indicated that generally they don't have a big market problem; left over chemicals are rare as long as imported on time.

All the 10 regional agro-dealers interviewed indicated that they keep selected herbicides and insecticides. They are willing to pay and stock the common brands such as palace, 2-4-D but for any new brand the company should consider delivery on credit or consignment. The agro dealers have indicted three distinctive challenges as far as marketing of chemicals is concerned. First there is wide range of brand names and often there are counterfeit or expired products which seriously undermine farmers trust. Second similar to the farmers they noted that price is increasing from time to time; stifling demand. Third there is irregularity of supply from distributors in Addis; chemicals stocked this year are often not available on time for next year.

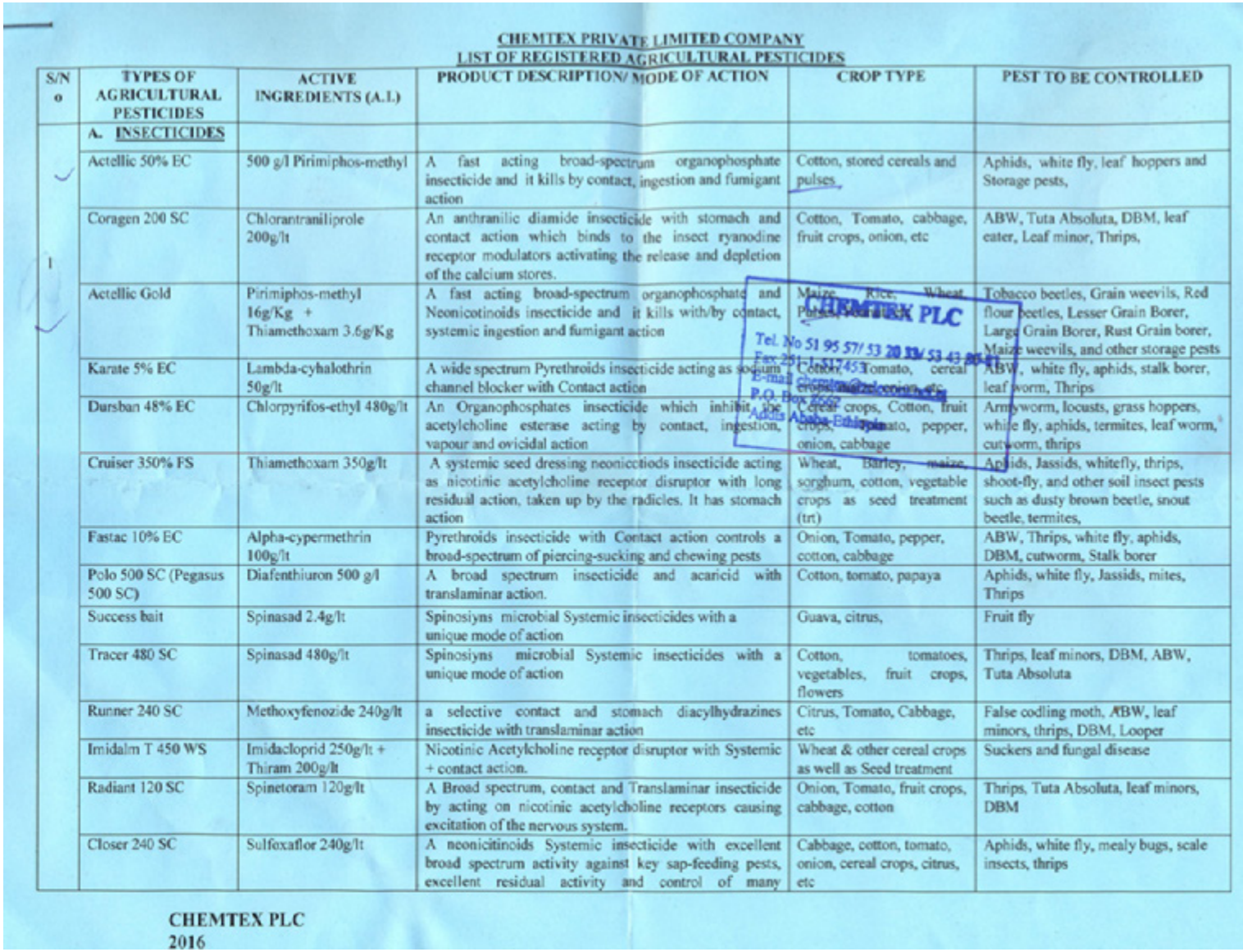
POST-HARVEST

PICS bags have been introduced to six of the woredas under investigation. All agro-dealers in the woredas where PICS was introduced are interested to keep supplying the bags. The agro-dealers however noted that the price of the bags is high and farmers hastate to pay unless they have profound understanding of the merit. In woredas where the extension was not conducted the demand to stock PICS bags 2 out of four agro-dealers showed interest. The agro dealers indicated that the extension is crucial to get farmer acceptance for the bags.

APPENDEX 1: INPUT RECOMMENDATION MATRIX

		RECOMMENDED APPLICATION PER HECTARE			
		FABA BEAN	HARICOT BEAN	SOYA BEAN	CHICK PEA
Seed (Qt)		2	1	0.8	1.3
Inoculant (# Sachet/gm)		4/500	4/500	4/500	4/500
DAP/ NPS (Qt)		1	1	1	1
Herbicide	Fusilade (Kg/Ha)	0.25	0.25	0.25	0.25
	Lasso (Lt/Ha)	4	4	4	4
	Dual Gold (Lt/Ha)	1	1	1	1
	Primicarb (Kg/Ha)	0.5	0.5	0.5	0.5
	Cypermethrin (gm/ Ha)	150	150	150	150
	Agro-Thoate (Lt/Ha)	1	1	1	1
Fungicide (# Sachet/8Kg of Seeds)		1	1	1	1
Yield (Qt/Ha)			**20**	**35**	

APPENDEX 2: LIST OF REGISTERED AGRICULTURAL PESTICIDES



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LIST OF REGISTERED AGRICULTURAL PESTICIDES

S/No	TYPES OF AGRICULTURAL PESTICIDES	ACTIVE INGREDIENTS (A.I.)	PRODUCT DESCRIPTION/ MODE OF ACTION	CROP TYPE	PEST TO BE CONTROLLED
	A. INSECTICIDES				
	Actellic 50% EC	500 g/l Pirimiphos-methyl	A fast acting broad-spectrum organophosphate insecticide and it kills by contact, ingestion and fumigant action	Cotton, stored cereals and pulses	Aphids, white fly, leaf hoppers and Storage pests,
	Coragen 200 SC	Chlorantraniliprole 200g/lt	An anthranilic diamide insecticide with stomach and contact action which binds to the insect ryanodine receptor modulators activating the release and depletion of the calcium stores.	Cotton, Tomato, cabbage, fruit crops, onion, etc	ABW, Tuta Absoluta, DBM, leaf eater, Leaf minor, Thrips,
	Actellic Gold	Pirimiphos-methyl 16g/Kg + Thiamethoxam 3.6g/Kg	A fast acting broad-spectrum organophosphate and Neonicotinoids insecticide and it kills with/by contact, systemic ingestion and fumigant action	Maize, Rice, Wheat, Pulses, Cotton	Tobacco beetles, Grain weevils, Red flour beetles, Lesser Grain Borer, Large Grain Borer, Rust Grain borer, Maize weevils, and other storage pests
	Karate 5% EC	Lambda-cyhalothrin 50g/lt	A wide spectrum Pyrethroids insecticide acting as sodium channel blocker with Contact action	Cotton, Tomato, cereal crops, maize, onion, etc	ABW, white fly, aphids, stalk borer, leaf worm, Thrips
	Dursban 48% EC	Chlorpyrifos-ethyl 480g/lt	An Organophosphates insecticide which inhibit the acetylcholine esterase acting by contact, ingestion, vapour and ovicidal action	Cereal crops, Cotton, fruit crops, tomato, pepper, onion, cabbage	Armyworm, locusts, grass hoppers, white fly, aphids, termites, leaf worm, cutworm, thrips
	Cruiser 350% FS	Thiamethoxam 350g/lt	A systemic seed dressing neonicctiods insecticide acting as nicotinic acetylcholine receptor disruptor with long residual action, taken up by the radicles. It has stomach action	Wheat, Barley, maize, sorghum, cotton, vegetable crops as seed treatment (trt)	Aphids, Jassids, whitefly, thrips, shoot-fly, and other soil insect pests such as dusty brown beetle, snout beetle, termites,
	Fastac 10% EC	Alpha-cypermethrin 100g/lt	Pyrethroids insecticide with Contact action controls a broad-spectrum of piercing-sucking and chewing pests	Onion, Tomato, pepper, cotton, cabbage	ABW, Thrips, white fly, aphids, DBM, cutworm, Stalk borer
	Polo 500 SC (Pegasus 500 SC)	Diafenthiuron 500 g/l	A broad spectrum insecticide and acaricid with translaminar action.	Cotton, tomato, papaya	Aphids, white fly, Jassids, mites, Thrips
	Success bait	Spinasad 2.4g/lt	Spinosiyns microbial Systemic insecticides with a unique mode of action	Guava, citrus,	Fruit fly
	Tracer 480 SC	Spinasad 480g/lt	Spinosiyns microbial Systemic insecticides with a unique mode of action	Cotton, tomatoes, vegetables, fruit crops, flowers	Thrips, leaf minors, DBM, ABW, Tuta Absoluta
	Runner 240 SC	Methoxyfenozide 240g/lt	a selective contact and stomach diacylhydrazines insecticide with translaminar action	Citrus, Tomato, Cabbage, etc	False codling moth, ABW, leaf minors, thrips, DBM, Looper
	Imidalm T 450 WS	Imidacloprid 250g/lt + Thiram 200g/lt	Nicotinic Acetylcholine receptor disruptor with Systemic + contact action.	Wheat & other cereal crops as well as Seed treatment	Suckers and fungal disease
	Radiant 120 SC	Spinetoram 120g/lt	A Broad spectrum, contact and Translaminar insecticide by acting on nicotinic acetylcholine receptors causing excitation of the nervous system.	Onion, Tomato, fruit crops, cabbage, cotton	Thrips, Tuta Absoluta, leaf minors, DBM
	Closer 240 SC	Sulfoxaflor 240g/lt	A neonicitinoids Systemic insecticide with excellent broad spectrum activity against key sap-feeding pests, excellent residual activity and control of many	Cabbage, cotton, tomato, onion, cereal crops, citrus, etc	Aphids, white fly, mealy bugs, scale insects, thrips

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			imidacloprid-resistant insects.		
2	**B. FUMIGANT**				
	Phostoxin Tablets	Aluminium Phosphide 56%	A fumigant which affect the nervous system of the pest	Stored cereals and pulses	Weevils, beetles, and other Storage pests
	Degesch Plates/ Strips	Magnesium Phosphide 56%	A fumigant which affect the nervous system of the pest	Maize and other Stored cereals and pulses	Weevils, and other Storage pests
3	**C. HERBICIDES**				
	Fusilade Forte 150EC	Fluaxifop-p-butyl	A selective systemic post-emergence acetyl CoA carboxylase inhibitors herbicide	Cotton, and other broadleaf crops	Grass weeds
	Starane M 64% EC	Fluroxypyr + MCPA 640g/lt	A selective post-emergent foliar applied and systemic herbicide. It penetrates primarily via the leaf surface and secondarily via the roots.	Wheat	Broadleaf weeds
	Mustang 306 SE	XDF + 2,4-D	A phenoxy-auxin type compound, mimics the action of a natural plant growth hormone by interfers the process of the susceptible weeds cells with selective herbicide	Small Cereal Crops	Broadleaf weeds
	Derby 175 SC	Florasulam 75g/lt + Flumetsulam 100g/lt	A triazolopyrimidine, systemic, post-emergence herbicide by inhibiting acetolactate synthase and inactivates the ALS enzyme	Wheat, and other cereal crops	Broadleaf weeds
	Sanaphen D 720 SL	2,4-D Amine salt 720g/lt	A phenoxy-auxin type compound, mimics the action of a natural plant growth hormone with selective herbicide	Wheat, teff, sugar cane & other cereal crops	Broadleaf weeds
	Mamba 360 SL	Glyphosate-iso-propyl ammonium 360g/lt	A non-selective, systemic, post-emergence herbicide	Coffee, citrus, tea, other fruit crops and zero tillage	Non-selective herbicide
	Mamba Super 480 SL	Glyphosate 480g/lt + Dimethylamine 608g/lt	A non-selective, systemic, post-emergence herbicide	Coffee, Citrus, Tea	Non-selective herbicide
	Pallas 45 OD	Pyroxsulam 45g/lt	A Triazolopyrimidine [illegible] selective post-emergence and systemic	Wheat and Teff	Broadleaf and grass weeds
	Ametrazine 500 SC	Atrazine 250g/lt + Ametryn 250g/lt	A photosystem II inhibitors of [illegible] and Translaminar action	Sugar cane	Annual and perennial grass and broad leaf weeds
	Lancelot 450 WG	300g/lt Aminopyralid + 150 g/lt Florasulam	A selective post-emergent [illegible] systemic herbicide by inhibiting acetolactate synthase with aminopyralid.	Wheat, other cereal crops	Broadleaf weeds
	Gallant Super	Haloxyfop – R-methyl ester 108 g/lt.	A selective systemic post emergence emulsifiable concentrate herbicide	Rape seed, other Broadleaf crops, onion, tomato, etc	Annual and perennials Grass weeds
	Strongarm 840 WG	Diclosulam	A pre-emergent/early post-emergent herbicide of triazolopyrimidine sulfonanilide inhibitors of the acetolactate synthase enzymes with a systemic action.	Soya bean, groundnuts, haricot bean and others	Pre-emergence Broad leaf and grass weeds
	Ralon Super EW 144	Fenoxaprop-P-ethyl 69g/lt + Mefenpyr-Diethyl 75g/lt	A broad spectrum selective, systemic, post-emergence herbicide by inhibiting the biosynthesis of fatty acids leading to plant death.	Wheat, Barley	Post-emergence herbicide for grass weeds
	Stellar Star	Topramezone 50g/lt + Dicamba 160g/lt	A systemic herbicide with early post– emergent	Maize	Annual & perennial grass and broadleaf weeds
4	**D. FUNGICIDES**				
	Curzate R WP	Cymoxanil 42%+ Copper Oxychloride 397.5%	A contact, systemic, preventative, post-infection and antisporulant activity, with unique kick-back action and	Tomato, Pepper, Potato, Grape, onion, mango	Late and early blight, downy mildew and purple blotch

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		activity at the very point of infection.		
Systhane 20 EW	Myclobutanil 200g/kg	A demethylation inhibitors fungicide of systemic, protectant and curative activity	Green Beans, tomato, grape vine	Bean rust, powdery mildew,
Revus 250 SC	Mandipropamid	A carboxylic acid amines fungicide with translaminar and contact action.	Potato, onion, tomato, grape vine and other crops	Late blight, downy mildew
Electis 75 WG	Zoxamide 8.3% + Mancozeb 66.7%	Residual super contact, systemic, protectant fungicide	Potato, onion, grapevine, tomato, other vegetable crops	Late blight, downy mildew
Equation Pro WDG	Famoxadone 22.5% + Cymoxanil 30%	A Carboxylic acid amides Organic preventive and curative Translaminar, contact action fungicide.	Grape, Potato, Tomato, Pepper, onion	Downy mildew, late blight
Kocide 2000 WG	Copper hydroxide 538g/kg	Cellulose inhibitors with oxidative phosphorylation uncouplers of translaminar and contact action herbicide.	Tomato, onion, grape vine, mango, other vegetable crops	Downy mildew, late blight and bacterial diseases
Funguran OH 50 WP	Copper hydroxide 770g/kg	A systemic, contact and protective bactericide/fungicide	Pepper, Tomato, onion, grape vine, mango, coffee, potato	Downy mildew, late blight and bacterial diseases (leaf spot)
Nativo 300 SC	Trifloxystrobin 100gm/lt + Tebuconazole 200gm/lt	A Systemic fungicide against many pathogens. It has a preventive, curative long lasting effect against diseases; product can break the resistance to other products due to the different mode of action of the 2 active ingredients, Another specificity of Nativo is the "green leaf" effect.	Wheat, Barley, tomato, onion, grape vine, fruit crops	Downey mildew, Powdery mildew, leaf rust, etc
Opera max 147.5 SE	Pyraclostrobin 85gm/lt + Epoxiconazole 62.5gm/lt	A demethylation inhibitors and strobilurins fungicide with protectant, curative and systemic action.	Wheat, tomato, grape vine, other fruit crops	Downey mildew, Powdery mildew, leaf rust, etc

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