Seed In the study area, farmers sow both local and improved seeds. As it can be seen from table 10, about 47.06% of farmers sow improved seed of faba bean. From the total faba bean sampled farmers 50% % of them sowed local seed and 2.94% of them sow both local and improved seeds. This indicates that almost half of the sample farmers utilize improved variety. The amount of seed used per ha also has important implication on productivity. The minimum amount of seed used by sampled farmers was 100 kg per hectare and the maximum was 320 kg/ha .Farmers sow an average of 205.29 kg of faba bean per ha and this level is in the recommendation of extension package program i.e. from 200 – 300 kg depending on the seed size of the variety.

In the study area farmers accessed seeds from different sources. The main source of seed for planting faba bean was farmer's own saved seed (56.6) followed by government package (15.1%), local traders (14.1%) and others (Table 10.).

Table 10.Utilization of improved, local and source of seed by sample farmers and plots number in the production year (2014/2015)

	Frequency	Percent
Improved seed	96	47.06
Local seed	102	50.00
Improved and local seed	6	2.94
Total	204	100
Source of seed		
Own seed	116	56.6
Government package	31	15.1
Local traders	29	14.1
Agro-dealers	1	0.5
Model farmers	8	3.9
Neighbor farmers	6	2.9
Cooperatives	3	1.5
Research center	4	2.0
Market	3	1.5
Parent	1	0.5
Exchange from farmers	2	1.0

Total	204	100

Although, farmers were asked whether they grow local faba bean variety for the last five years; 86.7% of them were responding that they were grown local faba bean variety for the last five years and 13.3% of them were responding that they did not plant local faba bean variety. Similar questions also asked about the growing of improved faba bean varieties, out of 181 respondents 59.5% were responding that they grow improved faba bean varieties and 40.3% were not grow improved faba bean varieties in the study area. The improved faba bean varieties used in the study area were Degagwhich is commonly used before 1990. Then after, variety Wolki, motiand other varieties were distributed in a limited amount in the area (Table 11).

Table 11. Descriptive statistics of faba bean varieties grown in the district

Name of variety	Frequency	Percent
Degaga	63	30.9
Wolki	11	5.4
Moti	14	6.9
Gebelcho	4	2.0
Tumsa	1	0.5
Hachalu	3	1.5
CS 20 DK	2	1.0
Local faba bean	103	50.5
Improved but name not known	3	1.5
Total	204	100

Commercial inputs Faba bean is a crop enriched with protein, therefore, may correct important amino aciddeficiencies of cereals when sowed in rotation with *teff*, wheat and barley. It is grown inrotation with cereals to break cereal disease cycles and to fix atmospheric nitrogen, thusreducing the demand of other cereal crops for nitrogen fertilizers.

In the study area, the other important input used for faba bean production is inorganic fertilizer (DAP and UREA) and organic fertilizer (manure/compost). According to the findings from the group and individual (key-informant) discussions, most farmers do have demand to utilize fertilizer for production of faba bean. Most of the time, they use fertilizer if the land is low fertile or if cereals are sown subsequently without sowing any pulse in between and if it is for the first time that pulse is sown on the land. When we specifically consider total sample faba bean plots, fertilizer was applied on 76.96 percent of them. As illustrated by table 12, the average usage of fertilizer on faba bean field is 103.28 kg/ha (Dap and UREA). Some farmers also reported that they applied manure and or compost on their plot of land especially fields which are found near to their homestead as a supplement for the inorganic fertilizer. In addition to this Very few farmers responded that they treat faba bean seed with bio-fertilizer during planting. Most of the time, they sow faba bean to break the cereal pattern and to fix nitrogen. Farmers within the sample framework follow the right, cereals-pulse-cereals cropping to maintain fertility of land.

In the study area, aphids and African boll worm are the most important types of insects affecting growth of faba bean. During high infestation of insect pests, farmers used primicarb (primor) 50% WP EC to control aphids and Endo Sulphane to control African boll worm.

Land preparation and planting Farmers sow faba bean after they plow land for an average of 2.53 times. About 27.9% of farmers sow faba bean after they plow land three times. And about 22.5, 27.9, and 21.6% of farmers plow their land for one, for two and more than three times for sowing. Hence, farmers weed their land after four and six weeks of sowing. The level of yield of faba bean might be determined by how good the farmer manages weed before sowing. Therefore, farmers weed their land within the interval between consecutive ploughs. Faba bean also has to be weeded two times; the first hand weeding is after 30 days of sowing and the second hand weeding is after six weeks of sowing. However, if the farmer leaves the plot until faba bean is flowering, it will result in yield reduction.

Production and productivity When the respondents were asked about the purpose of faba bean production, most of them answered that they produce faba bean for different uses: 33% of their total harvest is for income, family consumption and diversification; 19.3% of them were used for income and family consumption; 14.4% of them were used for family consumption; and they used about 13.3% of the yield for income and profit. By- product of faba bean is also used for animal feed.

In the production year of 2014/15, the sample farmers harvested faba bean within a range of 0.1 qt/ha to 72.00 qt/ha with an average of 19.34 qt/ha, this is greater than the national average which is 18.93 qt/ha. Yield per hectare of faba bean may affected by socio economic and institutional factors.

Access to public services and social networks in each of the peasant associations, there are three development workers and one supervisor for two PAs. These extension workers provide advice for farmers on different crop technologies and livestock production practices. Extension service creates an impact on agriculture by disseminating new technologies to farmers thereby increasing agricultural production and productivity, second by improving human capital and managerial skill of farmers to advance their efficiency level. In other words, it is assumed that an increase in the number of extension contacts enhances farmers' access to crop related information and improved technological packages. Those farmers' located far from DA centers are advised less frequently due to less accessibility of roads. Many farmers contacted individually and in group discussions argued that extension contact has significant and positive effect on the crop productivity. From the total sample farmers, 2.8% of the household head did not get advice from extension agent, about 42% of them stated that they got advice from extension workers for less than 12 times a year, 16% of them told that they got advice from extension workers. And about 39.2% of them stated that they get advice for more than 12 days per year. On average yearly extension contact of the farmers is about 17.64 days with a minimum of 0 days and a maximum of 120 days with a standard deviation of 20.36. The DA gives theoretical knowledge as well as shows the importance of technologies by means of demonstration sites.

Credit Accessibility of credit may facilitate the dissemination and promotion of fertilizer, improved varieties, insecticides and farming practices in agricultural production. The survey result showed that out of 181 respondents, about 50.3% of them had an access to credit facility the remaining 49.7% of them did not have any access to credit facility. Moreover over, even if they have access to credit, most of them were not borrowed money from different sources.

Table 1. The number of farmers borrowed (yes) and not borrowed (no) money from different institutions.

Sources		Frequency	Per cent
Relatives and friends	No yes	172 9	95 5
Informal saving and credit group	No Yes	177 4	97.8 2.2
Money lenders	No yes	176 5	97.2 2.8
Government credit schemes	No yes	146 35	80.7 19.3
NGOs/Church	No Yes	178 3	98.3 1.7
Bank or micro finance	No Yes	156 25	86.2 13.8

Table 14.Maximum likelihood estimates for parameters of stochastic frontier production function inefficiency effects model for faba bean grower in lemu district

Variable	parameters	coefficient	t-ratio
Constant (β0)	β_0	6.35***	16.11
Ln (Area)[A]	β_1	13.29***	14.13
Ln (Seed)[S]	β_2	-17.55	-18.70
Ln (Fertilizer)[F]	β_3	-20.99	-25.88
Ln (labor) [L]	β_4	27.21***	28.94
Ln (Oxen)[O]	β_5	-8.97	-95.41
Ln $(A)^2$	$\beta_6$50.89***	69.35	
Ln $(S)^2$	β_7	23.68***	32.70
Ln $(F)^2$	β_8	11.16***	19.00
Ln $(L)^2$	β_9	44.36*** 60.54	
Ln $(O)^2$	β_{10}	-18.67	-25.53

Ln (A) Ln (S)	β_{11}	-11.42	-12.90
Ln (A) Ln (F)	β_{12}	14.60***	16.79
Ln (A) Ln (L)	β_{13}	-61.32	-69.10
Ln (A) Ln (O)	β_{14}	-73.74	-83.13
Ln (S) Ln (F)	β_{15}	-53.02	-74.78
Ln (S) Ln (L)	β_{16} -19.56	-22.13	
Ln (S) Ln (O)	β17	64.70***	73.25
Ln (F) Ln (L)	β18	-10.66	-12.67
Ln (F) Ln (O)	β19	14.37***	17.69
Ln (L) Ln (O)	β_{20}	24.77***	27.95

Table 15. Technical efficiency of sample farmers producing Faba bean

Description	Household head level estimates
Mean	0.69
Minimum	0.13
Maximum	0.91
Standard deviation	0.16

Source: Own Computation Model Output (2014).

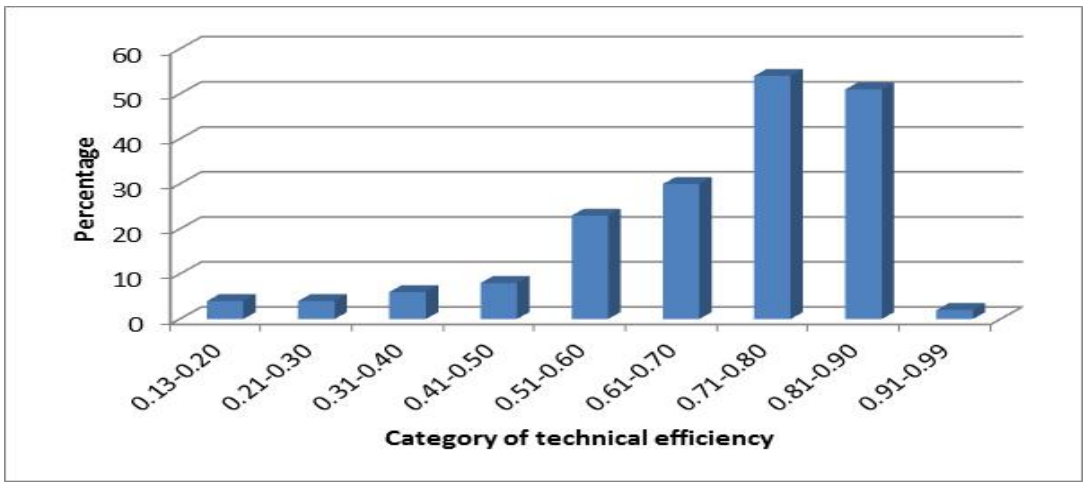

Figure 1. Distribution of technical efficiency of sample farmers

In summary to increase faba bean farming efficiency, efforts need to be invested in improving farmers' education through enhancing the universal primary education and training farmers about

specific crop production packages practically as well as theoretically which are being implemented in local communities.

CONCLUSION AND RECOMMENDATIONS

This study was designed to analyze technical efficiency of faba bean smallholder growers in South west Shewa zone of Oromia Regional State, lemu district. Cross-sectional data collected from sample farmers in ElalaSeden, KusayeBoda, Elala Wako, TahaGola, KarsaWarko and BayeGiche peasant associations were used.

The study used the farm-level data collected from a total of 181 faba bean producer and estimated the stochastic frontier production function (SFPF) by incorporating inefficiency effects. We find that SFPF best fits the data better than the Cobb-Douglas production function. Moreover, the traditional average response function is not an adequate representation of faba bean farm level data for 2014 cropping season.

The result of study showed that area of faba bean, seed, fertilizer, labour and oxen days are the major factors associated with change in faba bean output. The effect of land area allocated to faba bean production and human labour on output is positive and the coefficient is statistically significant at 1% to improve faba bean productivity. The quantity of seed and fertilizer applied and oxen days used have negatively associated on faba bean output, and statistically non-significant. The interactions of land and fertilizer, seed and oxen days, fertilizer and oxen days had also a significant and positive effect to improve the yields of faba bean.

The results of efficiency analysis show that the mean technical efficiencies were found to be 69% with minimum 13% and maximum of 91%. This indicated that about 60% of farmers in the study area were efficient and produced above the average efficiency level while 40% of the farmers were inefficient and producing below the average efficiency level, suggesting that efficiency improvement is one of the possible opportunities for increasing faba bean production with available input resources and technology. Thus, an average farmer is producing 31% less than the achievable potential output. The sources of inefficiency were estimated using the δ - coefficients. Inefficiency factors arethose relating to farmers' demographic, socio- economic, institutional and plot specificfactors. These include the farmers' level of education, distance to extension service, distance to input market, distance to output market, extension contact, household size, member to a group, training, credit accessibility, livestock

holding distance to weather road distance of plots from home, slop and soil fertility. Among the variables considered education, training, livestock holding, distance to all weather roads, distance to plot from home, and slop are insignificant to determine inefficiency of farmers. To the contrary, positive and significant coefficients of age, extension contact and household size indicate that inefficiency of farmers would be determined positively as the level of these factors increase.

Therecommendation/policy implication of this study is that technical efficiency in smallholder faba bean production could be increased by 31% on average through better use of available resources, especially area of faba bean land and labour given the current state of technology. Thus, government or other concerned bodies in the developmental activities working with the view to increase production efficiency of farmers in the study district should work on improving productivity of faba bean farmers by giving especial emphasis for significant factors of production and inefficiency.

In conclusion, the existence of inefficiency in faba bean production along with major inefficiency variables indicate that there is a room for improving efficiency and increase faba bean production using the readily available resources and technology. Hence, integrated developmental efforts that will decrease the existing level of inefficiency will have significance importance in improving faba bean production and productivity.

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