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Determinants and Resource Use Efficiency of Haricot Bean Production in Halaba Special District, Southern Ethiopia

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Abstract
The study aimed to analyze determinants and resource use efficiency of haricot bean production in Halaba Special district in Southern Ethiopia. The study employed multistage sampling technique to collect relevant primary data from smallholder producers. A total of 173 sample households were selected from two administrative *kebeles* using probability proportional to size sampling technique. Both qualitative and quantitative data were collected from primary data sources through structured questionnaire, key informant interview, and focus group discussion. Complementary secondary data were collected through literature review. Descriptive statistics, estimation of production function, and allocative efficiency index (MVP/MFC) were the analytical methods employed to achieve the objectives of the study. Accordingly, the result of the study indicated haricot bean output was positively and significantly influenced by plot size, amount of fertilizer applied, labor input in man days, level of education of the household head, farming experience, frequency of extension contact and types of haricot bean seed used. Resource utilization was found inefficient for the crop in the study area. The result of allocative efficiency index indicated, fertilizer (0.4), pesticide (0.2), labor (0.5) and oxen power (0.0) were over utilized resources. Thus, concerned bodies should work on policy relevant significant variables to improve the productivity and allocate resources efficiently.
Keywords: Allocative efficiency, Marginal factor cost, Marginal value product, Production function

1 Introduction

Pulses are not only constitute the major food crops for the majority of Ethiopians but also serve as a source of income at household level and a significant contributor of foreign currency earnings for the country (IFPRI, 2010). Pulses, which occupy around 12 to 13 % of cultivated land and account for 10 to 11 % of grain production, are critical to smallholder livelihoods and the economy in Ethiopia (CSA, 2012, 2015, 2016). Ethiopia is one of the top twelve producers of total legumes in the world, third largest producer of haricot bean in COMESA member countries and the leading exporter in Africa (Agete, 2014). On the other hand, the current productivity level of haricot bean falls significantly below the demonstrated potential. The current national average productivity of haricot bean in Ethiopia is 1.48 tons per hectare that is below average research demonstrated productivity potential (3.4 tons per hectare) in the country (Mulugeta et al., 2015).

Despite several efforts in varietal development and agronomic practice improvements, determinants of the production and resource use efficiency of smallholders have not been studied adequately in Ethiopia. For instance, Hassen *et al*. (2015) studied technical efficiency of smallholder haricot bean producers in Misrak Badawacho district. The study used stochastic frontier analysis to assess the technical efficiency of haricot bean producers and found producers in the study area produces haricot bean inefficiently. The study considered only conventional inputs of production to identify determinants of the production, which might not revealed the influence of non-conventional inputs of production. On the other side, stochastic frontier analysis could not show which input was inefficiently allocated by the producers. Therefore the leading aim of this study was to contribute in narrowing this information gap by examining factors that determine the productivity of haricot bean and whether the inputs used for the production were efficiently allocated or not.

1.1 Objectives

The study was initiated with the following specific objectives:-

i) To examine determinants of haricot bean production in the study area
ii) To analyze resource use efficiency of smallholder haricot bean producers in the study area

2 Research Methodology

2.1 Study area

Halaba Special District is located 310 km from Addis Ababa and 85 km from regional capital, Hawassa, on the main road to Arbaminch. It is located between the coordinates of 7º 14' 46.7" and 7º 18' 08.2" N Latitude and 38º 05' 35.5" and 38 º 06'16.5" E Longitudes. The district has 79 rural Administrative *Kebeles*. The district is called "special" because it has a special autonomy where the administration directly reports to the regional state

(Genene, 2006; IPMS, 2005). The mean temperature of the district varies from 17^0C and 20^0C. Rainfall has been a major limiting factor in agricultural production in the area. Annual rainfall of the district varies between 857 and 1,085 millimeters. The district receives a bimodal rainfall where short rains occur between March and April while long rains occur from July to September (IPMS, 2005; JICA, 2012).

2.2 Study Population and Sampling Procedure

The population for the study comprises all haricot bean producers in 2016/2017 production season in the study area. The study followed multistage sampling technique to select sample respondents. Major haricot bean producer *kebeles* were selected purposively in the first stage. In the second stage, two *kebeles were* selected randomly out of identified producer *kebeles*. In the third stage, households produced the study crop were selected purposively with the help of *kebele* development agents. Finally, sample households were selected from purposively selected producers using simple random sampling to administer the survey. The total sample size was distributed to selected *kebeles* based on the probability proportional to size sampling technique. The total sample size of 173 haricot bean producer households were selected based on Yamane (1967) formula, which is presented as follows:

$$n=\frac{N}{1+N(e)^2} \quad (1)$$

Where n is the sample size, N is the population size, and e is the level of precision (95% confidence level and P = 0.5 are assumed).

2.3 Types, Sources and Methods of Data Collection

Both qualitative and quantitative data were collected for this study. The data sources were both primary and secondary ones. Primary data gathered from sample respondents, key informants and focus group discussions. The survey schedule was pre-tested in one *kebele* that was not included for the study. The primary data collection was undertaken through trained enumerators. The study employed key informant interviews and one focus group to collect additional information to cross check and supplement the primary data collected from households using interview schedule. Secondary data was gathered from journals, books, thesis researches, reports of bureau of agriculture and rural development to supplement the results found from the primary data.

2.4 Method of Data Analysis

The analytical methods used in achieving the objectives of the study include descriptive statistics, estimation of production function and allocative efficiency index (ratio of VMP to MFC). The study used STATA 12 to execute descriptive statistics and estimate the production function. Whereas Microsoft office excel 2007 was employed to compute the allocative efficiency.

2.4.1 Estimation of production function

Choice between alternative production functional forms is a matter of subjective judgment, guided by consideration of goodness of fit, a priori economic theory, ease of analysis, and judgment about the economic implications drawn from the production function estimates (Dillon and Hardaker, 1980). William and crown (1998) pointed how well each of the models satisfies the assumptions underlying the regression model are important criteria. Generally, literatures pointed that the selected functional form must be computationally manageable for both estimation and testing.

For this study, four most common types of production functional forms (Linear, lin-log, log-lin and log-log) were tested whether they better fits and appropriate to the collected survey data. The collected data was checked for outliers and missing values and existence of multicollinearity before running regression. Then Linear, lin-log, log-lin and log-log types of production functional forms was computed to select the model that was appropriate for the data. Model specification test (ovtest), hetroskadasticity test, and normality of error distribution were undertaken for each alternative model. Multiple linear regression was selected as it has been found to fulfill important regression assumptions and most of prior expectations to analyze haricot bean survey data while the others fail to fulfill the assumptions. The result of variance inflation factor (VIF) for each variable was less than 10 and the mean VIF was 1.71, which shows there was no series multicollinearity among the explanatory variables. A test for heteroskedasticity was done using Breusch-pagan test and the test was not significant suggesting that the data has no heteroscedasticity problem. The normality of the error was checked using a kernel density plot and the plot indicated the distribution of the residual resembled normal pattern. The selected model did not have problem of misspecification. Linear regression model is specified following Gujarati, (2004) and Theresa *et al*., (2015) as follow.

$$Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_{10} X_{10i} + \beta_{11} D_1 + \beta_{12} D_2 + \mu_i \quad (2)$$

Where,

Y_i= output of haricot bean

$X_1 \ldots X_{10}$ = continuous explanatory variables (plot size, seed, fertilizer, pesticide, human labor, oxen

power, education, farming experience, extension contact and nonfarm income respectively)
D_1 = Dummy variable for sex of household head (1 = male, 0 = female)
D_1 = Dummy variable for type of seed used by household (1= improved seed, 0 = local seed)
β_o = the intercept of the relationship (constant)
$\beta_1 \ldots \beta_{12}$ = Slopes with respect to each input used
μ_i = Stochastic disturbance term
e = base of natural logarithm

Table 1: Summary of explanatory variables and hypothesis

Variable name	Type of variables	Unit of Measurement	Hypothesis
Plot size	Continuous	Hectare	+
Seed	Continuous	Kilogram	+
Fertilizer	Continuous	kilogram	±
Pesticide	Continuous	Liter	+
Labor	Continuous	Man Days	±
Oxen Power	Continuous	Oxen days	+
Education	Continuous	Schooling years	+
Farming experience	Continuous	Years of farming	+
Extension contact	Continuous	Number of contact in a year	+
Nonfarm income	Continuous	Ethiopian birr	+
Sex	Dummy	Dummy variable (0=female, 1=male)	±
Type of seed	Dummy	Dummy variable (0=local, 1=improved)	+

2.4.2 Resource Use Efficiency

The basic approach to estimate resource use efficiency (Allocative efficiency) is through the MVP. The MVP was calculated from econometrically estimated production function. Allocative efficiency was determined by comparing the MVP with the MFC. It was assumed that farmers are price takers in the input market, so that the price of i^{th} factor approximates MFC. Following Chukwuji *et al.* (2006) and Eze and Nwibo (2014) allocative efficiency index (AEI) was derived from the production function of equation 2 as follows:

$$MP_{xi} = \frac{\partial\,(Yi)}{\partial xi} \quad (3)$$

From multiple linear regression model:

$$MP_{xi} = \frac{\partial\,(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_{10} X_{10i} + \beta_{11} D_1 + \beta_{12} D_2 + \mu_i)}{\partial xi} = \beta i \quad (4)$$

$$AEI_{xi} = \frac{MP_{xi} * P_Y}{P_{xi}} = \frac{MVP_Y}{MFC_{xi}} \quad (5)$$

Where,
AEI_{xi} : is the allocative efficiency index of i^{th} input
MP_{xi} : is the marginal product of i^{th} input
βi: slopes with respect to i^{th} regressor variable
Xi: i^{th} input included in the production function
P_Y: is selling price per unit of haricot bean output
P_{xi}: is cost per unit of i^{th} input used
MVP_Y : marginal value of product of haricot bean resulting from an additional unit of i^{th} input.
MFC_{xi} : marginal factor cost of i^{th} input resulting from an additional unit of i^{th} input.

3 RESULTS AND DISCUSSION

3.1 Demographic and Socio-Economic Characteristics of the Respondents

The average age of haricot bean producer sample household heads was 40 (Table 2). This revealed that sample households were in their active working age. Majority (84.4%) of haricot bean producer sample household heads were married and the others 3.5%, 1.7%, and 10% were single, divorced and widowed respectively (Table 4). Table 2 and 3, indicated that 37.8% of the haricot bean producer sample household heads did not have any formal education; while the remaining 62.21% had attained different levels of education. The average annual income of haricot bean producers was 15,373 Ethiopian birr[1] in 2016/17 production season. Table 2 indicated that the average livestock holding of haricot bean producers were 4.39 TLU with minimum and maximum of 0 and 19.75 TLU respectively. On average typical haricot bean producer household has 2.17 hectare with maximum land holding of 8 hectare. Out of the total sample households, 75.1% of haricot bean producers had access to credit from different sources (Table 3). This might support producers when they face cash shortage and

[1] One US dollar = 23 Ethiopian birr

enable them to undertake farming activities without problem. About 75.1% of haricot bean producers were members of cooperative, but only 20.81% of sample households sold their haricot bean for cooperative (Table 3). This was also pointed out during focus group discussion. Farmers use the sale of haricot bean to cover their immediate expenses. Therefore, most of them did not want to wait until cooperative release money rather, they preferred to sell their grain for other buyers.

Table 2: Description of continuous demographic and socio-economic characteristics of respondents

Variables	Unit	Haricot bean producers (n=173)			
		Mean	**Std.D**	**Min.**	**Max.**
Age	Years	40	9.36	22	70
Family size	Number	6	2.05	1	14
Education	School years	3	3.06	0	16
Livestock holding	TLU	4.39	2.57	0	19.75
Total land owned	Ha	2.17	1.2	0.25	8
Total annual income	ETB	15,372	11,929	800	55,000

Source: Author's survey (2017)

Table 3: Summary of marital and educational status of sample household heads

Variables	Response	Haricot bean producers (n=173)	
		Number	**%**
Marital status	Single	6	3.5
	Married	146	84.4
	Divorced	3	1.7
	Widow	18	10.4
Educational status	Illiterate	65	37.79
	literate	107	62.21
Access to credit	Yes	130	75.1
	No	43	24.9
Cooperative membership	Yes	130	75.1
	No	43	24.9

Source: Author's survey (2017)

3.2 Description of Output and Input Variables

The average haricot bean productivity was found 1,146 kg per hectare; which was below the national productivity. It is noted that there is a potential for productivity gain as the maximum (3,200Kg) yield produced by some of the sample households was by far higher than the mean production per hectare. The average plot area allocated by haricot bean producers for the crop was close to half (0.47) hectare. The minimum and maximum plot area allocated for haricot bean was 0.13 and 1.5 hectare. The finding indicated that DAP was the major fertilizer type used in haricot bean production whereas, only few of the respondents used urea for haricot bean production. Amount of fertilizer applied on haricot bean per hectare by the sample households vary between 0 and 300 Kg with average of 92.46 Kg. Typical haricot bean producer applied 66.67 Kg of haricot bean seed per hectare on average. Labor is an important factor of production in subsistence agriculture. The average labor used per hectare by haricot bean producing households was 92.42 man-days. Oxen power was mainly used for land preparation in the study area. On average, sample households used 15.03 oxen days per hectare for haricot bean production in the study area. Pesticides were most important chemicals used by the sample households in the study area. However, very few respondents used fungicides. Sample households on average used 0.033 liter of pesticide per hectare for haricot bean production. Participation in nonfarm activities believed to support producers in their farm activities. Farmers would have more capital to purchase new technologies and other inputs like fertilizer and improved seed that assist production (Wogayehu and Tewodros, 2015). On average, sample households earned 3,795 Ethiopian birr from nonfarm activities in 2016/17 production season. The mean farming experience of haricot bean producer households were 12 years. Sample households on average had received an extension service of 34 times in that particular production season. There were two categories (local and improved) of haricot bean seed in the study area. Majority (90.8%) of the sample households were user of improved seed variety (Table 4 and 5). *Nasir* and *hawasa dume* varieties of haricot bean were grown in the district.

Table 4: Summary of output and continuous input variables used in the econometric model

Variables	Unit	Haricot bean producer HHs. (n=173)			
		Mean	Std.D	Min	Max
Yield	Kg/Ha	1,146.2	518.63	200	3,200
Plot size	Ha	0.47	0.27	0.13	1.5
Fertilizer	Kg/Ha	92.46	63.16	0	300
Seed	Kg/Ha	66.67	29.50	20.5	184
Labor	Man days/Ha	92.42	55.87	22.4	384
Oxen Power	Oxen days/Ha	15.03	8.77	4	64
Pesticide	Liter/Ha	0.033	0.147	0	1.07
Nonfarm income	ETB	3,795	4,739.6	0	30,000
Farming experience	Years	12	5.88	2	30
Number of extension contact	Frequency	34	13.26	3	52

Source: own computation (2017)

Table 5: Summary of dummy input variables used in the econometric model

variables	Category	Haricot bean producers (n=173)	
		No	%
Sex of the household head	Female(0)	37	21.4
	Male(1)	136	78.6
Type of seed used	Local(0)	16	9.2
	Improved(1)	157	90.8

Source: own computation (2017)

3.3 Determinants of Haricot Bean Production

Determinants of haricot bean production in the study area were identified by estimating multiple linear regression that appropriately fits to the survey data. Value of coefficient of determination (R^2) for the regression is 0.7398 indicating 73.98% of the variation in haricot bean output is explained by the model. From the F-statistic, it can be concluded that the overall regression is significant at 1% level of significance. The result of the model is presented in Table 6. The result indicated haricot bean output was responsive to plot size, amount of fertilizer, amount of man-days, level of education of the household head, farming experience, extension contact and types of haricot bean seed used. Output of haricot bean was not significantly responsive to amount of seed, pesticide, oxen days, nonfarm income and sex of the household heads.

Plot size (PLOTS): The estimated coefficient of plot size allocated for haricot bean was 538.54. The sign of the coefficient was positive as expected and significant at 1% level of significance, indicating the relevance of plot size on haricot bean production in the study area. This positive effect of plot size on haricot bean output implies that a unit increase in plot size leads to an increase in output of haricot bean by 538.54 Kg keeping other factors constant. This could be due to large plot size motivates adoption of innovations which can translate into higher output. The result agrees with Mustefa (2014) and Hailemaraim (2015) who reported land allocated had positive and significant effect on output in their studies.

Fertilizer (FRT): The estimated coefficient (0.82) of fertilizer was positive and statistically significant at 10% level of significance. The coefficient implies as amount of fertilizer increases by a unit, yield of haricot bean increases by 0.82 Kg. This might be due to farmers in the study area uses DAP fertilizer which provides the crop with required minerals that translated to increased output. The result is consistent with prior studies undertaken by Hassen *et al*. (2015), Wogayehu and Tewodros (2015) and Birachi *et al*. (2011).

Labor (LAB): The coefficient of labor measured in terms of man-days was positive and significant at 1% level of significance. The result implies that a unit increase in the use of labor will increase output of haricot bean by 4.02 Kg. The result fits with the finding of Wogayehu and Tewodros (2015) which also reported labor input has positive and significant influence on haricot bean output, but contrary to this, Hassen *et al*. (2015) reported a negative and significant relationship between labor and production volume in their research.

Education (EDU): Education of the household head was positively and significantly influenced the output of haricot bean at 1% level of significance. The result implies that an increase in schooling year by one results an increase of haricot bean output by 15.3 Kg. The result was consistent with the findings of Wongnaa (2013), and Wogayehu and Tewodros (2015).

Farming experience (FXP): This variable had positive coefficient of 3.89 and statistically significant at 10% level of significance, implying that respondents with higher farming experience tend to produce more haricot bean per hectare. This implies that an increase in farming experience of the crop by a year results an increase of haricot bean output by 3.89 Kg. Shalma (2014) and Wongnaa (2013) found opposite result in which farming experience influence the output of soybean and cashew negatively. This might be due to farmers in that study areas were not improved their production system or produce in obsolete traditional system.

Extension contact (EX): Extension contact of the household heads was positively and significantly influenced output of haricot bean at 5% level of significance. The sign of the coefficient was as per prior expectation. This implies that as frequency of extension contact of producers increase, amount of haricot bean output obtained tends to increase. Wongnaa (2013) found similar result in which dummy of extension contact positively and significantly influence output, whereas Wogayehu and Tewodros (2015) found negative coefficient for frequency of extension contact but insignificantly influenced volume of the output.

Type of seed (TSEED): Type of seed used was positively and significantly influenced output of haricot bean at 1% level of significance. The sign of the coefficient was as per prior expectation. The coefficient implies households that used improved seed of haricot bean could possibly increase his haricot bean output by 121.25 Kg than those used local type of seed indicating the importance of high yielding seed varieties in haricot bean production. During the FGDs, farmers told they preferred *nasir* variety because of its high productivity, and better demand in the market.

Table 6: Multiple linear regression estimates for haricot bean production in Halaba special district

VARIABLES	Dependent = Haricot bean yield in Kg		
	Coefficients	**Std.D**	**t-ratio**
Plot size (PLOTS)	538.5414***	77.6925	6.93
Seed (SEED)	1.1055	1.4395	0.77
Fertilizer (FRT)	0.8238*	0.4839	1.70
Pesticide (CHEM)	3.2546	218.5072	0.01
Labor (LAB)	4.0178***	1.0095	3.98
Oxen power (OXP)	1.1337	4.7119	0.24
Education (EDU)	15.3017***	4.3805	3.49
Farming experience (FXP)	3.8995*	2.2590	1.73
Extension contact (EX)	2.3882**	1.0254	2.33
Nonfarm income (NFI)	0.0005	0.0025	0.19
Sex (SEX)	16.2736	32.9212	0.49
Type of seed (TSEED)	121.2477***	46.2237	2.62
Constant	-254.0076***	70.1538	-3.62

Number of observations = 173
$R^2 = 0.7398$
$Adj\_R^2 = 0.7203$
F-statistic = 37.92
Prob (F-statistic) = 0.0000

***, ** and * shows significance at 1%, 5% and 10% probability level respectively
Source: Model output of authors' survey (2017)

3.4 Resource Use Efficiency in Haricot Bean Production

Cost minimization or a point of profit maximization is the point where MFC=VMP. The deviations from this point causes inefficiency (Debertin, 2012). Therefore, resource use efficiency in haricot bean and chickpea production was investigated based on this economic principle. Table 7 portrayed the resource use efficiency in haricot bean production. The ratios of MVP to MFC for haricot bean plot size (0.9), fertilizers (0.4), pesticide (0.2), labor (0.5) and oxen power (0.0) were less than one. These ratios indicated that much of these inputs were used in relation to the prevailing market conditions. The factor prices for plot size, fertilizers, pesticide, labor and oxen power used exceeded their respective marginal value products. The expected return from an additional unit of these factor inputs is less than the marginal factor cost incurred by these additional units of inputs. Hence, the sample households were allocatively inefficient in the use of the available inputs except amount of seed used. This implies that there were opportunities for the producers to improve their resource use efficiency and profit by using less of these inputs.

The result showed that the marginal productivity of land was higher than that of the other factors used in the production of haricot bean in the study area. This led to higher marginal value product for land. This would not however imply that farmers are more efficient in land use than in other factors, because their unit of measurement is not the same. Rather Allocative Efficiency Index (AEI) could show the relative efficiency of land allocation. As it could be understood from the result, plot size had highest allocative efficiency index very close to one among over utilized inputs revealed that very little deviation from efficient utilization.

Most family labor works on the farms are done with little or no supervision and this might have contributed to the overutilization of labor (AEI = 0.5). The over utilization of labor is in agreement with the finding of Jirgi *et al*. (2010).

Some households use urea additional to DAP even if the recommendation was only 100 Kg of DAP

(District agriculture office) for haricot bean production in the study area. This might lead to over utilization of fertilizer (AEI = 0.4). Bolarin, *et al*. (2012) found similar result during his study of profitability of production and resource use efficiency among rice farmers in Southwest, Nigeria.

Over utilization of pesticide (AEI = 0.2) might be due to frequent occurrence of haricot bean pests as producers identified this as one of production constraints in the study area.

Generally, MPP of over utilized inputs were not negative indicating that households still use these inputs in economical range of haricot bean production even if they did not utilized them optimally. Therefore, there is a possibility of improving the efficiency of haricot bean production by using less of over utilized resources in the study area. Additional income could be made from haricot bean production in the study area by allocating inputs efficiently.

Table 7: Resource use efficiency in haricot bean production

Resources	Haricot Bean Production (n=173)			
	MPP	MVP	MFC	AEI
Plot Size	538.54	3607.37	3947.28	0.9
Seed	1.11	7.41	7.41	1.0
Fertilizer	0.82	5.52	14.64	0.4
Pesticide	3.25	21.80	137.03	0.2
Labor	4.02	26.91	57.05	0.5
Oxen power	1.13	7.59	174.83	0.0

Note: Values of allocative efficiency index (AEI) is rounded to one decimal point
Source: own computation (2017)

3.5 Conclusion and Recommendations

The study revealed only 20.81% of sample households sold their haricot bean grain for cooperatives. This was due to cooperative did not pay money immediately after delivery of the grain even if farmers use sale of haricot bean for immediate expenses. Therefore, board of district cooperatives should alleviate the problem by improving their payment policy to better satisfy their members and strengthening their marketing linkage with potential buyers that could pay reasonable market price for the grain.

According to CSA (2016), national productivity of haricot bean is 1,480 Kg per hectare. However, the average haricot bean and chickpea productivity of sample households in the study areas was 1,146 Kg per hectare, which was below the national productivity. It could be noted that the productivity could be further improved as this also assured by some of the respondents that have produced above the average. Therefore, district office of agriculture has to do to improve the productivity of the crop focusing on the identified determinants of the production.

Fertilizer was found an important determinant that has positive and significant influence on the output of haricot bean in the study area. However, farmers blame the price was not affordable. Therefore, government should supply fertilizer on credit and work on how to reduce the price of fertilizer so that it could be affordable to the producers.

Education of the household head was found important in haricot bean production. Thus, government has to give due attention for farmers training through strengthening farmers' education and farmer training centers.

Frequency of extension contact was positively and significantly influenced output of haricot bean. Since an extension service is the main instrument used in the promotion of demand for modern technologies, appropriate agronomic management. Therefore, the concerned body has to ensure accessibility of appropriate extension services for the producers.

Using improved seed of haricot bean was found significant determinant that positively and significantly influences the output. Thus, continuous and adequate supply of improved seed has to be emphasized by government agriculture offices.

Analysis of AEI indicated that factor prices for fertilizers, pesticide, labor and oxen power used were exceeded their respective marginal value products in haricot bean production. Thus, expected return from an additional unit of these factor inputs is less than the marginal factor cost incurred by additional unit of this input indicating inefficient allocation. Therefore, it is advisable to improve the efficiency and expand the profit in haricot bean production by optimizing the over utilized resources in the study area.

4 References

Agete, J. 2014. An analysis of factors influencing participation of smallholder farmers in red bean marketing in halaba special district, Ethiopia. M.Sc. Thesis. University of Nairobi, Kenya. 109 p.

Birachi, E.A., Ochieng, J., Wozemba, D., Ruraduma, C., Niyuhire, M.C. and Ochieng, D. 2011. Factors influencing smallholder farmers' bean production and supply to market in Burundi. *African crop science journal.* 19(4): 335 - 342

Bolarin, T. O., Justina, O. L. and Ifeoluwa, D. O. 2012. Profiability of production and resource-use efficiency among ofada rice (*Oryza sativa* japonica) farmers in Southwest, Nigeria. *Comunicata Scientiae.* 3(2):104-107

Central Statistical Agency (CSA). 2012. Agricultural Sample Survey. Report on Area and Production of Major Crops 2011/12. Volume I. Addis Ababa, Ethiopia. 126 p.

Central Statistical Agency (CSA). 2015. Agricultural Sample Survey. Report on Area and Production of Major Crops 2014/15. Volume I. Addis Ababa, Ethiopia. 121 p.

Central Statistical Agency (CSA). 2016. Agricultural Sample Survey. Report on Area and Production of Major Crops 2015/16. Volume I. Addis Ababa, Ethiopia. 118 p.

Chukwuji, C.O., Inoni, O.E., Ogisi, O.D. and Oyaide, W.J. 2006. A Quantitative Determination of Allocative Efficiency in Broiler Production In Delta State, Nigeria. *Agriculturae Conspectus Scientificus.* 71 (1):21–26

Debertin, D.L. 2012. Agricultural Production Economics. 2nd Edition. University of Kentucky. 413p.

Dillon, J. L. and Hardaker, J. B. 1980. Farm Management Research for Small Farmer Development. FAO (Food and Agricultura Organization) Agricultural Services Bulletin 41, Rome. 145 p.

Eze, A.V. and Nwibo, S.U. 2014. Economics and Technical Efficiency of Cassava Production in Inka North East Local Government Area of Delta State, Nigeria. *Academic Journals*; *Journal of Development and Agricultural Economics.* 5(6): 429-436

Genene, T. 2006. Farmers' perceptions of land degradation and determinants of household food security status at middle catchment of bilate watershed. M.Sc. Thesis. Haramaya University, Ethiopia. 106 p.

Griffins, C.R., Mongomery, M.J. and Rister, W.E. 1987. Selecting Functional Forms in Production Analysis. *Western Journal of Agricultural Economics.* 216-217.

Gujarati, D. 2004**.** Basic Econometrics 4th ed. McGraw-Hill, New York. 1002 p.

Hailemaraim, L. 2015. Technical Efficiency in *Teff* Production: The Case of Bereh District, Oromia National Regional State, Ethiopia. M.Sc. Thesis. Haramaya University, Ethiopia. 77 p.

Hassen, N., Adam, B., and Jema, H. 2015. Analysis of Technical Efficiency of Haricot Bean Production in Misrak Badawacho District, Hadiya Zone, Ethiopia. *Science, Technology and Arts Research Journal*. 4(1): 234-241

Improving Productivity and Market Success of Ethiopian Farmers (IPMS). 2005. Alaba Pilot Learning Woreda Diagnosis and Program Design. www.ipms-ethiopia.org. [Accessed 12 Augest, 2016]

International Food policy Research Institute (IFPRI). 2010. Pulse Value Chain in Ethiopia: Constraints and Opportunities and Enhancing Exports. 54 P.

Japan International Cooperation Agency (JICA). 2012. Strengthening Agricultural Marketing System in Southern Nation"s Nationality and Peoples" Region, Ethiopia, Volume 1, Draft Final Project Report-Unpublished

Jirgi, J., Ogundeji, A., Viljoen, G. & Adiele, M. 2010. Resource Use Efficiency of Millet/Cowpea Intercropping In Niger State, Nigeria. Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.

Mulugeta, A., Tesfaye, K. and Dagne, K. 2015. The Importance of Legumes in the Ethiopian Farming System and Overall Economy: An Overview. *American Journal of Experimental Agriculture.* 7(6): 347-358.

Mustefa, B. 2014. Economic efficiency in barely production: the case of Chole district, East Arsi Zone, Oromia National Regional State. M.Sc. Thesis. Haramaya University, Ethiopia. 91 p.

Shalma, H. J. 2014. Economic Analysis of Soya Bean Production under Sasakawa Global 2000 Project in Kaduna State, Nigeria. M.Sc Thesis. Ahmadu Bello University. Nigeria. 91 p

Theresa, U. A., Obianuju, E. A. and Ikechukwu, M. O. 2015. Socioeconomic factors influencing agricultural production among cooperative farmers in Anambra State, Nigeria. *International Journal of Academic Research in Economics and Management Sciences* 4(3):43-58

Tewodros, T. 2014. Determinants of Smallholder Pulse Producers Market Orientation in Southern Ethiopia, *Asian Journal of Business Management.* 6(2): 97-103

William, H. and Crown. 1998. Statistical models for the social and behavioral science: multiple regression and limited dependent variable models. Greenwood publishing Group.Inc.United State of America. 191 p.

Wogayehu, A. and Tewodros, T. 2015. Factors Affecting Production and Market Supply of Haricot Bean in Southern Ethiopia. *Journal of Economics and Sustainable Development.* 6(15): 103-109

Wongnaa, C. A. 2013. Analysis of Factors Affecting the Production of Cashew in Wenchi Municipality, Ghana. *Journal of Agricultural Sciences* 8(1): 18-16

Yamane, T. 1967. Statistics: An Introductory Analysis, 2nd ed. Harper and Row. New York