Diversification Economies and Specialization Efficiencies in a Mixed Food and Coffee Smallholder Farming System in Benchmaji Zone, SNNPR

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Abstract

The main purpose of this study is to analyze diversification economies and specialization efficiencies of smallholder farming system characterized by a combination of cash cropping (of coffee and food), and subsistence food crop production in three woredas of Benchi-Maji zone based on their importance (their contribution) in coffee production to the zone, besides food crop. For the purpose of this study, both secondary and primary data were used. The secondary data was collected from zones' agriculture and rural development whereas; surveys of 393 small holder farmers were taken as a primary data source. An input distance function approach is used to establish whether diversification economies exist and whether specialization in coffee, subsistence food or cash food production exists or not and factors influences technical inefficiency on the sampled smallholdings. The result showed that diversification economies are strongly evident between coffee and subsistence food production, but weakly evident between subsistence food and cash sale output. Moreover, socioeconomic factors such as social and family obligations, access *to market and off farm activities were significantly causing inefficiency.*

Keywords: *Diversification, specialization, smallholder peasants, coffee, food for subsistence, food for cash sale*

1. Introduction

In Ethiopia, including but not limited to, agricultural development led industrialization (ADLI) strategy in 1993, a plan for Accelerated and Sustained Development to End Poverty (PASDEP) in 2005 and recently five years Growth and Transformation Plan have been introduced. All these strategies have been adopted to bring about improvement in agricultural sector with primary aims in the promotion of small scale market oriented agriculture. According to Ethiopian Ministry of Agriculture and Rural Development (2008) , more than 95 percent of the total viable agricultural land is cultivated by small holder peasant farmers that produce 97.6% of the agricultural output.

For Ethiopia, to enjoy high levels of economic growth and continues along the path of economic progress, improving productivity is paramount important. In this regard, proper utilization of scarce resources either in the form of *specialization efficiencies or diversification economies* are potentially considered to improve the productivity and livelihood of the most populous smallholder resource poor farmers (Jema, 2008).

Some economists argue that the achievement of specialization efficiency from scarce resources should be a major criterion for priority setting especially in developing smallholder agricultural economies. Some of the studies in empirical evidences, including, Seyoum et al. (1998); Weir and Knight (2004); Alemu et al. (2009) supported the argument and have proposed efficiency improvement as a solution for the productivity problem through better education, information, credit provision and extension visit.

Others, on the other hand, argue that diversification process plays a significant role for productivity improvement as well as for the path of economic progress by boosting non-traditional sectors; expanding the range of products and exports; and enabling the country to engage with new economic and development partners(UN,2011). Coelli and Fleming (2003) argued that in an uncertain production environment, the ability of family members to vary their levels of participation among different activities can help overcome difficulties arising from unanticipated events. These events would otherwise hinder the tasks they perform if they adopted the less familiar role of specializing chiefly in one particular production activity.

However, both specialization efficiencies and diversification economies requires enabling environment. United Nations Economic Commissions for Africa (UNECA, 2007) identified a number of key drivers for these issues in which some of this are macroeconomic stability, a competitive exchange rate and expansionary but responsible fiscal policy; and institutional variables such as good governance and absence of conflict.

The Southern Nations and Nationalities People's Region (SNNPR) is one of the regions in Ethiopia that comprises about 56 ethnic groups with their own distinct geographical location, language, cultures, and social identities. Based on ethnic and linguistic identities, at present the region is divided into 13 Zones, sub-divided in to 126 districts, 8 special districts and 3401 rural kebeles.

Bench Maji zone is one of the Zones of the Ethiopian Southern Nations, Nationalities and Peoples Region (SNNPR). The Zone has a total area of 10,602.7 square kilometer and it lies at an altitude ranging from 500 to 3500 meters above sea level. The total population of the zone is 858,600 (2007) with a population density of 90 persons per Kilometer Square.

According to the 2012 Ethiopian Demographic and Health Survey report, the zone has a total population of 781,006 with 391,885 males and 390,477females. The population density of the Zone is 23 persons per square kilo meter. It is the second sparsely populated zone in SNNPRS after Debub Omo Zone, which has 19 persons per square kilo meter.

The main food crops in this Zone include maize, godere (Taro root), and enset, while sorghum, teff, wheat and barley are cultivated to a significant extent. In addition to the primary cash crop (coffee), Cash crops include fruits (bananas, pineapples, oranges) and spices (e.g. coriander and ginger); honey is also an important local source of income. The Central Statistical Agency (CSA) reported that 10,097 tons of coffee was produced in Bench Maji in the year ending in 2005, based on inspection records from the Ethiopian Coffee and Tea authority. This represents 10.6% of the SNNPRs output and 4.4% of Ethiopia's total output.

Besides to production of food either for sale or subsistence, coffee is the main important cash crop of the zone, in which most kebeles found in Benchi- Maji zone has potential of producing coffee crop. In Bench Maji- zone (for smallholder peasants) the diversification of production away from a long-established and well-understood cropping system for subsistence purposes, to commercial cropping activities at better degree are needed in order help them to expand their range of products and ex-

ports. These commercial activities offer a potential for diversification economies to smallholders, leading to productivity gains that increase returns to their land and labour inputs. Greater Productivity gains from specialization of commercial activities of coffee production and/or food for domestic cash sale, on the other hand, is also very much needed. Sheko, South Bench and Shey Bench are among the woredas in Bench- Maji zone that inherited the above characteristics.

As the result, this important theme deserves empirical evidences and, thus, should be researched. The novelty here is that, firstly, it broadens our knowledge about diversification and specialization economies. Secondly, provide evidences of technical in/efficiency and thirdly factors affecting technical inefficiency at a time insights from Bench Maji zone (SNNP) which happen to be a rare case in the literature.

2. Objectives of the study

The general objective of this study is to analyze diversification economies and specialization efficiency of smallholder farming system characterized by a combination of cash cropping (of coffee and food) and subsistence food crop production in Sheko, South Bench and shey Bench Woredas.

Specifically the objective of this study is to:

- Identify whether diversification or specialization economies exists or not.
- Identify whether specialization in coffee, subsistence food and cash sale output significantly influences technical efficiency.
- Identify socioeconomic factors that influence technical inefficiency

3. Review of Related Literature

3.1 Theoretical Review

Several academic studies have analyzed the relationship between a country's productivity growth and its levels of specialization, from where a country produces a range of goods in few, concentrated sectors, to where this range broadens. There is evidence that at the early stages of economic development, where most African countries currently are, countries tend to leverage their natural endowments to boost economic gains from niche sectors. But as they prioritize new sectors, increase productivity and diversify their economies, they eventually reach relatively high levels of percapita income.

At this point of high development, countries then begin to specialize again. These add weight to the case for diversification, and serve as a caution against the hasty pursuit of specialization when economic growth levels are not sufficiently high (UN, 2011). The USA's African Growth and Opportunity Act (AGOA) is an important agreement that exemplifying a great effect on stimulating diversification in African economies by opening expanded markets in the USA to African exports.

3.1.1 Arguments concerning diversification

The relevance of economic diversification has been advocated by famous economists such as Nobel laureate Simon Kuznets, who states in his Nobel Prize lecture that "a country's economic growth may be defined as a long-term rise in capacity to supply increasingly diverse economic goods to its population" (Kuznets, 1971). Grossman and Helpman (1992:334) make an even stronger statement by asserting that "growing economies produce an ever increasing quantity, quality and variety of

goods and services."
The most straightforward argument for the importance of diversification is that diversified economies are less vulnerable to economic shocks than specialized economies: "although there are good theoretical arguments for specialization according to comparative advantage", Osakwe (2007:1) argues, "in practice policymakers in developing countries are interested in diversifying their production and export structure to reduce vulnerability to external shocks."Moreover, more diversified economies are less volatile in terms of outputs, and lower output.
Volatility is associated with higher economic growth (Ramey and Ramey, 1995). An early concept that highlights the particular problem of specializing in agriculture is the so-called "Graham paradox", which incorporates non-constant unit costs hence productivity between different sectors into Ricardian theory (cf. Graham, 1923). More specifically, productivity in the manufacturing sector rises with production as unit costs fall with increasing output due to the benefits of mass production, while the unit costs of agricultural products increase with production. For a country with a comparative advantage in agriculture, specialization according to comparative advantage decreases productivity in both the agricultural and the manufacturing sectors, hence, the country's total output declines. Even global production can decline if the increase in production of countries specializing in manufacturing is not large enough (Raffer, 2004:112-117).

3.1.2 Arguments concerning specialization

Traditional trade models suggest that on an aggregate level countries benefit from opening to trade and specializing in the production of goods in which they have a comparative advantage. By becoming more specialized, the allocation of resources becomes more efficient, allowing for mutual welfare increases (Krugman and Obstfeld, 2006). This idea goes back to David Ricardo, who pointed out in his famous example of Portuguese wine and British cloth that although Portugal requires less labour to produce a unit of either good compared to the United Kingdom, opening up for trade would benefit both countries, because they would be specializing in the good that has lower opportunity cost3 (Ricardo, 1971:153-154). Hence, poor countries may be able to trade with rich ones and may gain from this trade (Ruffin, 2002:741f).
Despite the simplicity of Ricardo's theory, it has been interpreted in several different ways, and continues to have a tremendous impact on how specialization and economic development are (mis)understood, as Deardorff (2005:3) denotes: "Comparative advantage is certainly one of the most basic ideas in economics, underlying much of our understanding of why countries trade the way they do and why they benefit from doing so. But it is also a difficult concept for many people to understand, and seemingly even more difficult for them to believe once they do understand it (and especially if they don't)." In the same vein, Nobel laureate Paul Samuelson has described comparative advantage as the best example of "an economic principle that is undeniably true yet not obvious to intelligent people." (Krugman and Obstfeld, 2006:24).
In fact, the Ricardian theory of comparative advantage states that specialization according to comparative advantage is an important factor in the production of more

goods. Policy recommendations based on the potential advantages of specialization, should be done with caution. Nevertheless, the necessity of specialization according to comparative advantage for economic development continues to be an integral part of policy advice (Rodrik, 2007).

4. Data and Methodology

4.1 Data source and Sampling Design

4.1.1 Sources of Data

In order to analyze diversification economies and specialization efficiencies in integrated food and coffee small holder in Benchi-Maji zone both primary and secondary sources of data were used. Secondary data concerning to the total output of each crop was obtained from the zone Agricultural and Rural Development office, Central Statistical Agency (CSA), Mizan Branch, etc. while some others in addition to socioeconomic variables affecting technical inefficiencies such as education level of the household, family and social obligations, proximity to market, household labour constraints during the coffee-harvesting season, etc. was collected using primary data.

4.1.2 Sampling Design

In Benchi-Maji zone Coffee is very important cash crop almost in all Woredas of the zone. Three woredas were selected based on their importance (their contribution) in coffee production to the zone, besides food crop . As the result from the total of 24,525 household found in these a sample size of 393 small holder peasant were taken.To get the representative sample from each woredas, a cluster sampling techniques was applied and finally the representative sample was determined as under.

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

$$\text{Sample Size} = \frac{N}{1+N(0.05)^2} = \boldsymbol{393}$$

Where: n-Sample size, N- Total household, e-Margin of error of 0.05

The sample size allotment across each woredas was based on the data from the zone's agriculture and rural development. Data on the level of total food and coffee productionfor each woredas was used for computation. Once the woredas were selected, the selection of kebeles for the survey was through the convenience sampling method based on their importance in coffee production and food for sale. This is because of the fact that all kebeles in these woredas produce coffee in addition to food forsale and consumption and contribute significant figures in total Woreda's coffee production. As a result, the selections were undergone in collaboration with DA's of respective woredas who settled around the area. After the kebeles were drawn based on convenience sampling, they were merged to get sampling frame for each woredas. Then final sample units wasselected by applying systematic random sampling to the sampling frame of respective woredas until the required number of sample size allocated to each woredas fill up.

However, woredas differ not only in size but may be variability in terms of both food

and coffee crop outputs. In this case, it is reasonable to take larger samples from woredas with higher variability of food and coffee outputs and smaller sample from the less variable Woredas.

4.1.3 Data Quality Control and Questionnaire Organization

Effort was made in each activity of the sample to assure data quality. Ample time was taken for questionnaire preparation in such a way that the enumerators can easily understand it. The questionnaire designed in advance of commencement of survey in order to have ample time for pre-testing, under taking pilot survey and under taking training to enumerators. Questions were formulated in clear, logical order, simplifying technical terms, definitions, and concepts and so on to avoid possible bias that could emanate from it.

Concerning training and supervision, Developmental Agents (DA's) were the primary enumerators for the study from the view point of; firstly, they are well known to the local farmers and have acceptance from local farmers; secondly, they have experience in data collection and thus they know techniques of interviewing, their duties and obligation. The training has been supplemented with practical demonstration and close supervision of enumerators to enhance quality of the data. Moreover, target groups were clearly informed about the objective of this study in order to avoid possible response and non -response error.

4.2 Model Specification and Estimation Technique

The stochastic production function can be specified as Cobb-Douglas, constant elasticity of substitution, Trans log, and other functional forms. The translog input distance function which is akin to Coelli and Perelman (1996) is employed in this analysis, since, it allows us to include inefficiency variables in our production model which is defined as:

$$\ln A = \beta_o + \beta_1 \ln(ML/A) + \beta_2 \ln(FM/A) + \beta_3 \ln(X/A) + \beta_4 \ln YC + \beta_5 \ln YFC$$
$$+ \beta_6 \ln YFS + 0.5\beta_7 \ln(YC)^2 + 0.5\beta_8 \ln(YFC)^2 + 0.5\beta_9 \ln(YFS)^2 + +\beta_{10}(\ln YC_{it})(\ln YFC_{it})$$
$$+ \beta_{11}(\ln YC_{it})(\ln YFS_{it}) + \beta_{12}(\ln YFC_{it})(\ln YFS_{it}) + v_i$$

Where, A is the total area planted to food crops and coffee trees; X is purchased inputs in Kg;YC is the value output of coffee in Kg; YFC is the value of output of food crops for cash sale in Kg; YFS is the value of subsistence food output in kg; and vi error term.

Factors affected technical inefficiency

Some of variables that are expected in explaining changes in technical inefficiency in smallholder crop production are broadly categorized as conventional and socio-economic variables.

In estimating of the parameters of the model using maximum-likelihood procedures, the FRONTIER 4.1 program by Coelli and Perelman (1996), is used.

5. Estimation and Discussion of Results

5.1 Econometrics analysis

Table 1: Estimates of input distance function (MLE)

Variables	Parameters	Coefficients of Parameters	Standard error
Constant	β_0	3.54	1.098
Direct Input	β_1	0.07	1.23
	β_2	0.04**	0.43
	β_3	0.002**	0.062
Output	β_4	0.19	1.01
	β_5	0.00	0.55
	β_6	2.68	3.97
Efficiency	β_7	0.039	1.91
	β_8	0.000	0.11
	β_9	0.037	0.02
Diversification	β_{10}	-0.03	4.12
	β_{11}	+0.56	1.42
	β_{12}	+0.002	0.75

No efficiency and diversification

5.1.1 Evidence of Diversification Economies

Diversification economies were measured by the coefficients estimates reported in table (4.4) for each pair of outputs at the means of the sample data. To test the hypothesis whether diversification economies exists or not among these production system, the standard errors for these measures of diversification economies was computed.

As, the result the value of standard error shows that the null hypothesis of no diversification economies was rejected at 5% level of significance for Coffee and food for subsistence and food for cash sale and for subsistence. However, we fail to reject for food for cash sale and coffee.

The results of the coefficient estimates provide values of +0.56 for the combination of coffee and food for subsistence. This implies that there is strong diversification between coffee and food for subsistence. The result also shows the output combination of food for cash sale and food for subsistence were found to be +0.0012.This

shows that the potentials for diversification between food for cash sale and food for subsistence is very small However, it was found that there is no evidence of diversification between food for cash sale and coffee.

The strong evidence on the existence of diversification economies observed between coffee and food for subsistence witnesses that small holder peasants have had most success in commercializing their operations through adaptive strategies of combining coffee and food for subsistence. Productivity improvement occurs with diversification from subsistence food production into cash cropping activities while still recalling a significant subsistence base due to the fact that, the farming system under observation continues to rely heavily on the farm inputs of household labour, management and land resources.

The ability of best practices smallholders to make productive use of surplus family labour in slack periods and avoid bottlenecks in labour usage, especially female labour, that detract from overall crop productivity is crucial in the production of subsistence and cash crops in a mixed-cropping setting(Coelli & Fleming).

When a smallholder peasant diversifies into cash production and food for subsistence the farmer has the opportunity to select those activities that complement each other given the seasonal nature of their labour demands to utilize family labour resources fully throughout the year. It is largely for this reason that the implementation of an adaptive growth strategyby smallholders has been so pervasive.

On the other hand, the observed diseconomies of diversification for the combination of food for cash sale and coffee suggest that smallholder peasants find it difficult to achieve productivitygains when attempting to diversify simultaneously into these two forms of cropping, with their different and often overlapping labour and management demands. This is due to the fact that Overfield and Fleming (2002)noted in different country: The labour demands for coffee production are especially likely to clash strongly with those for cash food production in the case of household labour, which is used intensively in food production and marketing and subject to severe constraints at certain times of the year.

5.1.2 Evidence of Specialization Economies

As that of diversification economies, specialization economies were also measured using coefficients estimates reported in table (4.4) for specialization variables. To test the hypothesis whether specialization economies exists or not in a single line of production system, the standard errors for these measures of specialization economies was computed.

The result shows that evidence of specialization on **coffee** production and **food for cash sale**, but no specialization on food for subsistence at 5% level of significance.

Specialization believes to increases efficiency since this allows us to be more adapt to what we are doing and have been trained well into doing a particular task, in able us to minimize mistakes and save time. The more practice we have into doing something, the faster we can be with our tasks with maximum output as well

Once, specialization economies is found to be exist we need to develop the model that tells us whether technical inefficiency is found or not and factors affecting it.

maximization, and profit maximization. Thus, the interest in this study is technical efficiency.

There are two approaches to the measurement of technical efficiency: output-oriented approach and input-oriented approach. In the output-oriented approach the interest is by how much output could be expanded from a given level of inputs. Whereas in the input-oriented approach. The concern is the amount by which all inputs could be proportionately reduced to achieve technically efficient level of production, hence, known as input over-use. In this paper preference has been made to the output-oriented approach, given we are considering developing country settings, the concern is rather not that inputs are over-used but output short-fall. Following Kumbhakar and Lovell (2000), the stochastic production frontier which is written as under will be used.

Where the stochastic production frontier consists of two parts: a deterministic part common to all producers and a producer specific part exp {vi}.

Therefore,

Where i, coffee and cash output (alternatively)

It measures technical efficiency as the ratio of observed output to maximum feasible output.Farmer is technically efficient if and only if Otherwise, provides a measure of the short-fall of observed output.

Assuming that takes the log-linear Cobb-Douglas form, then the stochastic production frontier model in Equation could be rewritten as

Where is the composed error term (Ainger et. al, 1977).Once the model is specified, maximum likelihood estimation is used.

Table 2: Frequency distribution of technical efficiency estimates of sample small holder peasant by category of efficiency level (by woreda, by output items)

a. Coffee

Level of eff.	South Bench (n=98)	Sheko (n=140)	Shy Bench (n=155)	Total sample (n=393)
>0.85	14	47	5	66
>0.75 ≤ 0.85	83	79	29	191
>0.65 ≤ 0.75	38	35	24	107
>0.45 ≤ 0.65	10	15	9	34
≤ 0.45	4	5	0	9
Mean(eff)	76.5	73.7	74	74.74

The above result shows that only 66(16.7%) of small holder peasants were relatively efficient, whereas majority of them remains inefficient in production of coffee.

Cash Sale Output

Level of eff.	South Bench (n=98)	sheko (n=140)	Shy Bench (n=155)	Total sample (n=393)
>0.85	10	17	25	52
>0.65 ≤ 0.85	66	73	21	160
>0.65 ≤ 0.75	83	80	14	177
>0.45 ≤ 0.65	2	0	1	3
≤ 0.45	0	0	1	1

Table 3: Definition and measurement of variables considered in the models

Variable name	Measurement method	Expected sign
Coffee output (Yc)	Value of coffee output in Birr	
Cash sale output (Yf)	Value of coffee output in Birr	
Land cultivated (R)Area in timad[1]		+
Labor input (L)	Quantity of farm labour hours worked/day	+
Modern inputs (X) Value in Birr		+/-
Oxen owned (Ox)	Number oxen owned	+
Access to market (mrt)	Dummy [2]	+/-
Access to credit (crt) Dummy[3]		+
Gender of farmer household head (gen) Dummy[4]	Dummy[4]	+/-
Off-farm activities (off)	Dummy[5]	+/-
Polygamous (ply)	Dummy[6]	-
Schooling of household head (ed)	Dummy[7]	+
Social & family obligations (sfo)	Dummy[8]	-

[1]*Timad*is a local area unit 1*tiimad*=0.25ha.

[2]variable having a value of 1if yes, (access to market), 0 otherwise

[3]variable having a value of 1if yes, (access to credit), 0 otherwise

[4]variable having a value of 1if yes, (household head is female), 0 otherwise

[5]variable having a value of 1if yes, (farmer involves off farm activities), 0 otherwise

[6]variable having a value of 1if yes, (farmer involves off farm activities), 0 otherwise

[7]variable having a value of 1if yes, (farmer involves off farm activities), 0 otherwise

[8]variable having a value of 1if yes, (farmer involves off farm activities), 0 otherwise

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Mean(eff)	76.5	73.7	74	74.74

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>0.65≤0.75	83	80	14	177
>0.45≤0.65	2	0	1	3
≤0.45	0	0	1	1

The above table shows that only about 52(13.2%) of peasants have technical efficiency greater than 85%. Majority of peasant household were inefficient in production of cash sale output. Moreover, it very low compared to other areas (Tigray, Oromia).

In general there is a room for efficiency improvement in Bench MajiZone given the current know how, technology and input usage.

Where are the sources of this inefficiency?

$\lambda = \sigma_u^2 / \sigma_v^2$

A value of λ close to zero implies that the discrepancy between the observed and the maximum attainable levels output is dominated by random factors outside the control of the producer or factors out of conventional input. As the result, the value of lamda for coffee and food for cash sale output is 0.031 and 0.0022 respectively implying the dominant factors are outside factors.

Then, a separate model was developed for each output.

5.2.1 Technical Efficiency Models

A Cobb-Douglas functional form which includes both the **conventional inputs** and **exogenous factors** affecting inefficiency was the one considered in our analysis.

Model 1: For coffee output

Model 2: For food for cash sale output

$$+\beta_1 \ln R + \beta_2 \ln L + \beta_3 \ln X + \beta_4 \ln Ox + \beta_5 \ln mrt + \beta_6 \ln crd + \beta_7 \ln gen + \beta_8 \ln$$
$$y + \beta_{10} \ln ed + \beta_{11} \ln sfo + \beta_{12} \ln fs + \beta_{13} \ln Age_1 + \beta_{14} \ln age_2 + \beta_{15} \ln age_3 + \beta_{16} \ln$$

Conventional input: Area of land cultivated (R), modern inputs(X), labour input (L) and Oxen ownership (Ox) were the variables considered as conventional inputs.

Demographic & Socio-economic variables:

mrt, proximity to market; crd, access to credit; gen, gender of household head; off, off farm income; ply,polygynous household; ed, schooling of household head; sfo,

Table 4: Definition and measurement of variables considered in the models		
Variable name	Measurement method	Expected sig
Coffee output (Yc)	alue of coffee output in Birr	
Cash sale output (Yf)	value of output for cash sale in Birr	
Land cultivated (R)	Area in timad[1]	+
Labour input (L)	Quantity of farm labour hours worked/day	+
Modern inputs (X)	Value in Birr	+/-
Oxen owned (Ox)	Number oxen owned	+
Access to market (mrt)	Dummy [2]	+/-
Access to credit (crt)	Dummy [3]	+
Gender of farmer household head (gen)	Dummy [4]	+/-
Off-farm activities (off)	Dummy [5]	+/-
Polygamous (ply)	Dummy [6]	-
Schooling of household head(ed)	Dummy [7]	+
Social & family obligations (sfo)	Dummy [8]	-
Family size (fs)	in number	+
Household age (age)		
Age>18≤30 (Age_1)	Dummy [9]	-
Age>30≤50 (Age_1)	Dummy [10]	+
Age>50 (Age_1)	Dummy [11]	-

Access to credit (crt)	0.003 (0.98)	0.02(1.2)
Gender of household head (gen)	0.100* (2.051)	0.04(1.34)
Off-farm activities (off)	0.12*(2.10)	3.2*(5.7)
Polygamous (ply)	0.01 (0.56)	0.034(0.19)
Schooling of household head(ed)	0.003 (1.08)	0.001(1.3)
Social & family obligations (sfo)	0.48*(4.75)	0.023(1.81)
Family size (fs)	0.01(0.88)	0.00(0.95)
Household age (age)		
Age>18 ≤30 (Age1)	0.001 (1.00)	0.11*(2.09)
Age>30 ≤50 (Age2)	0.00 (0.43)	0.01(0.13)

Age>50 (Age3)	0.30* (2.04)	0.55*(1.97)

The above table shows the maximum likelihood (ML) parameter estimates of the stochastic production frontier**.** The result shows variables such as the area of land cultivated, labor input, oxen owned are found to be significant in improving productivity. On the other hand, access to market, off farm activates and social and family obligations were found to have significant impact on inefficiency. However, the variables such as modern input, level of education and access to credit were insignificant. The possible reasons for the parameter estimate for modern input to turn out insignificant might be emphasizing increased use of external inputs might not be worthwhile for typical fertile land areas for which the data represents. The possible justification for the variable access to credit be insignificant might be, either Peasants have no problem of finance, or have enough income that enable them to produce the required amount of output. The variable of schooling level was also insignificant implying absence of significant difference in level of education among the peasant farmers

6. Conclusion

This study has provided information about economies of diversification, economies of specialization, Specialisation efficiencies and factors affecting technical inefficiency in farming systems comprising the three broad cropping activities of subsistence food, cash food and coffee in the Bench Maji zone. Information is also provided on the extent of technical inefficiency in smallholder crop production.

Diversification economies were found to exist between subsistence food production and the production of either coffee or cash food items, while diversification diseconomies were found between coffee and cash food production. Moreover, the results also indicate that substantial technical inefficiency exists, which means there may be opportunity to expand crop output without resort to greater use of factor inputs or the introduction of improved production technologies.

About nine socioeconomic variables were identified that could significantly influence technical inefficiency. Significant effects on technical inefficiency exist for the age of household head above 50 years, proximity to market, off farm activities and social and family obligations.

7. Policy Implications

Successful and sustained livelihood wellbeing requires both diversification and specialization economies. Therefore, prudent macroeconomic policy and enabling environment is needed to push the economy towards higher growth path through productivity improvement and efficiency achievement. Moreover, economic efficiency is also another area of importance that should be searched for future purpose.

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