Determinants of Coffee Value Addition by Smallholder Farmers in Jimma Zone, Ethiopia

Bizualem Assefa Gashaw[1*], Degye Goshu Habteyesus[2], Zekarias Shumeta Nedjo[3]

1. *Department of Agribusiness and Value Chain Management, Wolkite University, Ethiopia; P.O. Box: 07, Wolkite, Ethiopia*
2. *Department of Economics, Kotebe Metropolitan University, Ethiopia; P.O. Box: 76, Addis Ababa, Ethiopia*
3. *Department of Agricultural Economics and Extension, Jimma University, Ethiopia; P.O. Box: 307, Jimma University, Ethiopia;*

Abstract: *Value addition after production would involve enhancements or additions to a product that result in higher returns to the commodity seller, who is often the smallholder farmer. This study was undertaken with the aim of analysing determinants of intensity of value addition to coffee by smallholders. A multi-stage stratified and simple random sampling technique was employed; and a total of 152 smallholder farmers from six kebeles were sampled. Data were collected from primary sources through a semi-structured interview schedule. Tobit econometric model was employed to identify the underlying determinants of coffee value addition. The result revealed that sex, literacy status, coffee farming experience, active family labour force, perception of farmers towards the adequacy of extension service on value addition, access to credit, ownership of sufficient drying facilities, perception of farmers towards price of dry cherry, and non- and off-farm income were significantly affected coffee value addition. The finding stress that policy aiming at offering farmers a fair price, providing adequate credit and other extension services, providing drying facilities, building capacity of farmers with knowledge, improving farmer's business diversification besides coffee farming, and targeting gender inclusive strategy (paying attention to women) were recommended to increase coffee value addition at farm level.*

Key words: - Coffee, Value Addition, Drying, Hulling, Tobit model

I.   INTRODUCTION

Background and justification: The emerging trend for processed agricultural products in the global market creates opportunities for smallholder farmers in the developing countries to benefit from such opportunities by linking their activities to value chains through vertical and horizontal linkages (Vermeulen *et al.*, 2008). While high-income countries add nearly US $185 of value by processing one ton of agricultural products, developing countries add approximately US $40. Furthermore, while 98 % of agricultural production inhigh-income countries undergoes industrial processing, barely 38 % is processed in developing countries (Freeman, 2013). However, the prospects that lead firms such as brand owners, innovators and system integrators may appropriately increase shares of rent and therefore further widen the gap is very real (Altenburg, 2006).

Value addition can be broadly stated as the process of economically adding values to products (raw commodities) that possess intrinsic value in their original state by changing their current place, time, and form characteristics to improve their economic value and preferred by consumers in the market place (Fleming, 2005). According to these authors, value addition can be achieved in two ways; innovation and coordination. Value addition through innovation focuses on improving the existing processes, procedures, products, and services or creating new ones, while value addition through coordination involves arranging partnership among the value chain actors that produce and market farm products, changing the distribution of value in the chain which in turn through direct marketing, vertical integration, producer alliances, and cooperative efforts. By producer alliances is to mean individuals/companies from the same level of the chain consolidate in order to produce and market a superior product whereas by cooperative effort is to mean individuals or companies pool their products in order to increase bargaining power.

Despite coffee's economic and social importance for the Ethiopian economy, the performance smallholder farmers in the coffee sub-sector have remained unsatisfactory. Coffee farmers had very limited power when it came to securing their adequate share of the market price from coffee (IFPRI, 2003). According to Desse (2008), coffee quality defects in Jimma

is common mainly due to improper post-harvest processing and handling practices such as drying on bare ground, rainy weather particularly during drying season, improper storage and transportation. In the study area, it is thus customary that coffee farmers have been promoted to harvest and deliver the red cherry to wet processing stations than being encouraged to farm level value addition considering coffee defect is relatively high in dry cherry coffee. Furthermore, Abasanbi (2010) by his study recommended as wet processing is relatively a better approach to avoid common earthy and musty coffee defects. Because of this and other policy recommendations, farmers in the area have been encouraged to sell red cherry coffee without further farm level value addition improvements there by decreasing their competitiveness and bargaining power which in turn is leading to low earning than the income that would have been derived from dry cherry. However, farmers bargaining power while selling coffee in red cherry form is also very limited and gradually shifted to dry coffee than selling red cherry.

Value addition is very important for farmers as it can transform unprofitable agriculture into a profitable one (Fleming, 2005). Value addition after production would involve enhancements or additions to a product that result in higher returns to the commodity seller, who is often the farmer. From preliminary survey conducted prior in the study area, it is observed that selling value added coffee after drying would result in more earnings/profit than that of red cherry form. Yet, unlike their interest for value addition, farmers are challenged with many problems largely because of marketing environment, supportive services, resources, processing technologies, infrastructure, and economic and socio-demographic factors. There were farmers who didn't add value on coffee while others add value. Besides, there was variation between the intensity of value addition between those farmers who were involved in adding value on coffee. Farm level coffee value additions vary across socioeconomic and demographic characteristics of farm households and also in relation to factors associated with market access and institutional support services. Thus, to put value addition as an alternative and formulating strategies in line with it, it was pertinent to first analyse the underlying determinants of intensity of coffee value addition by smallholder farmers.

II.   METHODOLOGY

Description of the study area: Jimma zone is located in the South-Western part of Ethiopia between Latitude 6° and 9° North and Longitude 34° and 38° East, and between altitude ranges of 880 to 3340 meters above sea level (ORG, 2003). The Zone is one of the coffee growing zones in the Oromia Regional State, Ethiopia which has a total area of 1.1 million hectares of land. Currently, the total area of land covered by coffee in the zone is about 0.1 million hectares, which includes small-scale farmers' holdings as well as state and private owned plantations. Jimma zone covers a total of 21% of the export share of the country and 43% of the export share of the Oromia Region (JZARDO, 2008). There are favourable climatic conditions, variety of local coffee types for quality improvement and long history of its production in the Zone. In Jimma zone, coffee is produced in the eight districts namely, Gomma, Manna, Gera, Limmu Kossa, Limmu Seka, Seka Chokorsa, Kersa and Dedo, which serves as a major means of cash income for the livelihood of coffee farming families (JZARDO, 2008). From among Limmu-Kossa and Gomma districts were selected.

Limmu-Kossa district is geographically located between 70 50' to 80 36' North and 360 44' to 370 29' East (ORG, 2003). The total surface area of the district is 1355 km². Agro-climatic condition of the district comprises of highland (25%), midland (65%) and lowland (10%) with annual rain fall varying between 1200 to 2000 mm and altitude ranging between 1450 to 1950 masl while annual temperature is 10^oC to 25^oc. The total population of the district is 187,815 out of which 50.5% are male. There are about 29,138 households (92.3% male-headed) living in 40 *kebeles* and 3 towns (Limmu Genet, administrative center of district, Ambuye, and Babu). The average land holding size per house hold is 2.39 hectare out of which 24.6% is covered with annual crops.

Gomma is one of the known coffee growing districts of Jimma Zone. It is located 397 km Southwest of Addis Ababa and about 50 km west of Jimma town (ORG, 2003). Its area is 1,230.2 km². The annual rainfall varies between 800-2000 mm, while the mean minimum and maximum annual temperatures of the district vary between 7^oC-12^oC and 25^oC-30^oC, respectively (ARDO, 2008). Based on 15 years weather data obtained from Gomma district, the average annual rainfall is 1524 mm. Altitudinal range of the district is between 1387-2870 masl. The three dominant soil types in the district are Eutric Vertisols, Humic Alfisols and Humic Nitosols. Nitosols are the most abundant covering about 90% of the district, which is dark reddish brown in colour, slightly acidic and suitable for coffee production. Agro-ecologically, this district is divided into highland (8%), midland (88 %), and lowland (4%) (Figure 1).
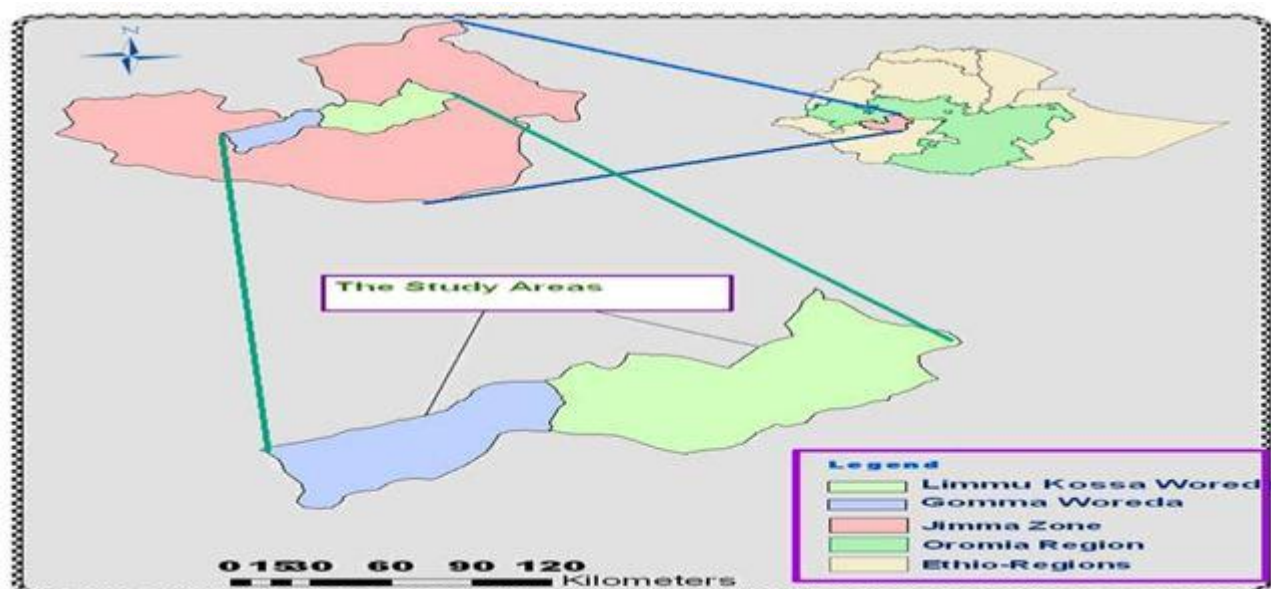
Figure 1: Map of the study area

Source: Adopted and manipulated from Ethiopian map

Sampling Techniques and Sample Size Determination: Stratification in the first and second; and simple random sampling technique in the third stage was employed for the study. In the first stage districts were stratified in two as potential and non-potential areas for coffee production. From among the eight potential districts, two districts namely Gomma and Limmu-Kossa districts were sampled randomly. Production potential of *kebeles* was again assumed to be important criteria to stratify *kebeles* for deriving representative sample *kebeles*. However, since it was difficult to get the estimated volume of coffee production in each *kebeles*, considering the agro-ecology was an alternative and best proxy for production potential in the study area. Thus, in the second stage, *kebeles* in the two districts were stratified into three by their agro-ecology as lowland, midland and highland. The lowland agro-ecology covers less than 10% in both districts while the highland agro-ecology covers only 8% in Gomma district. Accordingly, *kebeles* were sampled randomly and proportionately from midland and highland category in Limmu-Kossa district and from midland category in Gomma district. After screening out non-producing *kebeles*, proportionately four *kebeles* from Limmu-Kossa district (three from midland and one from highland) and two midland *kebeles* from Gomma district were randomly selected to obtain a total of six sample *kebeles*.

In the third stage, to consider the target populations (to avoid probability of including non-producers of coffee in the sample), only list of coffee farmers from sample *kebeles* were considered. Then, based on the number of coffee farmers available, proportional size of sample coffee farmers were selected from each sample *kebeles* using simple random sampling technique. Since adequate size of sample is needed for the purpose of econometric analysis (Israel, 1992), following the above sampling procedure, a total of 152 sample farmers were selected using Cochran (1963) sample size determination formula.

Data Types, Sources and Method of Collection: The data, both quantitative and qualitative type of this study were collected from primary source (from smallholder farmers) through a semi-structure interview schedule with the help of trained enumerators.

Method of Data Analysis: Descriptive statistics for testing the significance differences (by χ^2 or t tests) of farmers' characteristics across participation in value addition; and Tobit Econometric model to analyse the socio-economic factors affecting value addition were used.

Specification of the Tobit model: A household add value on some of its coffee, while another did not add at all. The data collected tend to be censored at the lower limit of zero. If only probability of participation in value addition was to be analysed, probit/logit models would be adequate techniques for addressing probability questions. However, the aim here was to look at the socioeconomic factors that affect intensity of coffee value addition. On the other side, ideally,

multiple linear regressions (MLR) model would be applicable if all households participated in coffee value addition through drying but in this study some of the households did not participate in coffee value addition through drying. Some households preferred to participate in selling red cherry in favour of drying (adding value). Therefore, it was interesting to identify factors that Where y_i - is the monetary valuation of value added in thousands of birr, y_i^* is the latent variable which is not observable; β_0 is an intercept; β_i is

coefficient of the ith independent variable; The x_i is vector of variables determining value addition of coffee; and i is 1, 2, 3.... m; and ε_i is the error term error/disturbance term that are independently and normally distributed with mean zero and a common variance σ^2.

A change in explanatory variables has two effects. It affects the conditional mean of Y_i^* in the positive part of the distribution, and it affects the probability that the observation will fall in that part of the distribution.

Influence the intensity of value addition leading to a need for an appropriate model which is the Tobit model that uses Maximum Likelihood estimation (MLE) (Tobin, 1958). A Tobit model answers both of the following questions: What factors influence the probability of value addition? What factors determine intensity of value addition? The results obtained from the Tobit procedure were the MLE or as well as the marginal effects. The marginal effects indicate the amount of coffee value addition in monetary value (birr) resulting from a unit change in the explanatory variables. The change in probability, on the other hand, indicates the likelihood for the farmers to participate in value addition through dry processing approach. Using Tobit to determine factors affecting coffee value addition while controlling for other factors, the econometric model is expressed as:

$$\psi_i^* = \beta_0 + \sum_{i=1}^{m} \beta_i \xi_i + \varepsilon_i$$

$$\psi_i = \begin{cases} \psi_i^* = \beta_0 + \sum_{i=1}^{m} \beta_i \xi_i + \varepsilon_i, & \text{if } \psi_i^* > 0 \\ 0 & \text{if } \psi_i^* \leq 0 \end{cases}$$

1) The marginal effect of an explanatory variable on the expected

value of the dependent variable is:

$$\frac{\partial E(Y_i)}{\partial X_i} = F(z)\beta_i$$

Where, z represents $\dfrac{\beta_i x_i}{\sigma}$ (Maddala, 1997).

2) The change in intensity of value addition with respect to a change in an explanatory variable among participants of value addition through drying coffee is:

$$\frac{\partial E(Y / Y^* > 0)}{\partial X_i} = \beta_i \left[1 - Z \frac{f(z)}{F(z)} - \left(\frac{f(z)}{F(z)} \right)^2 \right]$$

Where, F (z) is the cumulative normal distribution of z, f (z) is the value of the derivative of the normal curve at a given point (i.e., unit normal density), z is the Z-score for the area under normal curve, β_i is a vector of Tobit maximum likelihood estimates and σ is the standard error of the error term.

3)   The change in the probability of participation in value addition as independent variable Xi changes is

$$\frac{\partial F\ (z)}{\partial X_i} = f(z) \quad \frac{\beta_i}{\sigma}$$

Definitions and Hypothesis of Variables

Dependent variable

Coffee value addition: It is a continuous variable represented by monetary valuation of total value added in thousands of birr by a farmer after drying red cherry coffee in 2013/2014 fiscal year.

Independent variables: Value addition was hypothesized to be influenced by a combined effect of various factors such as household characteristics, socio-economic and physical environments in which farmers operate. The following variables (both continuous and discrete) were defined and hypothesised accordingly.

Sex of the household head: It is a dummy variable taking 1 for male and 0 for female coffee farmers. This variable has something to affect intensity of value addition in that male headed households are assumed to participate in coffee value addition more than female headed one as more men are supposed to have better access to drying facilities, extension services, information and even credit than women. In Mamo *et al.* (2014), being male headed household was related to volume of milk value added positively.
Therefore, being male headed household was hypothesised to affect intensity of value addition positively.

Literacy status of the household: It is a dummy variable considering the farmers' education status and taking 0 for illiterate and 1 for literate household. Households who are more educated are close to adopt processing and value adding technologies relative to those illiterate farmers there by affecting the probability to participate and then level of value addition positively. Ngore *et al.* (2011) found that improving literacy levels among rural entrepreneurs would increase meat value addition in the rural agribusiness sector. Therefore, literacy status was expected to affect value addition positively.

Coffee farming experience: This is a continuous variable referring to the number of years since the start of coffee farming and assumed to affect intensity of coffee value addition positively.
Farmers with longer production experience are expected to be more knowledgeable and skilful and then would most probably increase the amount of coffee value added. Therefore, it is hypothesized to affect value addition positively.

Active family labour force: It is a continuous variable measured in adult equivalent (Strock *et al.*, 1991) that is the number of active labour force available in the household. Since production, processing (value adding activities) and other marketing activities are the function of labour, availability of labour was assumed to have positive relation with value addition. A study by Berhanu *et al.* (2011) revealed that availability of family labour force affected the level of milk value addition by the smallholder farmers positively at 1% significance level. Thus in this study, active family size was hypothesized to have positive impact on value addition.

Ownership of drying facilities: It is a dummy variable taking 1 if farmers replied that drying facilities are not a problem (have sufficient facilities) and 0 if they replied that it is a problem (don't have sufficient facilities). In the study area the practice of farm level value addition activities are greatly depend on the availability of drying facilities. Thus, the ownership of sufficient drying facilities create the opportunity to increase value addition in that it was expected to have positive influence on farm level coffee value addition.

Contractual agreement on red cherry: It is a dummy variable which takes 1 if the household head made contractual agreement before with any buyer to supply red cherry coffee during the harvesting time of 2013/2014. The agreement is considered to bind farmers to dry little coffee or even not to dry at all if not enough for supplying the red cherry coffee

as per the contract before. Farmers who get in to such a contract is expected to dry less amount of red cherry than those farmers have no any contractual agreement to provide coffee in red cherry form. Thus, it was hypothesised to affect amount of coffee value addition negatively.

Urgent need of the household: It is a dummy variable taking 1 if a household faced urgent need of money during coffee harvesting/picking time and 0 if not. In the study areas, there is a situation that red cherry coffee is last option for farmers in that farmers would be forced to sell red cherry coffee which otherwise impossible to meet the urgent need at that time. This in turn decreases the volume of coffee planned to be dried. Therefore, this variable was expected to affect the intensity of coffee value addition negatively.

Distance to urban centre: It is a continuous variable measured in kilometres of distance from the farmers' residence to the nearest woreda towns. urban center. In this study, the variable is assumed as a proxy for access to information assuming that urban centres are sources of market and other information. The advantage is that as farmers are close (near) to urban centers, they would have more interaction with informative peoples and get awareness about value addition, price information, its costs and benefits and overall market condition. The study of Berhanu *et al.* (2011) showed that participation decisions and intensity of farm level milk value addition was negatively related with distance from urban centers. Hence, it was expected to influence intensity of coffee value addition negatively.

Access to credit: This is a dummy variable taking the value 1 if the household takes loan for coffee value adding activities and/or marketing and other activities related to coffee and 0 if otherwise. Credit is a key financial instrument to break low level of value addition and marketing problem. It is critical in financing investment and purchase of new inputs (Ellis, 1992 cited in Shimelis, 2004). Ngore *et al.* (2011) found that enhancing access to credit would result in high meat value addition in the rural agribusiness sector. In Mamo *et al*. (2014), access to credit was also related with volume of milk value added positively. Hence, in this study access to credit was hypothesized to influence farmers' coffee value addition positively.

Perception of farmers towards extension service on value addition: It is defined as whether farmers have got an extension services related to farm level coffee processing (value addition). The aim of the extension service considered in this case is introducing farmers with new and improved agricultural inputs for better methods of increasing farm level processing. The variable was considered as dummy taking 1 if the farmers perceived that they got relevant/adequate extension service and 0 if otherwise. Ngore *et al.* (2011) found that extension service increase meat value addition in the rural agribusiness sector. So, the more the adequacy of extension service the more the farmer would be decisive on value addition and affect the quantity of coffee to be value added positively.

Perception of farmers towards current price of red cherry coffee: It is a dummy variable taking 1 if farmers assumed that it is attractive and relatively profitable and 0 if not. If the price of the red cherry is considered to be low (unattractive), it wouldn't encourage selling red cherry rather is drying and adding value on coffee than when price of red cherry is attractive. Therefore, it was hypothesised that price of red cherry affects coffee value addition negatively.

Perception of farmers towards current price of dry cherry coffee: It is a dummy variable taking 1 if farmers assumed that price of dry cherry is relatively profitable and 0 if not. If the price of the dry cherry is considered to be low (unattractive) for farmers, farmers would hoard it (if already dried) or even wouldn't be encouraged to add value on coffee (dry) rather would sell in red cherry form compared to the case when price of dry cherry is attractive. Hence, perception of farmers about the price of dry cherry coffee was hypothesized to have a direct relationship with intensity of value addition.

Consideration of coffee drying for saving and/or bargaining mechanism: This is a dummy variable taking 1 if farmers believe or consider that drying coffee is a saving/bargaining mechanism and 0 if not. The need to coffee value addition or to use dry cherry coffee as a aving mechanism is another very important factor there in the study areas in that drying a red cherry coffee and storing in dry cherry form is a saving mechanism and a way of increasing bargaining power of the smallholder farmers. Thus, this variable was expected to affect intensity of coffee value addition positively.

Membership to coffee cooperative: It is a dummy variable taking the value of 1 if the household was tied in coffee cooperatives and 0 if otherwise. Cooperatives can develop members' understanding about market and strengthen the relationship among the members. Moreover, membered households can get an opportunity to receive training on value addition, exchange ideas and learn better about the benefits of value addition and are thus willing to take the extra steps

of adding value to more of their coffee. Berem *et al.* (2010) found that the decision to add value on honey is positively and significantly influenced by group membership. On the other hand, there is also an experience in the study area that cooperatives are advocating their members to supply red cherry than that of dry cherry because of the fear (doubt) that coffee quality would be deteriorated relatively when dried at the farm level. Therefore, this variable was expected to be associated with coffee value addition either positively or negatively.

Log of Non- and/ or off-farm income: It is a continuous variable which refers to part of the total amount of income measured in birr that is received from business activities (fire wood gathering, charcoal trading, agricultural trading, local drink selling, service provision, pension, aid from relative etc.) other than farm activities by the household. If earning from non/off-farm income is higher than income from coffee, farmers would mostly shift towards the non/off-farm income activities due to the fact that farmers with better non/off-farm income would not tend to generate cash from sell of agricultural commodities rather is from their non/off-farm activity. Similarly if households earn more non/off-farm income, they could wait for higher price of coffee (by drying and store for the future) than selling currently. In these ways, it has positive effect on value addition. Again this variable increases the financial strength of the farmers to invest more on the purchase of facilities and incur labour cost for value adding activities. In this way, this variable is assumed to affect value addition positively. In Mamo *et al.* (2014), income from non-dairy source was related with volume of milk value added positively. Berem *et al.* (2010) also found that amount of hours spent on off-farm activities increased the honey value addition. Thus, it was hypothesised to affect intensity of coffee value addition positively.

III. RESULT AND DISCUSSION

Farmers' characteristics by participation in value addition: Drying and hulling (dry processing) were practices through which farmers add value on the commodity itself besides other handling practices. An average of 10.1 and maximum of 65.28 quintals of value added coffee was obtained through farm level value addition by smallholder farmers. 86.8% of total respondents engaged in coffee value addition through dry processing (either by drying and/or further hulling processes). The remaining 13.16% of them did not practice value addition by dry processing. However, 90.78% of all farmers are not engaged in hulling dry cherry coffee in to sundried coffee. Only 9.2% of farmers are engaged in hulling process. From among 132 farmers who engaged in value addition, only 14 (10.61%) practiced further value additions through hulling process too, whereas the rest 118 (89.39%) of the 132 practiced only drying red cherry coffee but not further hulling practices. It implied that majority of the farmers were limited to undertake further hulling process beyond drying. On the other way, from those who did not hull (138), 19 (13.77%) were those who did not already dry the red cherry coffee and the remaining 119 (86.23%) were from those who dry coffee. However it is obvious that all (100%) of those who hull coffee are from those who already practiced drying red cherry coffee. It is because hulling is not expected unless red cherry coffee is dried first.

Table 1 presents mean/proportion comparison of demographic and socio-economic characteristics of sample farmers across participation in value addition (by dry processing). The study

indicated that demographic characteristics like sex, literacy status, and age of sample farmers have significant difference among the participation in value addition at 1%, 1% and 10% significance level respectively. It was revealed that 90.91% and 86.36% of those farmers who participate in value addition were those who are male headed and literate households respectively. With regard to price and value addition, 89.39% of those farmers who engaged in value addition were those who perceive price of dry cherry is attractive. 90% of those who did not engage in value addition were those who perceive price of dry cherry is low. On the other hand, 60.61% of those who did participate in value addition were those who perceive price of red cherry is unattractive. The result of chi square tests also revealed that the two price components, price of dry cherry and price of red cherry have significance difference among participation in value addition at 1% and 5% significance level respectively.

As seen in below Table 1, 63.64% and 69.7% of those farmers who participated in value addition are those who were member of primary cooperatives and those who received credit. The result of chi square test indicated that membership in cooperative and access to credit showed significance difference among those who add value and those who did not add value on coffee through dry processing at 5% and 1% significance level. Other variables like adequacy of extension service on value addition, contractual agreement, consideration of dry cherry for saving/bargaining mechanism, farming experience, non/off-farm income and volume of coffee harvested revealed significance difference among

participation in value addition at 1% significance level (except at 10% for adequacy of extension service on value addition and at 5% for non/off-farm).

Table 1: Mean/proportion comparison of variables by participation in coffee value addition

Variables	Participation in value addition			Pearson χ^2/ t
	No (N= 20)	Yes (N=1322)	Total (N =152)	
District (Gomma, %)	80	44.7	49.34	8.66***
Sex (male, %)	55	90.91	86.18	18.81***
Literacy status (literate)	55	86.36	82.24	11.7***
Cooperative (yes, %)	40	63.64	60.53	4.06**
Credit (yes, %)	20	69.7	63.16	18.44***
Extension on value addition (yes, %)	30	15.15	17.11	2.7*
Price of dry cherry coffee (attractive, %)	10	89.39	78.95	65.87***
Price of red cherry coffee (attractive, %)	15	39.39	36.18	4.48**
Ownership of drying facility (yes, %)	70	63.64	64.47	0.31
Contractual agreement on red cherry (yes, %)	85	24.24	32.24	29.35***
Dry cherry for saving/bargaining (yes, %)	0	32.58	28.29	9.09***
Age (year)	39.9	44.23	43.66	-1.85*
Farming experience (year)	10.65	17.52	16.62	-3.3***
Active family labour force (number)	2.2	3.17	3.05	-2.34**
Non/off-farm income (birr)	305	6566.52	5742.63	-2.19**
Volume of coffee harvested (qtl)	8.15	48.07	42.82	-4.17***

***, **, and * significant at 1%, 5% and 10% significance level, respectively, N=sample size
Source: Survey result, 2014

IV.   Econometric results

Determinants of Value Addition: Tobit's mmaximum likelihood estimates, marginal effects and change in probability of participation in value addition are presented below Table 2. The likelihood function of the model is significant (LR chi2 (15) = 261.27, Prob chi2= 0.0000) indicating the model is adequate because coefficients are jointly significant. Sex, literacy status, coffee farming experience, active family labour force, extension service on value
addition, credit access, perception of farmers towards current price of dry cherry coffee, ownership drying facilities, and non- and/or off-farm income were significantly affected intensity of coffee value addition (Table 2).

Table 2: Maximum likelihood estimates of Tobit model of coffee value addition

Variable	Coefficient	Standard Error	Marginal effect[1]	Marginal effect[2]	Change in probability
Sex	4.98***	1.55	4.80***	4.21***	0.0952**
Literacy status	2.18**	1.07	2.10**	1.84**	0.0417*
Coffee farming experience	0.17***	0.04	0.16***	0.14***	0.0032***
Active family labour force	1.31***	0.29	1.26***	1.11***	0.0250***
Extension service on value addition	7.90***	1.28	7.62***	6.68***	0.1510***
Distance to urban center	0.01	0.10	0.01	0.01	0.0002
Access to credit	1.78**	0.84	1.72**	1.51**	0.0341*
Ownership of drying facility	2.36***	0.84	2.28***	2.0***	0.0451**
Price of red cherry	0.21	0.94	0.20	0.18	0.0040
Price of dry cherry	2.92***	1.06	2.81***	2.47***	0.0558**
Membership in coffee cooperative	0.83	0.76	0.80	0.70	0.0158
Non- and/or off-farm income (log)	5.93***	0.35	5.72 ***	5.02***	0.0492***
Consideration of drying as saving and/or bargaining mechanism	1.41	1.13	1.36	1.19	0.0269
Contractual agreement on red cherry coffee	-0.95	0.95	-0.92	-0.81	-0.0182
Urgent need to sell red cherry	-0.07	0.85	-0.07	-0.06	-0.0014
Constant	-31.14***	3.07			
Sigma	4.14	0.25			

Pseudo R^2 = 25.5%   Number of observations = 152

Log-likelihood = -382.54   Left-censored observations = 20

LR chi2(15) = 261.27   Uncensored observations = 132

Prob > chi2= 0.0000   Right-censored observations = 0

[1]   The effects of change in the explanatory variables on the expected value of the dependent variable among the whole sample

[2]   The change in intensity of value addition with respect to a change in an explanatory variable among participants

NB: - Dependent variable is represented by monetary valuation of value added on coffee (thousands of birr)

***significance at 1% level, ** significance at 5% level, and *significance at 10% level Source: Own computation from survey, 2014

Sex of the household: As expected, sex affected coffee value addition negatively at 1% significance level. The marginal coefficient values for this explanatory variable were found to be 4.8 and 4.21 implying that being male-headed household against that of female-headed would increase the intensity of value addition by 4800 birr among the whole sample and by 4210 birr among the participant group. The result supports the study of Mamo *et al.* (2014) in that being male headed household was related with volume of milk value added positively. This variable would also increase the probability of value addition significantly by 9.52%. These implied that conditions of coffee value addition activities are favorable for male headed than female headed farmers.

Literacy status: It was positively related with value addition at 5% significance level. The computation of marginal effects showed that while all other variables in the model held constant, being literate than illiterate would increase coffee value addition by amount coffee value addition by 2100 birr among the whole sample and by 1840 birr among the participant group. Being literate household also led to an increase in the probability of coffee value addition by 4.17%. Households who have better education are likely to understand importance of value addition through drying coffee. It is probably due to the reason that more educated farmers are close to adopt processing and value adding technologies relative to those illiterate farmers there by increasing the intensity of value addition positively. This result agrees with the findings of Ngore *et al.* (2011) who found that improving literacy levels among rural entrepreneurs would increase the level of meat value addition in the rural agribusiness sector.

Coffee farming experience: This variable affected the intensity of value addition significantly and positively at 1% level. It implied as farmers stay longer in coffee farming business, it is expected to increase value addition through drying and/or further processing. All other factors being unchanged, a one year increase in farming experience leads to an increase in coffee value addition by 160 birr among the whole sample and by 140 birr among the participant group. As experience increased by a year the likelihood of value addition would also increase significantly by 0.32%. This is probably due to the reason that as farmers are experienced with coffee farming, they would be aware of the benefits of drying coffee and engages in value addition than those famers with few years of farming experience.

Active family labour force: In line with the expectation, labour force affected coffee value addition positively at 1% significance level. Other factors being constant, a one person labour force availed in the family increased the coffee value addition by 1260 birr among the whole sample and by 1110 birr among the participant group. As the number of labourer in the family increased by one, the probability to participate in value addition would increase by 2.5%. This result was in confirmation with Berhanu *et al.* (2011) who revealed that availability of family labour force affected level of milk value addition by the smallholder farmers positively at 1% significance level.

Extension service on value addition: As expected, this variable was found to be positively associated with coffee value addition at 1% significance level. The marginal effects of this variable showed that as farmers are addressed with extension service, value addition increased by 7620 birr among the whole sample and by 6680 birr among the participant group. Extension service on value addition increases the probability of adding values on coffee by 15.1%. This result was in line with the study of Berhanu *et al.* (2011) who revealed that negative livestock extension services decreased milk value addition.

Access to credit: This variable affected the intensity of coffee value addition positively at 5% significance level. The marginal effects for this variable revealed that those who have got credit access would increase value addition by 1720 birr among the whole sample and by 1510 birr among the participant group. Credit access increases the likelihood to participate in value addition by 3.41%. These explain that credit is a key financial instrument to break the low level of value addition and marketing problem. This result supports the study of Ngore *et al.* (2011) who revealed that enhancing access to credit would result in high meat value addition in the rural agribusiness sector. In Mamo *et al.* (2014), access to credit was also related with volume of milk value added positively.

Ownership of sufficient drying facilities: As hypothesised, intensity of coffee value addition was related with the availability of drying facilities for farmers positively at 5% significance level. The marginal effects for this explanatory variable were found to be 2.28 and 2 implying that for those who assumed that they had enough drying facilities, the value added on coffee would increase by 2280 birr among the whole sample and by 2000 birr among the participant group. Having enough coffee drying facilities increased the likelihood of value addition by 4.51%.

The result indicated that practice of farm level coffee value addition activities were greatly depending on the availability of drying facilities.

Perception of farmers towards current price of dry cherry: This variable also affected coffee value addition positively at 1% significance level. As farmers perceived that price for dry cherry is attractive, value addition would increase by 2810 birr among the whole sample and by 2470 birr among the participant group. Consideration of price of dry cherry as attractive would increase the probability of participation in value addition by 5.58%. The results, therefore, suggested that farmers to be encouraged to coffee value addition through drying, increasing price of dry cherry would be a strategy. Thus, let alone other factors constant, the higher attractive the price of dry cherry, the better would be the participation in and intensity of value addition.

Log of non- and/or off-farm income: It affected intensity of coffee value addition positively at 1% significance level. The marginal effects revealed that, on average, a one percent increase in non-and/or off-farm income would result in an increase in value addition by 57.2 birr among the whole sample and by 50.2 birr among the participant group. This may be explained by the fact that farmers with a better non-and/or off-farm income would diversify their coffee business like value addition since the financial strength of farmers to invest more on the purchase of facilities and disbursing on labour cost for value adding purpose and/or to wait for future higher prices from coffee would increase. This finding coincided with the results of Mamo et al. (2014) who revealed non-dairy income source affected milk value added positively and Berem et al. (2010) that amount of hours spent on off-farm activities increased the honey value addition.

V. CONCLUSION AND RECOMMENDATION

The result indicate that female headed households were not in a better position in adding value to coffee compared to the male headed households indicating that giving due attention by improving access to credit and other extension facilities for female headed is mandatory. Women should be targeted while providing training and other extension service for farmers. Literacy status is another significant variable that affect intensity of value addition positively. Building education capacity of rural farmers through arranging consecutive trainings and experience sharing sessions among smallholder farmers or arranging other formal way of education should be designed to increase farm level coffee value addition. The adequacy of extension service provided and ownership of drying facilities to farmers have also something to do with enhancing value addition. It is, therefore, important to serve farmers with appropriate extension service provisions and offering drying facilities for farmers so that they would be encouraged to value addition. Assigning professional development agents and upgrading their knowledge and skills to provide adequate extension services is recommended. The study also finds that access to credit enables farmers to increase value addition. Thus, strengthen the financial capability of farmers by providing adequate size of credit is the necessary strategy to increase intensity of value addition. It is must to finance coop/unions sufficiently to solve severe financial problems of farmers. Modern value chain financial products (more importantly warehouse receipt finance) as an alternative for credit provision should be established.

Non-and/or off-farm income is another important factor affected value addition positively. Hence, encouraging farmers to diversify their business besides coffee is an alternative way to enhance coffee value addition at the farmer level. On top of these, price of dry cherry coffee affects value addition positively. Therefore, there should be a system for which suppliers couldn't fix price below some threshold limit. As farmers are the pro-poor groups who need to be prioritized in any intervention, legal tactics and conditions (for instance prevailing price ceiling and price floor) under which such practices of offering unfair price would not likely to prevail should be implemented.

In general policy aiming at offering farmers a fair price, providing adequate credit and other extension services, improving marketing infrastructures, building capacity of farmers, encouraging farmer's business diversification besides coffee farming, targeting gender inclusive strategy (paying attention to female headed households) are recommended to increase coffee value addition at farm level.

REFERENCES

[1.] Abasanbi, A.A. (2010) Assessment of coffee quality and its related problems in Jimma Zone of Oromia Regional State. An MSc thesis in Agriculture (Horticulture), Jimma University, Jimma, Ethiopia. 141p.

[2.] Altenburg, T. (2006) The rise of value chain governance and its implications for UNIDO's development policy: Presentation on behalf of the German Development Institute, Bonn.

[3.] Berem RM., Obare G., and Owuor G. (2010). 'Is value addition in honey a panacea for poverty reduction in the Asal in Africa? Empirical evidence from Baringo district, Kenya', Contributed 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.

[4.] Berhanu K, Kindie G, Derek B, and Belay Kassa (2011) 'Determinants of participation decisions and level of participation in farm level milk value addition': The case of smallholder dairy farmers in Ethiopia, Ethiop. J. Appl. Sci. Technol. 2(2): 19 – 30.

[5.] Cochran, W. G. (1963) Sampling techniques, 2nd ed, John Wiley and Sons, Inc. New York, 1953-1963, Library of Congress Catalog Card Number: 63-7553, P206-20.

[6.] Coltrain D., Barton D., Boland M. (2000) 'Value Added: opportunities and strategies', Department of Agricultural Economics, Kansas State University.

[7.] Desse Nure (2008) 'Mapping quality profile of Ethiopian coffee by origin', In Proceedings of a National Work Shop Four Decades of Coffee Research and Development in Ethiopia, 14-17 August 2007, EIAR, Addis Ababa, Ethiopia, pp 328-333.

[8.] Fleming, K. (2005) Value added strategies: Taking agricultural products to the next level, Honolulu (HI): University of Hawaii, 2p. (Agribusiness; AB-16).

[9.] ARDO (2008). Annual Report of Agriculture and Rural Development Office of Gomma district, for year 2007/2008, Agaro, Gomma, Ethiopia.

[10.] IFPRI (2003) Annual report Headquarters 2033, Washington, DC 20006-1002, USA.

[11.] Glenn D. Israel (1992) Sampling the Evidence of Extension Program Impact, Program Evaluation and Organizational Development, IFAS, University of Florida, PEOD-5.

[12.] JZARDO (Jimma Zone Agricultural and Rural Development Office) (2008). Annual Report for year 2007/08, Jimma, Ethiopia.

[13.] Mamo T., Tewodros T., and Noreen B. (2014) 'Factors affecting urban and peri-urban dairy producers' participation in milk value addition and volume of milk value added in Welmera woreda, west Shewa zone of Oromia regional state, Ethiopia', International Journal of livestock production: Vol.5 (9), pp165-172.

[14.] P.M. Ngore, P.M. Mshenga, G Owuor and B. K. Mutai (2011) 'Socioeconomic factors influencing meat value addition by rural agribusinesses in Kenya', Current Research Journal of Social Sciences 3(6): 453-464, 2011 ISSN: 2041-3246.

[15.] Vermeulen, S, Woodhill, J, Proctor, F.J and Delnoye, R. (2008) Chain-wide learning for inclusive agro food market development: a guide to multi-stakeholder processes for linking small scale producers with modern markets, International Institute for Environment and Development, London, UK, and Wageningen University and Research Centre, Wageningen, the Netherlands.