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“Grow Wiser at the Water Tower”

“የዕውቀት አውጅማ ከጮቂ ማማ”

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Market Chain Analysis of Hot pepper in Ayehu Guagusa Woreda, Ethiopia

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Abstract

Hot pepper (*Capsicum annum*) is Ethiopia's most widely cultivated pungent vegetable and a cornerstone of both cuisine and rural livelihoods. Despite favorable agro-ecological conditions, production and marketing are constrained various agronomic, institutional, and marketing challenges persist. This study examined the hot pepper market chain in Ayehu Guagusa Woreda, Amhara Region, using data collected from 151 producers and 50 traders. Descriptive statistics, the Structure–Conduct–Performance (SCP) framework, and multiple regression models were employed to evaluate market channels performance, behavior structure and supply determinants, respectively. Six major marketing pathways were identified, with direct farmer-to-consumer sales (channel I) yielding the highest margins (3,356 Birr/quintal). The market concentration ratio was found 24.17% that indicated a competitive market structure. Regression analysis identified yield, land size, farming experience, cooperative membership, credit access, and current price as significant positive drivers of supply, while distance to market reduced market supply. The findings highlight the need to strengthen market infrastructure, expand credit services, enhance cooperative institutions, and provide farmer training to improve productivity and market integration. These interventions would enhance the efficiency of the hot pepper value chain and increase smallholder incomes.

1. Introduction

The production and distribution of agricultural products are greatly influenced by agricultural marketing, which is an essential engine for economic growth. Ethiopia's agricultural output markets, however, confront a number of difficulties. Inadequate infrastructure, a small number of traders, limited financing availability, high handling and marketing expenses, erroneous market information between buyers and sellers, and the farmers' weak negotiating position are some of these [5].

According to UNCTAD (4) market access is a crucial instrument for accomplishing the Sustainable Development Goals (SDGs). The SDGs are influenced by a variety of external and endogenous factors, including a country's size, geography, import and export composition, connectivity to significant markets, availability of natural resources, level of development, and institutional strength.

Hot pepper is a high-value crop central to Ethiopian cuisine and smallholder income. Hot pepper is a significant traditional crop that is prized for its color and pungency in the form of *karia* (green pod) and *berbere* (dry pod pounded into powder). Additionally,

the crop is one of the major spice cash crops that provide revenue, especially for smallholder farmers in several regions of the nation [1]. The Amhara, Oromia, and Southern Nations, Nationalities, and People's (SNNP) Regions are where hot pepper is mostly grown. In the 2017–2018 production year, 157,752.94 hectares of hot pepper were grown nationwide, and 2,647,225 quintals were produced altogether [2]. In the Amhara Region during the 2018/2019 production year, a total of 87,350.44 hectares of land were covered with hot pepper yielding about 1.5 million quintals. This indicates 17 quintals per hectare productivity rate [3].

The Amhara Region, particularly Ayehu Guagusa Woreda, has favorable conditions for production, yet farmers face persistent challenges including poor roads, limited storage, and weak market linkages. Because of its advantageous agro ecological circumstances in the Awi Zone, the study location, Ayehu Guagusa Woreda, is acknowledged as a promising region for hot pepper production. The Woreda Office of Agriculture and Rural Development reports that the woreda produced 167,958 quintals of hot peppers on 9,331 hectares during the

2017/2018 growing season [10]. Farmers in the Woreda are not taking advantage of the potential benefits of producing hot peppers. Price volatility, knowledge asymmetry, and inadequate infrastructure-such as bad roads and telecommunications-are some of the causes of this predicament. Inadequate market connection, seasonal fluctuations, a lack of storage and warehouse space, and illnesses that impact hot pepper plants are other problems. The potential benefits that could be obtained from the woreda's current opportunities are limited by these obstacles taken together.

Previous studies in other districts highlight oligopolistic tendencies and barriers to entry, but evidence from Ayehu Guagusa remains limited. This study addresses that gap by analyzing market channels, structure, conduct, and performance, and identifying factors influencing supply. This research is designed to examine variables that determine the market's supply of hot peppers and key hot pepper marketing channels in Ayehu Guagusa Woreda. Thus, the objectives of the research are:

- To analyze the market chain of hot pepper in the woreda

- To identify factors that determine the quantity supply of hot pepper in the market
- To examine the market's structure, behavior, and efficacy of existing hot pepper marketing channels.

2. Methodology

2.1. Description of the Study Area

The study was conducted in Ayehu Guagusa Woreda, Awi Zone, and Amhara Region. The woreda encompasses 17 rural and 3 urban kebeles, and has a distance of 36 kilometers from Enjibara, the zonal seat, 158 kilometers from Bahir Dar, the regional state capital, and 470 kilometers from Addis Ababa. The Ayehu Guagusa Woreda shares boundaries with Zigam Woreda on the west, Wemberema Woreda on the east, Oromia region on the south, and Ankesha Guagusa Woreda on the north. The entire land use shows about 65% is allocated for agriculture, 31.23% for grazing, 0.34% for water bodies, and the remainder is allotted for other uses. The woreda has a total population of 135,209, of which 48.46% male and 51.54% female. The rural population counts about 91.9 % of the total population. Regarding the topography of the study area 80% of total land constitute Woyna dega (subtropical zone) [10].

2.2. Sample Size Determination and Sampling Technique

The sample size was determined by using a formula developed by Yamane [11]. A three-stage sampling method was used to select 151 respondents of smallholder farmers from 17 rural Kebele Administrations (KAs). Firstly, in consultation with district experts based on their hot pepper production potential seven kebeles were selected purposively. Secondly, Four Kebeles (Sosetu Sumata, Ambela, Enabara, and Kubare) were selected using simple random sampling technique. Then the lists of hot pepper producer farmers in the survey year in each kebele were taken from kebele development agents. Thirdly, proportional to size systematic random sampling technique was used to draw individual sample households from each kebeles. Accordingly, 40, 46, 36, and 29 respondents were chosen from Sosetu, Ambela, Enabara, and Kubare kebeles, respectively. Purposive sampling was used to include the top four largest traders in the study's findings. The remaining traders were selected using a systematic random sampling technique

2.3. Data Collection Methods

The study used both primary and secondary data for its analysis. Primary data were collected from 151 producers and 50 traders through interviews based on the structured questionnaire, prepared, pretested and amended. Secondary data were also collected from multiple sources Published and unpublished materials.

2.4. Method of Data Analysis

Analysis combined descriptive statistics with the SCP framework and multiple regression using OLS to identify determinants of market supply. The market concentration ratio (CR), marketing cost and marketing margin analysis, barriers to entry, and pricing strategy were used to analyze the market structure, conduct, and performance of the hot pepper market in the study area. Descriptive statistics, such as the mean, standard deviation, and percentage frequencies, were used to examine and comprehend the demographic, socioeconomic, and institutional characteristics of the respondents.

Structure Conduct and Performance (S-C-P) Model: this model was used to investigate how the market's structure and the behavior of vendors of various goods and services impact the market's performance and, in turn,

the nation's overall welfare [12]. The model looks at the causal relationships between market structure, conduct, and performance.

Concentration Ratio (CR): Industrial organizations frequently use this numerical statistic to gauge the number of businesses in a market [13]. According to Kohl and Uhl [14], a strong oligopolistic industry is generally indicated by a concentration ratio of 50 percent or more of the four largest firms; a weak oligopoly is indicated by a ratio of 33 to 50 percent; and a non-concentrated industry is indicated by a ratio of less than that. The concentration ratio was calculated to ascertain whether the market is controlled by a large number of small enterprises or a small number of large corporations.

$$CR = \sum_{i=1}^r S_i$$

$i = 1, 2, 3, 4$

Here, CR stands for the Concentration Ratio, S_i for the i^{th} firm's percentage share and r for the top four firms.

Entrance hurdles: The ease of obtaining a license, capital restrictions, and the acts of illicit traders all contributed to the creation of entrance barriers. Since everyone has entered the market, it may really be challenging to

question merchants about entrance hurdles. Instead, it is possible to see the age, gender, and ethnic distribution of traders and employees of various business sizes as well as the degree to which variations in the number of active traders lead to increases and decreases in profitability [15].

Analysis of market behavior: The patterns of behavior that businesses follow in order to adapt to the markets in which they buy or sell are referred to as market conduct. This suggests the examination of human behavioral patterns that are difficult to recognize, obtain, or measure. As a result, a descriptive and qualitative approach is taken to the behavior variables. Pricing techniques were used to analyze it. Few factors are carefully taken into account to identify signs of unfair pricing practices and ⁽¹⁾the circumstances that make them prone to occur. The availability of pricing information and how it affects current prices, the viability of using other market outlets, and the presence of formal and informal producing and marketing groups are among the points to be considered [15].

Market performance: The market's performance was examined using marketing margins, producers' gross marketing margin

(GMMp), and total gross marketing margin (TGMM). Calculating the producers' gross marketing margin (GMMp), which is the

percentage of the product's price that the consumer pays and the producer receives, is also essential.

The producer's margin is calculated as:

$$TGMM = \frac{\text{Consumer price} - \text{Producer price}}{\text{Consumer price}} \times 100 \quad (2)$$

$$GMMP = \frac{\text{Consumer price} - \text{Marketing gross margin}}{\text{Consumer price}} \times 100 \quad (3)$$

Where TGMM = total gross marketing margin; GMMP = gross marketing margin of the producer.

Econometric Model: A multiple linear regression model was employed to examine the factors influencing the market supply of hot pepper. The functional form of the model is described as follows:

$$Y_i = X_i\beta + \varepsilon_i \quad (4)$$

where, Y_i represents the actual supply of hot pepper, X_i denotes the vector of explanatory variables, β indicates the vector of coefficients for the explanatory variables, and ε_i signifies the disturbance term.

2.5. Working Hypotheses and Variable Definitions

Quantity supplied (QS) the dependent variable is a continuous variable measured in quintals. Reflecting the amount of hot pepper that producers supply to the market during

the 2019/2020 production period. Based on theories and review of empirical studies the type, unit of measurement expected sign, and code, of explanatory variables included in the model were summarized in the following table (Table 1).

Table 1: An explanation of the OLS model's hypotheses and explanatory variables

Variables	Definitions & units of measurement	Expected effect
FARM_EXP	Farming experience: years	Positive
FAMI_SIZE	Family size: adult equivalent	Positive
LAND	Land allocated for hot pepper: hectare	Positive
YIELD	Hot pepper output: quintals	Positive
EXT_CON	Extension contact number/year	Positive
DIS_MKT	Distance to the nearest market: km	Negative
C_PRICE	Average current market price: Birr/kg	Positive
L_PRICE	Average lagged market price: Birr/kg	Positive
NO_OXEN	Number of oxen owned	Positive
SEX	Sex of the household head: 1 = male, 0 = female	Positive
EDU	Education status of the household head: 1 = literate, 0 = illiterate	Positive
CRED_USE	Credit use: 1 = yes, 0 = no	Positive
MAR_INF	Market information: 1 = yes, 0 = no	Positive
OFF_INCOME	Off farm income: 1 = yes, 0 = no	Negative
COP_MEM	Cooperative membership: 1 = yes, 0 = no	Positive

3. Results and Discussion

3.1. Demographic, Socioeconomic, and Institutional characteristics of respondents

As shown in table 2 below, a farmer was produced on average 11.26 quintals during production year. Farmers on average supplied 9.76 quintals of pepper, with a standard deviation of 4.32 quintals which shows with noticeable variation across households. They had on average about 8.71 years of farming experience, with standard deviation of 3.59 years showing moderate differences among them. The family size

averaged 5.19 adult equivalents, with standard deviation of 1.39 indicating relatively highest as compared to the national average. The average landholding size was found 1.05 hectares per farmer with standard deviation of 0.58 hectares showing a lowest variation among respondents. Farmers maintained regular connections with extension services, averaging 8.31 contacts per year. The distance to markets was 4.65 km, which could affect accessibility and costs. The current market price averaged 62.32 Birr, while the lagged price was lower

at 52.50 Birr, showing price growth over time. Livestock ownership was limited, with

farmers keeping about 2.47 oxen on average

Table 2: Summary of Continuous Variables

Variable	Unit	Mean	Std. Dev.
Quantity of pepper supplied	Quintal	9.76	4.32
Farm experience	Years	8.71	3.59
Family size	Adult equivalent	5.19	1.39
Land holding	Hectare	1.05	0.58
Quantity of pepper produced	Quintal	11.26	5.19
Extension contact number/year	Number	8.31	2.97
Distance to number	Kilometer	4.65	2.60
Average current market price	Birr per Kg	62.32	9.81
Average lagged market price	Birr per kg	52.50	8.62
Number of oxen	Number	2.47	1.19

Source: Own survey result, 2020

The survey results indicates that among the total sample household heads, 92.05% were male and 7.95% of them were female (table 3). Concerning the educational level of sample household heads, about 54 % of the total respondents are illiterates, while the rest have various educational levels. The result also shows that about 60% of the respondents

were use credit during the survey year and 87.42 % of respondents are a member of agricultural cooperative. Among the 151 respondents surveyed only 19.87 % were engaged in off farm activities, which shows agriculture is the only source of income for most of them.

Table 3: Summary of Dummy Variables

Variable	Category	Frequency	Percent
Sex of the household head	Female	12	7.95
	Male	139	92.05
Education status of the household head	Illiterate	81	53.64
	Literate	70	46.36
Credit use	No	62	41.06
	Yes	89	58.94
Market information	No	65	43.05
	Yes	86	56.95
Off farm income	No	121	80.13
	Yes	30	19.87
Cooperative membership	No	19	12.58
	Yes	132	87.42

Source: Own survey result, 2020

3.2. The structure, behavior, and performance of the hot pepper market

The Market Channels: Six primary channels were identified for the product to reach to consumers, ranging from direct farmer-to-consumer sales to multi-step chains involving

collectors, wholesalers, and retailers. The majority of the product passes to consumer through retailers (Channel IV). Out of 1474 quintals total market supply by respondents 36.22% (534qt) pass through retailers only (Figure 1).

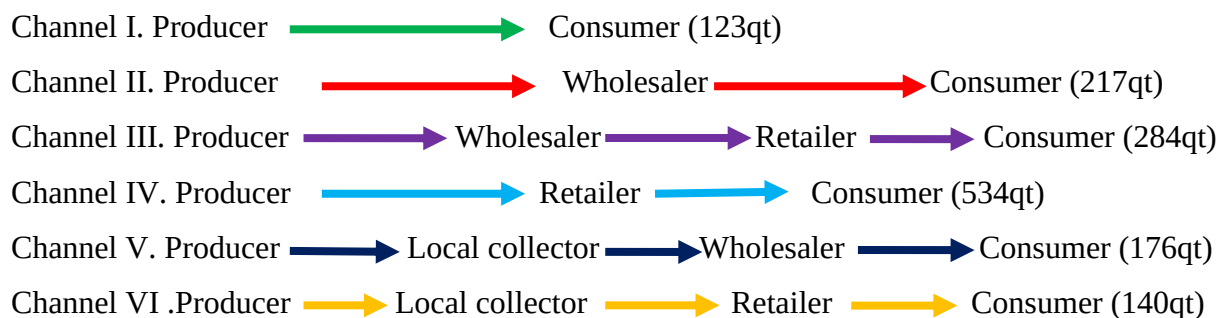


Figure 1: Marketing channel of hot pepper in the study area

Market Structure and Conduct: The 24.17 % concentration ratio indicates that the presence of a competitive market with dispersed actors for the product in the study area. The result indicates that from the total sample farmer respondents, about 41.06%, 16.56%, 15.23%, 13.91%, and 13.24% stated that market prices were determined by supply and demand (market), by buyers, through negotiation, and by themselves, respectively. While, about 58%, 16%, and 26% of sample traders responded that the buying price was set by the market, by them, and by agreements with suppliers and producers, respectively. This implies that Price-setting was largely determined by supply-demand dynamics,

though negotiation and buyer influence were common. Traders relied on long-term relationships and visual inspection of produce. Market Performance: As indicated in table 4 below direct farmer-to-consumer sales yielded the highest returns to producers amounting to 3.356.36 birr per qt gross profit. , which shows the importance of reducing intermediaries. The results reveal that direct sales provided the highest farmer profit, while reliance on collectors reduced margins. Retailers captured the largest margins in certain channels (III, IV & VI) while wholesalers earned the least as compared to retailers (Table 4).

Table 4. Estimated Marketing Margin of Market Actors

Actors	Cost items (Birr/Quintal)	I	II	III	IV	V	VI
Producers	Cost of production	1993.66	1993.66	1993.66	1993.66	1993.66	1993.66
	Selling price	5500	5200	5200	5400	4800	4800
	Marketing cost	150	135	138	125	118	130
	Gross profit	3356.34	3071.34	3068.34	3281.34	2688.34	2676.34
	GMMp (%)	100	76.47	68.78	67.5	63.57	63.16
	Purchase price					4800	4800
Local collectors	Selling price					6500	6500
	Marketing cost					247	220
	Gross profit					1453	1480
	GMMlc (%)					22.52	22.37
	Purchase price		5200	5200		6500	
Whole salers	Selling price		6800	6450		7550	
	Marketing cost		420	430		415	
	Gross profit		1118	820		635	
	GMMw (%)		23.53	16.54		13.91	
	Purchase price			6450	5400		6500
Retailers	Selling price			7560	8000		7600
	Marketing cost			340	309		255
	Gross profit			770	2291		2545
	GMMr(%)			14.68	32.5		14.47
	TGMM%	100	23.53	31.22	32.5	36.43	36.84
	Purchase price						
	Selling price						

Source: Own survey result, 2020

3.3. Results of the econometric model

The important demographic, socioeconomic and institutional factors that are expected to influence the market supply of hot pepper were included in the model for analysis. Prior to running the linear regression model,

explanatory variables were checked for multicollinearity problems using Variance inflation factor (VIF) for continuous and contingency coefficient (CC) for discrete/dummy variables. On top of this, heteroscedasticity was checked using the

Breusch-Pagan test and the problem of missing variables was also examined by using the Ramsey RESET test. As a result, no significant problem was found.

Determinants of Market Supply: The results of Linear multiple Regression analysis showed that eight of the fifteen hypothesized variables including farming experience, family size, land size, yield, credit, market distance, current price and cooperative membership) are significantly affected the market supply of hot pepper (Table 5). Of which farming experience, land size,

yield, cooperative membership, credit access, and current price positively and significantly market supply. Whereas, family size and distance to market negatively and significantly affect the quantity of market supply.

The findings confirm that productivity and institutional support are critical and significantly increase the quantity of market supply. This result is similar with study findings of Alemnew [7], Rehima [6], and Gizachaw [8], which found that the amount of hot pepper on the market was positively influenced by the quantity produced.

Table 5: Multiple Regression Model Results

Variables	Coefficients	Standard error	t_ratio	P_value
Constant	-1.228	1.296	-0.948	0.345
SEX	0.499	0.480	1.040	0.300
EDU	0.072	0.295	0.243	0.809
FARM_EXP	0.077**	0.031	2.483	0.015
FAMI_SIZE	-0.181	0.095	-1.905	0.060
LAND	0.624*	0.340	1.835	0.069
YIELD	0.618***	0.042	14.71	0.001
EXT_CON	-0.063	0.048	-1.31	0.194
CRED_USE	0.826***	0.312	2.646	0.009
MAR_INF	0.305	0.269	1.134	0.259
OFF_INCOME	-0.251	0.338	-0.742	0.459
DIS_MKT	-0.140***	0.051	2.745	0.007
C_PRICE	0.031**	0.015	2.06	0.037
L_PRICE	0.014	0.011	1.272	0.180
NO_OXEN	0.072	0.108	0.670	0.504
COP_MEM	0.980**	0.427	2.295	0.023
Number of observation		151		
R_Square		0.885		
Adjusted R_Square		0.873		
F value		69.557		

Source: Own survey result, 2020

*, **, and *** show significance at the 10%, 5%, and 1% levels, respectively.

Farming experience, Cooperative membership and credit access enhance farmers' ability to supply, while distance from the market limits the quantity of supply for sale. This finding is supported by the study results of Alemnew [7], Addisu [17], Abraham [18], and Gizachaw [8].

Land allocated for the crop had a positive and significant impact on the supply of hot peppers at the 10% significance level. This is in line with the findings of Alemnew [7], Kindie [19], and Addisu [17], who discovered that farmers' land allocations increased, the market supply of onions, sesame, and hot peppers. However, the market supply of hot pepper was negatively and significantly affected by family size at the 10% significance level. This is due to the fact that as family size increase the houses holds consumption amount increases, results a decline in market supply. Comparisons with other districts suggest that Ayehu Guagusa's market is more competitive, but farmers still face systemic barriers.

4. Conclusion and Recommendations

Hot pepper is the primary crop grown in the study woreda by smallholder farmers. The area has a favorable agro-ecology for producing hot peppers Hot pepper markets

in Ayehu Guagusa are competitive but constrained by infrastructure and institutional gaps. Policy interventions should focus on: Expanding market infrastructure such as roads, storage, and irrigation, increase the availability of inputs to improve hot pepper yield, strengthening credit services and cooperative institutions, providing farmer training to improve production skills, promoting efficient land use to boost yields and enhancing market information systems to reduce price asymmetry. These measures would improve the efficiency of the hot pepper market supply and increase smallholder incomes.

5. Declarations

Availability of data and materials: The full document (thesis) is available at our hand and at Debre Markos University.

Competing interests: We do not have competing interests.

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Authors' contributions: All authors have read and approved the final manuscript

6. References

- [1]. ICARDA (International Center for Agricultural Research in the Dry Areas) (2016) Participatory adaptation of hot pepper (*Capsicum* species) varieties for green pod production under irrigation condition, Reducing Land Degradation and Farmers' Vulnerability to Climate Change in the Highland Dry Areas. Technical Report of Experimental Activities, North-Western Ethiopia.
- [2]. CSA (Central Statistical Authority, Federal Democratic Republic of Ethiopia) (2018) Central Statistical Agency, Agricultural Sample Survey, 2018, Vol. 1, Report on area and production of major crops (private peasant holdings, Maher season), Addis Ababa, Ethiopia.
- [3]. CSA (Central Statistical Authority, Federal Democratic Republic of Ethiopia) (2019) Central Statistical Agency, Agricultural Sample Survey, (2019), Vol. 1, Report on area and production of major crops (private peasant holdings, Maher season), Addis Ababa, Ethiopia.
- [4]. UNCTAD (United Nation Conference on Trade and Development) (2015) Trading in to sustainable development: Trade, market access, and the sustainable development goals.
- [5]. Jema, H (2008) Economic Efficiency and Marketing Performance of Vegetable Production in the Eastern and Central Parts of Ethiopia. PhD Dissertation, Swedish University of Agricultural Sciences, Uppsala.
- [6]. Rehima, M (2006) Analysis of hot pepper marketing: The case of Alaba and Siltie in SNNPRS of Ethiopia. M.Sc thesis, Haramaya University, Haramaya, Ethiopia.
- [7]. Alemnew, A (2010) Market chain analysis of hot pepper: the case of Bure District, West Gojjam zone, Amhara National Regional State, Ethiopia. M.Sc Thesis, presented to School of Graduate Studies, Haramaya University. Haramaya, Ethiopia.
- [8]. Gizachew, W (2018) Analysis of hot pepper value chain: The Case of Wenberma District, West Gojam Zone Of Amhara National Regional State, Ethiopia, M.Sc thesis presented to School of Graduate Studies, Haramaya University, Ethiopia.
- [9]. Abate, T.M., Dessie, A.B. and Mekie, T.M (2019) Technical efficiency of smallholder farmers in hot pepper

- production in North Gondar Zone, Amhara Regional State, Ethiopia. *Journal of Economic Structures*.
- [10]. AGWOARD (Ayehu Guagusa Woreda Office of Agriculture and Rural Development) (2019): Annual report of the Woreda in 2017/2018 production year, Awi Zone, Amhara Regional State, Ethiopia.
- [11]. Yamane, T 1967 Statistics: An Introductory Analysis. 2nd Edition, Harper and Row, New York.
- [12]. Kizoto, A (2008) Famine Early Warning Systems Network Market Guidance No.2: Structure, Conduct and Performance and Food Security.
- [13]. Shughart, William F (1990) The Organization of Industry. Richard O. Irwin Inc, U.S.
- [14]. Kohls, R.L. and Uhl, JN (1985) Marketing of Agricultural Products. 5th Edition, Macmillan Publishing Company, USA.
- [15]. Scarborough, V. and J. Kydd (1992) Economic analysis of agricultural markets. A manual of marketing series 5, Chatham, UK: Natural Resource Institute.
- [16]. Soepatini, Aflit Nuryulia P, Muzakar Isa, and Syamsudin (2018) “Supply-chain Analysis and Commodity Marketing of Chilli in Subosukowonosraten” in International Conference on Economics, Business and Economic Education 2018, KnE Social Sciences, pages 957–973.
- [17]. Addisu, H (2016) Value chain analysis of vegetables: The case of Ejere district, West Shoa Zone, Oromia National Regional State of Ethiopia. MSc Thesis, Haramaya University, Haramaya, Ethiopia.
- [18]. Abraham, T (2013) Value chain analysis of vegetables: The case of Habro and Kombolcha Woredas in Oromia Region, Ethiopia. MSc Thesis, Haramaya University, Haramaya, Ethiopia.
- [19]. Kinde, A. (2007). Sesame Market Chain Analysis: the case of Metema Woreda, North Gondar Zone, ANRS. An MSc Thesis Presented to School of Graduate Studies of Haramaya University.